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Investigation Report for Cañon de Valle Aggregate Area, Technical Area 14

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January 2012

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EXECUTIVE SUMMARY

Thirty-one solid waste management units (SWMUs) and areas of concern (AOCs) are located within Technical Area 14 (TA-14) of the Cañon de Valle Aggregate Area. This investigation report presents the results of Los Alamos National Laboratory's investigation activities at SWMUs and AOCs located within TA-14 of the Cañon de Valle Aggregate Area. Of the 31 sites, 2 sites have been approved for no further action by the U.S. Environmental Protection Agency, 1 site was removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit by the New Mexico Environment Department, and 1 site is subject to Resource Conservation and Recovery Act closure requirements. Of the 27 remaining sites addressed in this investigation report, 5 sites are deferred from investigation pursuant to Table IV-2 of the Compliance Order on Consent, 4 sites located next to active firing sites are proposed for delayed investigation, and 18 sites were sampled during the 2011 investigation.

The objectives of this investigation are to define the nature and extent of contamination and, if defined, to determine whether the sites pose potential unacceptable risks or doses to human health or the environment. This report presents the results of site characterization activities conducted during the 2011 investigation, as directed by the approved investigation work plan for the TA-14 portion of the Cañon de Valle Aggregate Area and the field implementation plan.

The 2011 investigation activities included collecting soil, sediment, and tuff samples from the surface to a maximum depth of 10 ft below ground surface. Data from samples collected during the 2011 investigation were evaluated along with data collected during previous investigations, if available, that meet current Laboratory data-quality requirements.

Sampling to determine the nature and extent of contamination was not conducted at one site, AOC 14-001(g), proposed for delayed investigation. Samples collected from drainages downgradient of this site indicate concentrations of inorganic chemicals, organic chemicals, and radionuclides either decreased in the drainages or decreased downgradient in Cañon de Valle.

The sampling data presented in this investigation report indicate the extent of contamination has been defined at five sites [AOCs 14-001(a,b,c,d,e)], and further sampling for extent is not warranted at two sites (SWMU 14-003 and AOC C-14-001). Human health and ecological risk assessments were performed for these sites, where applicable. SWMU 14-003 and AOCs 14-001(a,b,c,d,e) and C-14-001 do not pose a potential unacceptable risk to human health and the environment under the current or reasonably foreseeable future land use and are recommended for corrective action complete.

The nature and extent of contamination have not been defined at the remaining 10 sites. Additional sampling is needed to define the lateral and/or vertical extent of contamination at each of these sites. Additional soil removal is needed at SWMU 14-006 to remove elevated benzo(a)pyrene and at SWMU 14-009 to remove elevated uranium-238. 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 (amsl).

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 2011 investigation of the sites located in Technical Area 14 (TA-14) within the Cañon de Valle Aggregate Area at the Laboratory (Figure 1.0-1 and Plate 1). These sites are potentially contaminated with both hazardous and radioactive components. The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 5400.5, Radiation Protection of the Public and the Environment; DOE Order 435.1, Radioactive Waste Management; and DOE Order 458.1, Administrative Change 2, Radiation Protection of the Public and the Environment. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

Corrective actions at the Laboratory are subject to the Compliance Order on Consent (the Consent Order). This investigation report describes work activities that were completed in accordance with the Consent Order.

1.1 General Site Information

The Cañon de Valle Aggregate Area investigation work plan identified and described the activities needed to complete the investigations of TA-14 sites within the aggregate area (LANL 2006, 091698, section 9.0). Since the work plan was approved in 2007 (NMED 2007, 095478), the Laboratory's Environmental Programs (EP) Directorate, in cooperation with and with the consent of NMED, has revised and improved investigation sampling for sites regulated under the Consent Order. Sampling activities implemented during the investigation described in this report have deviated substantially from the approved work plan, which were described in detail in the 2011 field implementation plan (FIP) (LANL 2011, 207481). This FIP also incorporated the modifications NMED requested in its approval with modification letter for the work plan, issued on February 9, 2007 (NMED 2007, 095478), and is more consistent with the current strategy employed at the Laboratory to collect field samples.

Thirty-one SWMUs and AOCs are located within TA-14 of the Cañon de Valle Aggregate Area (Plate 1). Table 1.1-1 identifies the 31 SWMUs and AOCs and their status.

Of the 31 sites, 2 sites have been approved previously for no further action (NFA) by the U.S. Environmental Protection Agency (EPA), 1 site was removed from Module VIII of the Laboratory's

Hazardous Waste Facility Permit by NMED, and 1 site is subject to Resource Conservation and Recovery Act (RCRA) closure requirements. Therefore, these four sites are not addressed further in this report.

Of the 27 remaining sites addressed in this investigation report, 5 sites are deferred from investigation pursuant to Table IV-2 of the Consent Order, 4 sites located next to active firing sites are proposed for delayed investigation, and 18 sites were sampled during the 2011 investigation. This investigation report describes the investigation status and results of sampling activities conducted to date for the 27 sites (Plate 2).

1.2 Purpose of Investigation

During the 2011 investigation, 18 SWMUs and AOCs in TA-14 within the Cañon de Valle Aggregate Area were sampled in August and September of 2011 in accordance with the FIP (LANL 2011, 207481). For each site sampled, the objectives of the 2011 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 and the environment, and (3) assess whether any additional sampling and/or corrective actions are required.

All analytical data collected during the 2011 investigation activities are presented and evaluated in this report in conjunction with decision-level data from previous investigations, when available.

1.3 Document Organization

This report is organized into nine sections, including this introduction, with multiple supporting appendixes. Section 2 provides site conditions of the aggregate area. Section 3 provides an overview of the scope of the activities performed during the implementation of the work plan and the FIP. Section 4 describes the regulatory criteria used to evaluate potential risks to human and ecological receptors. Section 5 describes the data review methods. Section 6 presents an overview of the operational history of each site, information on historical releases, summaries of previous investigations, results of the field activities performed during the 2011 investigation, information on site contamination, evaluation of the nature and extent of contamination, and summaries of human health and ecological risk-screening assessments. Section 7 presents the conclusions of the investigations and risk-screening assessments. Section 8 provides recommendations based on the applicable data and the risk-screening assessment results. Section 9 includes a list of references cited and the map data sources for all figures and plates.

Appendixes include acronyms, a metric conversion table, and definitions of data qualifiers (Appendix A); field methods (Appendix B); analytical program descriptions and summaries of data quality (Appendix C); analytical suites and results and analytical reports (Appendix D) including the inorganic all analyses table (Table D-1) and the radionuclide all analyses table (Table D-2); investigation-derived waste (IDW) management (Appendix E); box plots and statistical results (Appendix F); scatter plots, box plots, and a table of selected inorganic chemicals detected at depth in soil and in weathered Qbt 4 at TA-14 (Appendix G); and risk assessments (Appendix H).

2.0 AGGREGATE AREA SITE CONDITIONS

2.1 Surface Conditions

The Cañon de Valle watershed consists of roughly east- to southeast-trending, flat-topped mesas that drain predominantly into Cañon de Valle (Plate 1). Fishladder Canyon, located in the eastern portion of the watershed, is a small tributary canyon that drains in a southeasterly direction into Cañon de Valle. At the southeastern end of the watershed, the Cañon de Valle watershed terminates at the confluence with Water Canyon. Source waters are predominantly from storm and snowmelt runoff that flows from the Sierra de Los Valles mountains (i.e., the eastern front of the Jemez Mountains), located west of the Laboratory (Collins et al. 2005, 092028, pp. 2-104–2-107) and flow from perennial springs.

The mesa tops range from 7700 ft amsl at the western Laboratory boundary to 7200 ft amsl at the southern tip of the watershed and overlook the confluence with Water Canyon. Cañon de Valle is fairly narrow and steep near its headwaters in the Sierra de Los Valles headlands, located west of the Laboratory boundary. The headlands transition into the mesa top at the western Laboratory boundary, and Cañon de Valle becomes broader with a gentler gradient for approximately 0.5 mi east of the western Laboratory boundary. At this point, the canyon steepens and narrows with up to 300-ft-tall cliffs at its terminus with Water Canyon (Plate 1).

2.1.1 Soil

Soil on the Pajarito Plateau was initially mapped and described by Nyhan et al. (1978, 005702). The canyon slopes between the mesa tops and canyon floors are 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).

A variety of soil types occur at TA-14, including Carjo loam, Frijoles very fine sandy loam, and Pogna fine sandy loam (LANL 1994, 034755, pp. 3-8–3-9). These soil units transition into outcrops of Bandelier Tuff along the margins of the mesa tops.

The eastern and central portions of the area of TA-14 sites were moderately burned in the 2000 Cerro Grande fire with damage to groundcover. The western portion was moderately to severely burned in the 2000 Cerro Grande fire, with substantial damage to the canopy and groundcover (LANL 2000, 067370, pp. 11–14). The entire south-facing slope located south of the TA-14 structures was moderately burned, with damage to the groundcover (LANL 2001, 071342, p. 19).

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.

Cañon de Valle has a drainage area of 4 mi^2, and surface water is perennial from Burning Ground Spring to stream gage E256 (Plate 1). Intermittent surface water occurs from natural and anthropogenic sources to stream gage E262 (Cañon de Valle confluence with Water Canyon) (Collins et al. 2005, 092028, p. 3-A-36). Permanent gaging stations located in the Cañon de Valle watershed consist of E253, located outside the western Laboratory boundary; E256, in the central portion of the watershed; E257, in the headwaters of Fishladder Canyon; and E262, located at the confluence of Cañon de Valle and Water Canyon (Plate 1).

Several springs issue from the Bandelier Tuff in the upper reaches of Cañon de Valle (Plate 1). Peter Seep, SWSC (Sanitary Wastewater Systems Consolidation) Spring, and Burning Ground Spring are located in Cañon de Valle. Fishladder Seep is located in Fishladder Canyon, a tributary to Cañon de Valle. Martin Spring is located in S-Site Canyon (Plate 1) but actually flows into Water Canyon (Collins et al. 2005, 092028, p. 3-A-37). Hollow Spring is a seep located at TA-15, near stormwater runoff monitoring sampling location CDV-SMA-8 (Plate 1).

2.1.3 Land Use

Currently, land use at TA-14 is industrial. TA-14 sites consist of decommissioned pull boxes, an active firing site, former firing sites, a decommissioned bullet test facility (now used for test shots), former buildings structures, a former burn area, decommissioned sumps, a decommissioned septic system, magazines, a surface disposal area, and a storage area. TA-14 is not accessible to the public. The current land use is not expected to change for the reasonably foreseeable future.

2.2 Subsurface Conditions

2.2.1 Stratigraphic Units of the Bandelier Tuff

The stratigraphy of the Cañon de Valle 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 hydrogeological 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 following descriptions of the stratigraphic units begin with the oldest (deepest) and proceed to the youngest (topmost). Stratigraphic units comprising the Bandelier Tuff are shown in Figure 2.2-1. The only stratigraphic unit encountered during the TA-14 investigation was unit 4 of the Tshirege Member of the Bandelier Tuff (Qbt 4).

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, crystal fragments, and fragments of perlite. The basal part of the Otowi Member includes the Guaje Pumice Bed, which is a sequence of well-stratified pumice-fall and ash-fall deposits.

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 is the upper member of the Bandelier Tuff 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 surge deposits and vertical fractures within the Bandelier Tuff have been identified as likely fast pathways for infiltration of surface water and contaminants from ponds and drainages into the vadose zone (LANL 2011, 207069). 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 within the Cañon de Valle Aggregate Area.

The Tsankawi Pumice Bed forms the base of the Tshirege Member. Where exposed, it is commonly 20–30 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 (Broxton and Vaniman 2005, 090038).

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 (4–10 in.) pumice-poor surge deposit commonly occurs at the base of this unit (Broxton and Vaniman 2005, 090038).

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, is 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 has 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 (Broxton and Vaniman 2005, 090038).

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 (Broxton and Vaniman 2005, 090038).

Qbt 4 is a complex unit consisting of nonwelded to densely welded ash-flow tuffs and thin intercalated surge deposits. Devitrification and vapor-phase alteration are typical in this unit, but thin zones of vitric ash-flow tuff occur locally. The occurrence of Qbt 4 is limited to the western part of the Pajarito Plateau. Welded portions of Qbt 4 are typically more dense and more highly fractured than nonwelded portions. Fractures originating in welded zones commonly die out in the underlying nonwelded zones or in less welded units beneath (Broxton and Vaniman 2005, 090038).

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 with the wettest canyons containing continuous streams and perennial groundwater in the canyon-bottom alluvium. Dry canyons have only occasional stream flow and may lack alluvial groundwater. Perched-intermediate groundwater has been found at certain locations on the plateau at depths ranging between 100 and 850 ft below ground surface (bgs). The regional aquifer is found at depths of about 600–1200 ft bgs (Collins et al. 2005, 092028), and groundwater has been encountered in the Tschicoma Formation at depths greater than 1500 ft bgs (LANL 2011, 204541).

The hydrogeological 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) perched-intermediate 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 annual 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 Cañon de Valle Aggregate Area are shown on Plate 1.

Alluvial Groundwater

Intermittent and ephemeral stream flows 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, resulting 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).

A thin (typically less than 10 ft thick) alluvial system in Cañon de Valle near Peter Seep, SWSC Spring, and Burning Ground Spring has perennial saturation. However, the alluvial saturation does not extend to the confluence with Water Canyon. The downcanyon extent of saturation is highly variable and fluctuates depending on weather conditions. Saturation is also restricted by the limited extent of alluvium in the canyon. The alluvial monitoring wells within the Cañon de Valle Aggregate Area are shown on Plate 1.

Six alluvial wells (designated CdV-16-02655, CdV-16-02656, CdV-16-02657, CdV-16-02658, CdV-16-02659, and CdV-16-02660) were installed in conjunction with the Phase II RFI for Consolidated Unit 16-021(c)-99 in the fall of 1997. Two of the alluvial wells, CdV-16-02657 and CdV-16-02658, were destroyed on August 21, 2011, by severe flooding in Cañon de Valle caused by a thunderstorm centered over the Las Conchas wildfire burn area west of NM 501 (LANL 2011, 207069).

Perched-Intermediate Waters

Perched groundwater systems beneath the Pajarito Plateau are identified primarily from direct observation of saturation in boreholes, wells, piezometers, or from borehole geophysics (Collins et al. 2005, 092028, p. 2-96). Perched water has been identified in the following Cañon de Valle wells: R-25, R-25b, R-26, R-63, CdV-16-1(i), CdV-16-2(i), CdV-16-3(i), CdV-16-4ip, and CdV-R-15-3 (Plate 1). In intermediate well R-47i, located in TA-14, perched water was encountered at a depth of 840 ft bgs (LANL 2011, 207069). There are also shallow perched waters at depths less than 200 ft bgs, as evidenced by perennial perched waters in intermediate well 16-26664 (LANL 2011, 207069).

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

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 2011, 201568). The regional aquifer is typically separated from the alluvial groundwater and perched- intermediate groundwater by 350–620 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). Figure 2.2-2 shows depths to the top of the regional aquifer across the Laboratory.

The depths to the regional aquifer near TA-14 have been determined by drilling to be at 1245 ft bgs at well CdV-R-15-3 (LANL 2002, 073211, p. 22); 1197 ft bgs at well CdV-R-37-2 (LANL 2002, 073707, p. 16); 1286 ft bgs at well R-25 (Broxton et al. 2002, 072640, p. 45); 1242 ft bgs at well R-47i (LANL 2010, 109188); 563 ft bgs at well CdV-16-1(i) (located in Cañon de Valle) (Kleinfelder 2004, 087844, p. 14); 957 ft bgs at well CdV-16-2(i) (Kleinfelder 2004, 087843, p. 13); and 1350 ft bgs at well CdV-16-3(i) (Kleinfelder 2004, 087845, p. 14). A poorly transmissive groundwater zone was found in the Tschicoma Formation in regional well R-48, with the highest transmissivity at a depth of 1500–1520 ft bgs. Regional well R-63 was completed with a single well screen in groundwater between 1325 to 1345.3 ft bgs within the Puye Formation (LANL 2011, 204541).

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 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).The Bandelier Tuff is very dry and does not readily transmit moisture in much of its extent on the Pajarito

Plateau. However, in the southwestern portion of the Laboratory and possibly in the vicinity of TA-14, there is evidence that infiltration of surface water and alluvial groundwater has resulted in the vertical transport of contaminants through the vadose zone, impacting both shallow (<200 ft) and deep (>700 ft) perched groundwater as well as the regional aquifer (LANL 2011, 207069). Surge deposits and interconnected fractures have been identified as likely fast pathways for infiltration and vadose zone transport of surface water and contaminants (LANL 2011, 207069).

2.2.2.3 Hydrologic Conceptual Model

Hydrogeologic elements potentially affected by contaminant releases in the aggregate area include surface water, sediments, alluvial groundwater, perched-intermediate groundwater, and regional groundwater. The mobility of contaminants is controlled by the geochemical characteristics of each contaminant and the geochemical properties of the medium along transport pathways. Water infiltration into bedrock is greater beneath the canyon floors than on the mesa tops because surface flow and alluvial groundwater provide hydrologic drivers for infiltration. However, the mesas have local areas of increased infiltration where sufficient hydrologic drivers may exist to transport contaminants from the near-surface vadose zone to greater depths. The hydrologic conceptual model for the portion of the Laboratory encompassing the Cañon de Valle Aggregate Area is discussed in detail in the investigation report for Water Canyon/Cañon de Valle (LANL 2011, 207069).

3.0 SCOPE OF ACTIVITIES

After the Cañon de Valle Aggregate Area investigation work plan (LANL 2006, 091698) was approved in 2007 (NMED 2007, 095478), the EP Directorate, in cooperation with and with the consent of NMED, revised and improved investigation sampling for sites regulated by the Consent Order. A FIP for the TA-14 sites (LANL 2011, 207481) was developed in 2011 to incorporate current strategies of collecting field samples and also to incorporate the modifications NMED requested in its approval with modification letter for the work plan, issued on February 9, 2007 (NMED 2007, 095478). Table 3.0-1 is a crosswalk of the sampling activities implemented by the FIP compared with the sampling activities proposed in the approved work plan (LANL 2006, 091698).

This section presents an overview of the field activities performed during the implementation of the FIP for the TA-14 sites (LANL 2011, 207481). The scope of activities for the 2011 investigation included site access and premobilization activities, geodetic and radiological surveys, surface and shallow subsurface sampling, health and safety monitoring, and waste management activities. Deviations from the FIP are discussed in section 3.3 and in Appendix B, section B-8.0.

3.1 Site Access and Premobilization Activities

The area encompassing the TA-14 sites within the Cañon de Valle Aggregate Area is currently used for Laboratory operations. Before field mobilization, the issue of Laboratory worker access (e.g., traffic control plan and 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 2011 investigation. Additional 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 TA-14 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 R8 Global Navigation Satellite System (GNSS). The surveyed coordinates for all 2011 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 Field Screening

Field screening for organic vapors and radioactivity was conducted for health and safety purposes and to guide sampling if elevated readings were encountered. Field screening for metals and explosive compounds was performed in accordance with the approved investigation work plan (LANL 2006, 091698; NMED 2007, 095478) and the FIP (LANL 2011, 207481) to guide sample collection. The field-screening results are discussed below.

3.2.2.1 Organic Vapor

Environmental samples were field screened for headspace organic vapors with a MiniRAE 2000 photoionization detector (PID) equipped with an 11.7-electronvolt lamp. 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 it was collected, each sample was placed in a sealed plastic bag for approximately 5 min. Screening measurements were recorded on the field sample collection log (SCL)/chain-of-custody (COC) forms. The organic vapor screening results are presented in Table 3.2-2. No additional samples were collected based on elevated organic vapor field-screening results.

3.2.2.2 Radioactivity

All samples collected were field screened for radioactivity before they were submitted to the Sample Management Office (SMO). A Laboratory radiation control technician 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 gross-alpha and gross-beta/gamma radioactivity were recorded in disintegrations per minute (dpm) on the field SCL/ COC forms. The SCLs/COC forms are provided on DVD in Appendix D. The radioactivity screening results are presented in Table 3.2-2. If elevated radioactivity was encountered during field screening, samples were submitted to the American Radiation Services, Inc., laboratory in White Rock, New Mexico, for gross-alpha, -beta, and -gamma analyses before shipment by the SMO to ensure compliance with U.S. Department of Transportation requirements.

3.2.2.3 Explosive Compounds

All samples collected during the 2011 were field screened quantitatively for RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) and TNT (2,4,6-trinitrotoluene) using Laboratory-developed spot test kits. Field screening for explosive compounds is described in detail in Appendix B, section B-3.3 and the screening results for explosive compounds are presented in Table 3.2-2. All high explosives (HE) spot test results were negative; therefore, no additional samples were collected based on field screening for explosive compounds.

3.2.3 Surface, Shallow Subsurface, and Sediment Sampling

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. Shallow-subsurface samples were collected using the hand-auger method in accordance with SOP-06.10. Samples for volatile organic compound (VOC) analysis were collected immediately to minimize the loss of subsurface VOCs during the sample collection process. Containers for VOC samples were filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. The remaining 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.

Sediment samples were collected from areas of sediment accumulation that include sediment determined as representative of the historical period of Laboratory operations. The locations were selected by the field geologist based on geomorphic relationships in areas likely to have been affected by discharges from Laboratory operations. Because sediment systems are dynamic and subject to redistribution by runoff events, some sediment sampling locations were adjusted appropriately by the field geologist and the adjusted locations were surveyed using GNSS.

Standard quality assurance (QA)/quality control (QC) samples (field duplicates, field trip blanks, and rinsate blanks) were collected in accordance with SOP-5059, Field Quality Control Samples.

All sample collection activities were coordinated with the SMO. All surface, shallow subsurface, sediment, and QA/QC samples were placed in appropriate sample containers. Samples 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 for the analyses specified in the FIP.

3.2.4 Borehole Abandonment

No boreholes requiring the use of a drill rig were drilled during the 2011 investigation. Hand-auger sampling locations were backfilled with cuttings. A power-auger was used where necessary. The cuttings from the power-auger sampling locations were managed as IDW as described in Appendix E. All locations where a power-auger was used were abandoned in accordance with 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 of the hydrated chips.

3.2.5 Equipment Decontamination

All field equipment with the potential to contact sample material (e.g., hand augers, sampling scoops, and bowls) was decontaminated between sample collection and between sampling locations to prevent cross-contamination of samples and sampling equipment. 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.

3.2.6 Sample Analyses

All samples were shipped by the SMO to off-site contract analytical laboratories for the requested analyses specified in the FIP (LANL 2011, 207481). The samples were analyzed for all or a subset of the following: target analyte list (TAL) metals, total cyanide, nitrate, perchlorate, dioxins and furans, explosive compounds, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), VOCs, gamma-emitting radionuclides, isotopic uranium, and strontium-90.

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. The analytical methods and summaries of data quality are presented in Appendix C. The analytical results and analytical reports are included on DVD in Appendix D.

3.2.7 Health and Safety Measures

All 2011 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 organic vapors and for gross-alpha and -beta radioactivity using portable air monitoring systems. HE spot test kits were used to screen common explosive compounds prior to sample collection.

3.2.8 IDW Storage and Disposal

All IDW generated during the 2011 investigation was managed in accordance with SOP-5238, Characterization and Management of Environmental Program Waste. This procedure incorporates the requirements of all applicable EPA and NMED regulations, DOE orders, and Laboratory implementation requirements, policies, and procedures. The waste streams associated with the 2011 investigation included contact waste and drill cuttings. Each waste stream was containerized and managed in accordance with the approved waste characterization strategy form (WCSF). Details of IDW management are presented in Appendix E. All available waste documentation, including WCSF and land application packages are provided in Appendix E (Attachment E-1 on CD).

3.3 Deviations

Investigation activities described in the FIP deviated from the approved work plan to incorporate investigation approaches that had been implemented since the work plan was approved. In addition, deviations occurred while field activities were conducted as defined in the FIP (LANL 2011, 207481). The deviations did not adversely affect the completion or results of the investigation. Specific deviations are summarized in section 6 and are described in Appendix B, section B-8.0.

4.0 REGULATORY CRITERIA

This section describes the criteria used for evaluating potential risk and doses to human and ecological receptors. Regulatory criteria identified by sample 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 Cañon de Valle 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 land use of TA-14 is currently industrial and is expected to remain industrial for the reasonably foreseeable future. The 18 sites sampled in TA-14 consist of sites that have undergone decontamination and decommissioning and an active site. The industrial and construction worker scenarios are evaluated for the sites investigated. Because part of TA-14 is actively used for explosives testing, recreational activities such as walking or jogging are not allowed for Laboratory employees, and TA-14 is not accessible to the general public. Therefore, the recreational scenario is not applicable for the sites investigated. The residential scenario is not applicable given the current and foreseeable future land use, but was evaluated for comparison purposes per the Consent Order.

4.2 Screening Levels

Human health risk-screening evaluations were conducted for two sites investigated at TA-14. The human health risk screening assessments (Appendix H) 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) for the same scenarios (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 H) were conducted using ecological screening levels (ESLs) obtained from the ECORISK Database, Version 3.0 (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 3.0 (LANL 2011, 206473).

4.4 Cleanup Standards

As specified in the Consent Order, SSLs for inorganic and organic chemicals (NMED 2009, 108070) 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. SALs (LANL 2009, 107655) are used as soil cleanup levels for radionuclides. Screening assessments compare COPC concentrations for each site with industrial, construction worker, and residential 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 H are based on these cleanup goals.

5.0 DATA REVIEW METHODOLOGY

The purpose of the data review is to identify COPCs for each site in TA-14, where the nature and extent of contamination have been defined or further sampling for extent is not warranted.

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 (if appropriate) to determine if concentrations are comparable with background and to aid in defining extent. Across a site, extent is defined for inorganic chemicals and radionuclides whose concentrations decrease with depth and decrease laterally or are not different from background. 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. Extent is defined for organic chemicals whose concentrations decrease with depth and decrease laterally or are detected at or below the estimated quantitation limit (EQL) for the analytical method and are considered present at “trace” concentrations.

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 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 to 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 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 per medium), statistical tests are used to compare the site sample data with the background data set for the appropriate medium. If statistical tests cannot be performed because of insufficient data (less than 10 samples per medium) or a high percentage of nondetects, the sample results are compared with the BV and the maximum background concentration of the chemical in the appropriate medium. If sample results are above the BV and 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 with 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 TA-14 sites, include soil (all soil horizons, designated by the media code ALLH or SOIL), alluvial sediment (media code SED), and Bandelier Tuff (media code Qbt 4—the only unit of Bandelier Tuff encountered during this investigation).

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). The 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).

Nonparametric tests most commonly performed include the Gehan test (modification of the Wilcoxon 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 might 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 test. 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 test whether site data are different from background. Specifically, the Gehan test (or the Wilcoxon Rank Sum test, if all sample results are detects) is the preferred initial test. If the result of the Gehan test indicates 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 F.

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 F.

5.3 Inorganic Chemicals Detected in Qbt 4 at TA-14 Sites

As described in detail in section 5.1, inorganic chemical data are compared with Laboratory BVs (LANL 1998, 059730) to determine if site data are elevated with respect to background as an indicator of possible site contamination. The Laboratory BVs used for comparison with Qbt 4 site data are the composite Qbt 2, Qbt 3, and Qbt 4 BVs (LANL 1998, 059730). Multiple inorganic chemicals are consistently elevated above BVs in Qbt 4 samples collected across TA-14 based on straight comparisons with the Qbt 2, Qbt 3, and Qbt 4 BVs. Specifically, 13 inorganic chemicals (aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, lead, magnesium, nickel, selenium, and vanadium) typically exceeded the respective Qbt 2, Qbt 3, and Qbt 4 BVs, and some of them exceeded the maximum concentrations in the background datasets.

The Qbt 4 unit encountered during sampling at TA-14 is a highly weathered, poorly consolidated, nonindurated unit. It is white to pale tan or gray and crystal poor in comparison with the lower units of the Tshirege Member. It breaks easily into flaky fragments and can be crumbled by hand. The field observations of the lithology for samples collected were recorded on the field SCL/COC forms (Appendix D). Based on the field observations of lithology at locations where Qbt 4 samples were collected, the Qbt 4 samples collected from the TA-14 sites were from weathered tuff.

As noted in the Qbt 4 background study report (LANL 2011, 206327, p. 7), existing Qbt 2, Qbt 3, Qbt 4 BVs are based on analysis of unweathered tuff samples and are not comparable with analytical results from weathered tuff samples. Because the act of weathering is the process by which tuff forms soil over time, the soil BVs are more representative of the material sampled and appropriate for determining whether inorganic chemicals detected in weathered tuff samples are naturally occurring or the result of releases. Besides straight comparison of site data with the Qbt 2, Qbt 3, and Qbt 4 BVs, comparison with soil BVs was conducted where appropriate for evaluating the extent of contamination and determining if further sampling for extent is warranted. The identification of COPCs followed the procedure described in section 5.1 and was not affected by this approach, i.e., inorganic chemicals detected in weathered Qbt 4 were not eliminated as COPCs by the comparison to soil BVs.

The Qbt 4 was the only unit of the Bandelier Tuff encountered during this investigation. To enhance the identification of possible site contamination at TA-14 and to account for the higher background concentrations of inorganic chemicals in weathered Qbt 4, a geochemical evaluation was conducted. Scatter plots of Qbt 4 site data were constructed for the 13 metals consistently detected above the Qbt 2, 3, 4 BVs, using aluminum as the reference element for 12 metals and iron as the reference metal for aluminum. Scatter plots are commonly used to evaluate the association between two variables (in this case inorganic chemicals) and provide a graphical display of the relationship between them (EPA 1995, 076856; U.S. Navy 2002, 076854). A total of 106 Qbt 4 samples were included in this evaluation. This approach is identical to that used in the investigation report for TA-49 sites (LANL 2010, 110656), and is comparable to evaluations performed during investigation at the 260 Outfall (LANL 2003, 077965).

The scatter plots for antimony, arsenic, barium, calcium, chromium, cobalt, copper, lead, magnesium, nickel, selenium, and vanadium detected in Qbt 4 samples at the TA-14 sites are presented in Figures G-1 through G-12, respectively, in Appendix G. Aluminum was plotted using iron as the reference metal (Figure G-13). The Qbt 4 data collected from TA-14 are presented on the plots as diamonds. For comparison, the soil BVs and maximum soil background concentrations are presented as horizontal lines. The scatter plots show a linear trend with a positive slope for all inorganic chemicals, except selenium. The scatter plot for selenium does not show a geochemical relationship between selenium and aluminum; however, the plot does show most of the detected concentrations of selenium are consistent across the site.

As shown by the scatter plots Figures G-1 through G-13, concentrations of aluminum, arsenic, barium, calcium, cobalt, magnesium, and vanadium across TA-14 were below the respective soil BV and/or the maximum soil background concentration. Antimony, chromium, copper, lead, nickel, and selenium (Figures G-1, G-5, G-7, G-8, G-10, and G-11, respectively) were detected above the maximum soil background concentrations at TA-14. These concentrations indicate possible site contamination and were observed in Qbt 4 samples collected from SWMUs 14-002(c), 14-006, 14-009, and 14-010, and AOCs C-14-007 and C-14-009. The nature and extent of contamination for these inorganic chemicals in Qbt 4 are discussed in more detail within appropriate sites.

In addition to the scatter plots, Gehan, quantile, and slippage tests were run to compare TA-14 weathered Qbt 4 data to Laboratory soil background data. The results of the statistical tests are presented in Table G-1 in Appendix G and indicate that, except for selenium and silver, the other inorganic chemicals in weathered Qbt 4 across TA-14 are not different from soil background. In the case of silver, statistical tests were not conducted because there is no soil background data set for this inorganic chemical. Box plots were generated for all of the inorganic chemicals and are presented in Figures G-14 through G-36 in Appendix G. The box plots show the similarity between the two data sets for all inorganic chemicals, except selenium and silver. In addition, the box plots illustrate that although the data sets are not statistically different, the weathered Qbt 4 data are slightly lower than the soil background data (as indicated by the respective boxes in each plot). This relationship is expected as the weathered Qbt 4 matrix is not quite soil and should be lower than (but not different from) soil background. It is apparent that selenium at TA-14 is different from Qbt 2, 3, 4 and soil background. However, the selenium concentrations are relatively consistent across TA-14 as indicated by the scatter plot (Figure G-11), and it is unclear whether all of the elevated concentrations reflect site releases.

Table G-2 (Appendix G) presents the inorganic chemical data sorted by site and media. The inorganic chemicals selected correspond to the scatter plots in Figures G-1 through G-13. The range of detected concentrations for each inorganic chemical in soil and/or Qbt 4 is presented by site. Concentration ranges in weathered Qbt 4 and in soil are similar at all sites. For example, at SWMU 14-002(c), the weathered Qbt 4 concentration range for chromium is 2.4 mg/kg–3.7 mg/kg, while the soil concentration range is 1.9 mg/kg–4.2 mg/kg. At AOC 14-001(g), the weathered Qbt 4 concentration range for cobalt is 0.75 mg/kg–1.9 mg/kg, while the soil concentration range is 1.9 mg/kg–2.3 mg/kg. At SWMU 14-002(c), the weathered Qbt 4 concentration range for chromium is 4.8 mg/kg–10.4 mg/kg, while the soil concentration range is 6.7 mg/kg–11.9 mg/kg. The weathered Qbt 4 concentration range for cobalt at SWMU 14-009 is 0.79 mg/kg–5.7 mg/kg, while the soil concentration range for cobalt at AOC C-14-005 is 4.7 mg/kg–5.7 mg/kg. Other inorganic chemicals at the site show similar relationships between weathered Qbt 4 concentrations and soil concentrations. Again, the weathered Qbt 4 concentration ranges are similar to, but generally slightly lower than, the soil concentration ranges (with the exception of selenium). This comparison supports the stated condition that the weathered Qbt 4 inorganic chemical concentrations closely resemble soil background concentrations.

In summary, the multiple lines of evidence presented in this report (i.e., scatter plots [Figures G-1 through G-13], box plots [Figures G-14 through G-36], statistical tests [Table G-1], site concentration range comparisons [Table G-2], and the Qbt 4 background study report [LANL, 2011, 206327]) illustrate the similarity between the weathered Qbt 4 and soil background concentrations for inorganic chemicals at TA-14. As a result, this similarity was used to evaluate the spatial distribution of inorganic chemicals detected in Qbt 4 at a site. These comparisons determined at least in part whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

6.0 TA-14 BACKGROUND AND FIELD INVESTIGATION RESULTS

6.1 Background of TA-14

TA-14 sites within the Cañon de Valle Aggregate Area are located in the southeastern portion of TA-14, next to the north side of Cañon de Valle (Plate 1). All the TA-14 sites within the Cañon de Valle Aggregate Area drain into Cañon de Valle. Elevations range from 7410 to 7280 ft amsl, and the site topography slopes south toward Cañon de Valle.

6.1.1 Operational History

Also known as Q-Site, TA-14 has been used since 1944 for explosives development and testing, including testing that involves radioactive materials. In 1952, the main firing site was renovated, the structures were removed, and a new firing site was constructed.

6.1.2 Summary of Releases

Potential contaminant sources at the TA-14 sites within the Cañon de Valle Aggregate Area include former and active firing sites, facilities associated with firing sites, a surface disposal area, a former burning area, removed buildings and structures, former HE magazines, electrical pull boxes, HE sumps and drainlines, and a septic system. Details on historical releases from the TA-14 sites can be found in the historical investigation report (HIR) (LANL 2006, 091697, section 9).

6.1.3 Current Site Usage and Status

HE operations continue at TA-14; most are remotely controlled and involve HE detonation, certain types of HE machining, and permitted burning. Tests are conducted on explosives charges to investigate fragmentation impact, explosives sensitivity, and thermal responses of new HE. No offices are located at this site, and personnel are present only during testing.

6.2 AOC 14-001(a), Pull Box

6.2.1 Site Description and Operation History

AOC 14-001(a) is a small steel pull box (structure 14-25) located at TA-14 (Figure 6.2-1). The pull box measures 26 in. long × 32 in. wide × 32 in. high and is covered with a metal lid. Most of the box is belowground with only the lid and top 2 to 3 in. of the box exposed. Pull boxes were used to contain detonator and diagnostic electrical hookups. Historically, the AOC 14-001(a) pull box contained capacitor discharge units. The pull box has been decommissioned and the top is welded shut.

6.2.2 Relationship to Other SWMUs and AOCs

AOCs 14-001(a,b,c,d,e) are a series of pull boxes located south of control building 14-23. These pull boxes are approximately 80–100 ft apart lined up in a north-south direction and are not associated with other SWMUs or AOCs at TA-14.

6.2.3 Summary of Previous Investigations

AOC 14-001(a) was visually inspected during the 1995 RCRA facility investigation (RFI) and found to be clean and well sealed by the protective lid, with no evidence of contaminant releases within or outside the pull box (LANL 1996, 054086, pp. 5-35–5-36).

No previous sampling has been performed at AOC 14-001(a).

6.2.4 Site Contamination

6.2.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC 14-001(a):

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Two samples were collected from location 14-614493 at the base of the pull box at 3–4 ft and 6–7 ft bgs. Both samples were analyzed for PCBs only based on the operational history of the site (LANL 2011, 207481, p. 2).

The 2011 sampling locations at AOC 14-001(a) are shown in Figure 6.2-1. Table 6.2-1 presents the 2011 samples collected and the analyses requested for AOC 14-001(a). The geodetic coordinates of the 2011 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 levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.2.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 14-001(a) consist of the results from two soil samples collected from one location in 2011. The extent of contamination is defined at AOC 14-001(a).

Inorganic Chemicals

Samples were not analyzed for inorganic chemicals at AOC 14-001(a).

Organic Chemicals

PCBs were not detected at AOC 14-001(a). No organic COPCs are identified at the site.

Radionuclides

Samples were not analyzed for radionuclides at AOC 14-001(a).

6.2.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic COPCs

Samples were not analyzed for inorganic chemicals at AOC 14-001(a).

Organic COPCs

PCBs were not detected at AOC 14-001(a). The extent of PCBs is defined at AOC 14-001(a).

Radionuclide COPCs

Samples were not analyzed for radionuclides at AOC 14-001(a).

Summary of Nature and Extent

The extent of PCBs is defined at AOC 14-001(a).

6.2.5 Summary of Human Health Risk Screening

Because no COPCs are identified at the site, risk-screening assessments were not performed for the construction worker and residential scenarios at AOC 14-001(a).

No potential unacceptable risk or dose exists for the industrial, construction worker, and residential scenarios at AOC 14-001(a).

6.2.6 Summary of Ecological Risk Screening

Because no COPCs are identified at the site, an ecological risk-screening assessment was not performed for ecological receptors at AOC 14-001(a). No potential ecological risks exist for any receptor at the site.

6.3 AOC 14-001(b), Pull Box

6.3.1 Site Description and Operation History

AOC 14-001(b) is a small steel pull box (structure 14-26) located at TA-14 (Figure 6.2-1). The pull box measures 26 in. long × 32 in. wide × 32 in. high and is covered with a metal lid. Most of the box was belowground with only the lid and top 2 to 3 in. of the box exposed. Pull boxes were used to contain detonator and diagnostic electrical hookups. Historically, the AOC 14-001(b) pull box contained capacitor discharge units. The pull box has been decommissioned and the top is welded shut. During a 2011 site visit, this pull box was not visible because it had been completely covered over with sand.

6.3.2 Relationship to Other SWMUs and AOCs

AOCs 14-001(a,b,c,d,e) are a series of pull boxes located south of control building 14-23. These pull boxes are approximately 80–100 ft apart lined up in a north-south direction and are not associated with other SWMUs or AOCs at TA-14.

6.3.3 Summary of Previous Investigations

AOC 14-001(b) was visually inspected during the 1995 RFI and found to be clean and well sealed by the protective lid, with no evidence of contaminant releases within or outside the pull box (LANL 1996, 054086, pp. 5-35–5-36).

No previous sampling has been performed at AOC 14-001(b).

6.3.4 Site Contamination

6.3.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC 14-001(b):

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Two samples were collected from location 14-614494 at the base of the pull box at 3–4 ft and 6–7 ft bgs. Both samples were analyzed for PCBs only based on the operational history of the site (LANL 2011, 207481, p. 2).

The 2011 sampling locations at AOC 14-001(b) are shown in Figure 6.2-1. Table 6.2-1 presents the 2011 samples collected and the analyses requested for AOC 14-001(b). The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.3.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.3.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 14-001(b) consist of the results from two soil samples collected from one location in 2011. The extent of contamination is defined at AOC 14-001(b).

Inorganic Chemicals

Samples were not analyzed for inorganic chemicals at AOC 14-001(b).

Organic Chemicals

PCBs were not detected at AOC 14-001(b). No organic COPCs are identified at the site.

Radionuclides

Samples were not analyzed for radionuclides at AOC 14-001(b).

6.3.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic COPCs

Samples were not analyzed for inorganic chemicals at AOC 14-001(b).

Organic COPCs

PCBs were not detected at AOC 14-001(b). The extent of PCBs is defined at AOC 14-001(b).

Radionuclide COPCs

Samples were not analyzed for radionuclides at AOC 14-001(b).

Summary of Nature and Extent

The extent of PCBs is defined at AOC 14-001(b).

6.3.5 Summary of Human Health Risk Screening

Because no COPCs are identified at the site, risk-screening assessments were not performed for the construction worker and residential scenarios at AOC 14-001(b).

No potential unacceptable risk or dose exists for the industrial, construction worker, and residential scenarios at AOC 14-001(b).

6.3.6 Summary of Ecological Risk Screening

Because no COPCs are identified at the site, an ecological risk-screening assessment was not performed for ecological receptors at AOC 14-001(b). No potential ecological risks exist for any receptor at the site.

6.4 AOC 14-001(c), Pull Box

6.4.1 Site Description and Operation History

AOC 14-001(c) is a small steel pull box (structure 14-27) located at TA-14 (Figure 6.2-1). The pull box measures 26 in. long × 32 in. wide × 32 in. high and is covered with a metal lid. Most of the box is belowground with only the lid and top 2 to 3 in. of the box exposed. Pull boxes were used to contain detonator and diagnostic electrical hookups. Historically, the AOC 14-001(c) pull box contained capacitor discharge units. The pull box has been decommissioned and the top is welded shut.

6.4.2 Relationship to Other SWMUs and AOCs

AOCs 14-001(a,b,c,d,e) are a series of pull boxes located south of control building 14-23. These pull boxes are approximately 80–100 ft apart lined up in a north-south direction and are not associated with other SWMUs or AOCs at TA-14.

6.4.3 Summary of Previous Investigations

AOC 14-001(c) was visually inspected during the 1995 RFI and found to be clean and well sealed by the protective lid, with no evidence of contaminant releases within or outside the pull box (LANL 1996, 054086, pp. 5-35–5-36).

No previous sampling has been performed at AOC 14-001(c).

6.4.4 Site Contamination

6.4.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC 14-001(c):

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Two samples were collected from location 14-614495 at the base of the pull box at 3–4 ft and 6–7 ft bgs. Both samples were analyzed for PCBs only based on the operational history of the site (LANL 2011, 207481, p. 2).

The 2011 sampling locations at AOC 14-001(c) are shown in Figure 6.2-1. Table 6.2-1 presents the 2011 samples collected and the analyses requested for AOC 14-001(c). The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.4.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological screening results exceeded twice the daily site

background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.4.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 14-001(c) consist of the results from two Qbt 4 samples collected from one location in 2011. The extent of contamination is defined at AOC 14-001(c).

Inorganic Chemicals

Samples were not analyzed for inorganic chemicals at AOC 14-001(c).

Organic Chemicals

PCBs were not detected at AOC 14-001(c). No organic COPCs are identified at the site.

Radionuclides

Samples were not analyzed for radionuclides at AOC 14-001(c).

6.4.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic COPCs

Samples were not analyzed for inorganic chemicals at AOC 14-001(c).

Organic COPCs

PCBs were not detected at AOC 14-001(c). The extent of PCBs is defined at AOC 14-001(c).

Radionuclide COPCs

Samples were not analyzed for radionuclides at AOC 14-001(c).

Summary of Nature and Extent

The extent of PCBs is defined at AOC 14-001(c).

6.4.5 Summary of Human Health Risk Screening

Because no COPCs are identified at the site, risk-screening assessments were not performed for the construction worker and residential scenarios at AOC 14-001(c).

No potential unacceptable risk or dose exists for the industrial, construction worker, and residential scenarios at AOC 14-001(c).

6.4.6 Summary of Ecological Risk Screening

Because no COPCs are identified at the site, an ecological risk-screening assessment was not performed for ecological receptors at AOC 14-001(c). No potential ecological risks exist for any receptor at the site.

6.5 AOC 14-001(d), Pull Box

6.5.1 Site Description and Operation History

AOC 14-001(d) is a small steel pull box (structure 14-28) located at TA-14 (Figure 6.2-1). The pull box measures 26 in. long × 32 in. wide × 32 in. high and is covered with a metal lid. Most of the box is belowground with only the lid and top 2 to 3 in. of the box exposed. Pull boxes were used to contain detonator and diagnostic electrical hookups. Historically, the AOC 14-001(d) pull box contained capacitor discharge units. The pull box has been decommissioned and the top is welded shut.

6.5.2 Relationship to Other SWMUs and AOCs

AOCs 14-001(a,b,c,d,e) are a series of pull boxes located south of control building 14-23. These pull boxes are approximately 80–100 ft apart lined up in a north-south direction and are not associated with other SWMUs or AOCs at TA-14.

6.5.3 Summary of Previous Investigations

AOC 14-001(d) was visually inspected during the 1995 RFI and found to be clean and well sealed by the protective lid, with no evidence of contaminant releases within or outside the pull box (LANL 1996, 054086, pp. 5-35–5-36).

No previous sampling has been performed at AOC 14-001(d).

6.5.4 Site Contamination

6.5.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC 14-001(d):

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Two samples were collected from location 14-614496 at the base of the pull box at 3–4 ft and 6–7 ft bgs. Both samples were analyzed for PCBs only based on the operational history of the site (LANL 2011, 207481, p. 2).

The 2011 sampling locations at AOC 14-001(d) are shown in Figure 6.2-1. Table 6.2-1 presents the 2011 samples collected and the analyses requested for AOC 14-001(d). The geodetic coordinates of the 2011 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 levels during PID screening of the samples during the 2011 investigation. No radiological screening results exceeded twice the daily site

background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.5.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 14-001(d) consist of the results from two Qbt 4 samples collected from one location in 2011. The extent of contamination is defined at AOC 14-001(d).

Inorganic Chemicals

Samples were not analyzed for inorganic chemicals at AOC 14-001(d).

Organic Chemicals

PCBs were not detected at AOC 14-001(d). No organic COPCs are identified at the site.

Radionuclides

Samples were not analyzed for radionuclides at AOC 14-001(d).

6.5.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic COPCs

Samples were not analyzed for inorganic chemicals at AOC 14-001(d).

Organic COPCs

PCBs were not detected at AOC 14-001(d). The extent of PCBs is defined at AOC 14-001(d).

Radionuclide COPCs

Samples were not analyzed for radionuclides at AOC 14-001(d).

Summary of Nature and Extent

The extent of PCBs is defined at AOC 14-001(d).

6.5.5 Summary of Human Health Risk Screening

Because no COPCs are identified at the site, risk-screening assessments were not performed for the construction worker and residential scenarios at AOC 14-001(d).

No potential unacceptable risk or dose exists for the industrial, construction worker, and residential scenarios at AOC 14-001(d).

6.5.6 Summary of Ecological Risk Screening

Because no COPCs are identified at the site, an ecological risk-screening assessment was not performed for ecological receptors at AOC 14-001(d). No potential ecological risks exist for any receptor at the site.

6.6 AOC 14-001(e), Pull Box

6.6.1 Site Description and Operation History

AOC 14-001(e) is a small steel pull box (structure 14-29) located at TA-14 (Figure 6.2-1). The pull box measures 26 in. long × 32 in. wide × 32 in. high and is covered with a metal lid. Most of the box is belowground with only the lid and top 2 to 3 in. of the box exposed. Pull boxes were used to contain detonator and diagnostic electrical hookups. Historically, the AOC 14-001(e) pull box contained capacitor discharge units. The pull box has been decommissioned and the top is welded shut.

6.6.2 Relationship to Other SWMUs and AOCs

AOCs 14-001(a,b,c,d,e) are a series of pull boxes located south of control building 14-23. These pull boxes are approximately 80–100 ft apart lined up in a north-south direction and are not associated with other SWMUs or AOCs at TA-14.

6.6.3 Summary of Previous Investigations

AOC 14-001(e) was visually inspected during the 1995 RFI and found to be clean and well sealed by the protective lid, with no evidence of contaminant releases within or outside the pull box (LANL 1996, 054086, pp. 5-35–5-36).

No previous sampling has been performed at AOC 14-001(e).

6.6.4 Site Contamination

6.6.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC 14-001(e):

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Two samples were collected from location 14-614497 at the base of the pull box at 3–4 ft and 6–7 ft bgs. Both samples were analyzed for PCBs only based on the operational history of the site (LANL 2011, 207481, p. 2).

The 2011 sampling locations at AOC 14-001(e) are shown in Figure 6.2-1. Table 6.2-1 presents the 2011 samples collected and the analyses requested for AOC 14-001(e). The geodetic coordinates of the 2011 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 levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site

background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.6.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 14-001(e) consist of the results from two Qbt 4 samples collected from one location in 2011. The extent of contamination is defined at AOC 14-001(e).

Inorganic Chemicals

Samples were not analyzed for inorganic chemicals at AOC 14-001(e).

Organic Chemicals

PCBs were not detected at AOC 14-001(e). No organic COPCs are identified at the site.

Radionuclides

Samples were not analyzed for radionuclides at AOC 14-001(e).

6.6.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic COPCs

Samples were not analyzed for inorganic chemicals at AOC 14-001(e).

Organic COPCs

PCBs were not detected at AOC 14-001(e). The extent of PCBs is defined at AOC 14-001(e).

Radionuclide COPCs

Samples were not analyzed for radionuclides at AOC 14-001(e).

Summary of Nature and Extent

The extent of PCBs is defined at AOC 14-001(e).

6.6.5 Summary of Human Health Risk Screening

Because no COPCs are identified at the site, risk-screening assessments were not performed for the construction worker and residential scenarios at AOC 14-001(e).

No potential unacceptable risk or dose exists for the industrial, construction worker, and residential scenarios at AOC 14-001(e).

6.6.6 Summary of Ecological Risk Screening

Because no COPCs are identified at the site, an ecological risk-screening assessment was not performed for ecological receptors at AOC 14-001(e). No potential ecological risks exist for any receptor at the site.

6.7 AOC 14-001(g), Firing Site

6.7.1 Site Description and Operation History

AOC 14-001(g) is an active firing pad (structure 14-35) located south of control building 14-23 at TA-14 (Figure 6.7-1). Installed in 1964, the reinforced concrete pad is 5 ft square × 2 ft thick and surrounded on three sides with a blast shield. At the base, the shield is a 6-ft-square × 2-ft-thick concrete pad overlain by a neoprene shock pad, a 4.5-in.-thick steel plate, and several inches of sand. The shield directs the force of detonations away from nearby control building 14-23. The AOC 14-001(g) firing pad is used to conduct test shot experiments.

6.7.2 Relationship to Other SWMUs and AOCs

AOC 14-001(g) is located approximately 10 ft west of AOC 14-001(a). However, there is no current association between these two sites.

6.7.3 Summary of Previous Investigations

AOC 14-001(g) was not sampled during the 1995 RFI, and the RFI report stated that any corrective action at this AOC will be delayed until the site is decommissioned (LANL 1996, 054086, p. 5-37). No historical analytical data exist for this site.

6.7.4 Site Contamination

6.7.4.1 Soil and Rock Sampling

The approved investigation work plan indicated active firing site AOC 14-001(g) would not be investigated until testing operations had ceased (LANL 2006, 091698). The NMED approval with modifications letter required the proposed investigation activities in the work plan to be implemented because this site was not deferred under the Consent Order (NMED 2007, 095478). Since that time, the Laboratory has implemented an alternate approach for investigating active firing sites that are not on the list of deferred sites in the Consent Order. These sites include AOC 36-004(c) in the approved work plan for Potrillo and Fence Canyons Aggregate Area (LANL 2009, 106657.8; NMED 2009, 106677) and SWMU 39-004(d) in the approved work plan for North Ancho Canyon Aggregate Area (LANL 2007, 101894; NMED 2007, 098948). This approach involves sampling in drainages downgradient of the sites to characterize contaminant migration from the sites but does not include sampling to define nature and extent within the active firing site. This approach was implemented at AOC 14-001(g) (LANL 2011, 207481).

As part of the 2011 investigation, the following activities were conducted at AOC 14-001(g):

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Thirty samples were collected from 15 locations at 0–1 ft and 2–3 ft bgs in the four drainages downgradient of the site. Samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, VOCs (excluding surface samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.

The 2011 sampling locations at AOC 14-001(g) are shown in Figure 6.7-1. Table 6.7-1 presents the 2011 samples collected and the analyses requested for AOC 14-001(g). The geodetic coordinates of the 2011 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 levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.7.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC 14-001(g) consist of the results from 30 samples (17 soil and 13 Qbt 4) collected from 15 locations in 2011. These locations are in four drainages downgradient of the site. As observed in the field, the lithology of the surface samples in the drainages is predominantly sandy silt. The field observations of the lithology for samples collected were recorded on the field SCL/COC forms (Appendix D).

Because AOC 14-001(g) is an active firing site, the extent of contamination was not evaluated, and COPCs for the site have not been identified.

Inorganic Chemicals

All 30 samples (17 soil and 13 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.7-2 presents the inorganic chemicals above BVs. Figure 6.7-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Eleven TAL metals (aluminum, antimony, barium, beryllium, calcium, chromium, copper, lead, mercury, nickel, and selenium) were detected above BVs or not detected but had DLs above BV. Total cyanide was not detected above BV but had DLs above BV. Nitrate and perchlorate were detected.

Organic Chemicals

All 30 samples (17 soil and 13 Qbt 4) were analyzed for explosive compounds and SVOCs, 6 samples (2 soil and 4 Qbt 4) were analyzed for PCBs, and 15 samples (4 soil and 11 Qbt 4) were analyzed for VOCs. Table 6.7-3 presents the detected organic chemicals. Figure 6.7-3 shows the spatial distribution of detected organic chemicals.

Three explosive compounds (HMX [1,3,5,7-tetranitro-1,3,5,7-tetrazocine]; RDX; and TATB triaminotrinitrobenzene]); four SVOCs (acenaphthene, bis[2-ethylhexyl]phthalate, diethylphthalate, and di-n-butylphthalate); and five VOCs (benzene, 1,3-dichlorobenzene, 4-isopropyltoluene, toluene, and trichloroethene) were detected. PCBs were not detected.

Radionuclides

All 30 samples (17 soil and 13 Qbt 4) were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.7-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.7-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Cesium-134, cesium-137, and strontium-90 were detected.

6.7.4.4 Spatial Distribution of Contaminants

AOC 14-001(g) is an active firing site. Because the distribution of contamination is affected by continuing operations, limited characterization sampling was performed to determine whether off-site migration is occurring but not to determine the nature and extent of contamination. Contaminant distributions were evaluated primarily to determine what contaminants are being dispersed, whether they are migrating off-site, and what the general spatial distribution is. Because samples were collected in drainage areas where vertical mixing may occur, vertical distribution is not considered.

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined inorganic chemicals were not migrating off-site.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) in one sample (7810 mg/kg) from 2–3 ft bgs at location 14-614469. Aluminum concentrations decreased downgradient.

Antimony was not detected but had a DL (0.51 mg/kg) that was equivalent to the Qbt 2, 3, 4 BV (0.5 mg/kg).

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in two samples at locations 14-614469 and 14-614471. Barium was detected at concentrations of 30.8 mg/kg and 42.6 mg/kg below the soil BV (295 mg/kg) from 0–1 ft bgs at locations 14-614469 and 14-614471, respectively (Table D-1). Concentrations increased with depth at both locations, but the barium Qbt 4 concentrations detected were below the maximum Qbt 2, 3, 4 background concentration (51.6 mg/kg). Concentrations of barium remained essentially the same along the drainage and were below the soil BV (295 mg/kg) or the maximum Qbt 2, 3, 4 background concentration.

Beryllium was detected above the Qbt 2, 3, 4 BV (1.21 mg/kg) in one sample (1.4 mg/kg) from 2–3 ft bgs at location 14-614469. This concentration is below the maximum Qbt 4 background concentration (1.8 mg/kg), and concentrations of beryllium decreased downgradient.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in one sample (2460 mg/kg) from 2–3 ft bgs at location 14-614469. This concentration is below the maximum Qbt 4 background concentration (2230 mg/kg), and concentrations of calcium decreased downgradient.

Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in one sample (7.5 mg/kg) from 2–3 ft bgs at location 14-614469. This concentration is below the maximum Qbt 4 background concentration (13 mg/kg), and concentrations of chromium decreased downgradient.

Copper was detected above the soil BV (14.7 mg/kg) in one sample (29.9 mg/kg) at location 14-614472 and was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in two samples at locations 14-614465 and 14-614469. Concentrations of copper decreased downgradient of locations 14-614469 and 14-614472. The concentration of 7.3 mg/kg detected in Qbt 4 at location 14-614465 was not substantially above the maximum Qbt 2, 3, 4 background concentration (6.2 mg/kg). Figure G-7 is the scatter plot of Qbt 4 site data for copper that shows a linear trend with a positive slope for copper and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV. Table G-1 indicates Qbt 4 copper concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of copper are similar between Qbt 4 and soil at this AOC. This concentration of copper does not indicate off-site migration is occurring

Total cyanide was not detected above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg) but had DLs above BV. All results reported between the BV and the individual sample DLs were nondetects.

Lead was detected above the soil BV (22.3 mg/kg) in two samples at locations 14-614464 and 14-614473. Concentrations of lead decreased downgradient.

Mercury was detected above the soil BV (0.1 mg/kg) in one sample (0.409 mg/kg) from 0–1 ft bgs at location 14-614467. Concentrations of mercury decreased downgradient.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in one sample (6.7 mg/kg) from 2–3 ft bgs at location 14-614469. This concentration is below the maximum Qbt 4 background concentration (7 mg/kg) and concentrations of nickel decreased downgradient.

Nitrate was detected in 30 samples at 15 locations, with a maximum concentration of 8 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected likely reflect naturally occurring levels.

Perchlorate was detected in three soil samples at locations 14-614463 and 14-614472. Concentrations of perchlorate decreased downgradient.

Selenium was detected above the soil BV (1.52 mg/kg) in 13 samples and above the Qbt 2, 3, 4 BV (0.3 mg/kg) in 13 samples at 14 locations. These concentrations ranged from 1.2 mg/kg to 3.3 mg/kg. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows that the majority of the detected concentrations are consistent across the site. In addition, Table G-2 indicates concentration ranges of selenium are similar between Qbt 4 and soil at this AOC. Compared with the maximum soil background concentration (1.7 mg/kg), selenium concentrations detected at the most downgradient locations 14-614465, 14-614471, 14-614476, and 14-614477 were below or similar to the maximum soil background concentration. Therefore, the spatial pattern of selenium concentrations at the site does not indicate off-site migration is occurring.

Organic Chemicals

Acenaphthene was detected in one sample (0.061 mg/kg) from 2–3 ft bgs at the most downgradient location 14-614477. However, the concentration was below the EQL.

Benzene was detected in five samples at locations 14-614471 through 14-614475 at concentrations below EQLs. Concentrations of benzene decreased downgradient along the two drainages to the west and to the east, and benzene was detected at the most downgradient location 14-614471 in another drainage, but the concentration was below the EQL.

Bis(2-ethylhexyl)phthalate was detected in three samples at three locations 14-614466, 14-614468, and 14-614472 at concentrations below EQLs. Concentrations of bis(2-ethylhexyl)phthalate decreased downgradient.

Dichlorobenzene[1,3-] was detected in one sample (0.00038 mg/kg) below the EQL from 2–3 ft bgs at location 14-614472. Concentrations of 1,3-dichlorobenzene decreased downgradient.

Diethylphthalate was detected in one sample (0.059 mg/kg) below the EQL from 0–1 ft bgs at location 14-614475. Concentrations of diethylphthalate decreased downgradient.

Di-n-butylphthalate was detected in one sample (0.14 mg/kg) below the EQL from 0–1 ft bgs at location 14-614473. Concentrations of di-n-butylphthalate decreased downgradient.

HMX was detected in 11 samples at locations 14-614463, 14-614464, 14-614466, 14-614468, 14-614469, 14-614472, and 14-614473. Concentrations of HMX decreased downgradient.

Isopropyltoluene[4-] was detected in two samples at locations 14-614466 and 14-614477 at concentrations below EQLs. Concentrations of 4-isopropyltoluene decreased downgradient of location 14-614466. Isopropyltoluene[4-] was detected at the most downgradient location 14-614477 in another drainage, but the concentration was below the EQL.

RDX was detected in one sample (0.25 mg/kg) below the EQL from 2–3 ft bgs at location 14-614472. Concentrations of RDX decreased downgradient.

TATB was detected in 12 samples at locations 14-614463, 14-614464, 14-614465, 14-614467, 14-614468, 14-614471, 14-614472, 14-614473, 14-614474, and 14-614476. Concentrations of TATB decreased downgradient.

Toluene was detected in five samples at locations 14-614471 through 14-614475 at concentrations below EQLs. Concentrations of toluene decreased downgradient along the two drainages to the west and to the east. Toluene was detected at the most downgradient location 14-614471 in another drainage, but the concentration was below the EQL.

Trichloroethene was detected in two samples at locations 14-614464 and 14-614469 at concentrations below EQLs. Concentrations of trichloroethene decreased downgradient.

Radionuclides

Cesium-134 was detected in one soil sample (0.051 pCi/g) from 0–1 ft bgs at location 14-614468. Concentrations of cesium-134 decreased downgradient.

Cesium-137 was detected in five samples at locations 14-614465, 14-614471, 14-614475, 14-614476, and 14-614477, including the four locations at the bottom of the drainages. Concentrations of cesium-137 ranged from 0.203 pCi/g to 0.473 pCi/g at these four locations. Four sediment samples were collected in Reach CDV-3 downcanyon of TA-14 as part of the Water Canyon-Cañon de Valle investigation (LANL 2011, 207069, p. 51). Cesium-137 was not detected above the sediment BV (0.9 pCi/g) in two of the samples and was detected at concentrations of 0.935 pCi/g and 1.22 pCi/g in the other two samples (LANL 2011, 207069, Table 6.2-4, p. 356), which are below the maximum sediment FV (1.28 pCi/g). These concentrations do not indicate off-site migration of cesium-137 is occurring from AOC 14-001(g).

Strontium-90 was detected in one sample (0.302 mg/kg) from 2–3 ft bgs at location 14-614472. Concentrations of strontium-90 decreased downgradient.

Summary of Contaminant Distribution

The concentrations of detected inorganic chemicals were within the range of background concentrations or decreased in the drainages downgradient of AOC 14-001(g). Nitrate was detected at multiple locations including at the bottom of the drainage at naturally occurring concentrations. Selenium concentrations at the most downgradient locations were below or similar to the maximum soil background concentration. Based on these data, inorganic chemicals are not migrating off-site.

Organic chemicals were not detected above EQLs and/or detected concentrations decreased in the drainages downgradient of AOC 14-001(g) and are therefore not migrating off-site.

Concentrations of cesium-134 and strontium-90 decreased in the drainages downgradient of AOC 14-001(g) and are therefore not migrating off-site. Cesium-137 was detected in samples at the bottom of the drainages below AOC 14-001(g), with concentrations ranging from 0.203 pCi/g to 0.473 pCi/g. Concentrations detected in sediment in downgradient Reach CDV-3 were above sediment FV of 0.9 pCi/g but below the maximum sediment FV (1.28 pCi/g). Therefore, cesium-137 is not migrating off-site.

Potential contamination is limited to the drainages downgradient of AOC 14-001(g) and is not migrating off-site.

6.7.5 Summary of Human Health Risk Screening

The purpose of sampling the drainages downgradient of the site was to determine whether contaminants are migrating from the site. AOC 14-001(g) is an active firing site; therefore, a human health risk assessment was not performed for AOC 14-001(g).

6.7.6 Summary of Ecological Risk Screening

The purpose of sampling the drainages downgradient of the site was to determine whether contaminants are migrating from the site. AOC 14-001(g) is an active firing site; therefore, an ecological risk assessment was not performed for AOC 14-001(g).

6.8 Consolidated Unit 14-002(a)-99

Consolidated Unit 14-002(a)-99 consists of a bullet test facility [AOC 14-001(f)], two former firing sites [SWMUs 14-002(a) and 14-002(b)], a former structure [SWMU 14-002(f)], a surface disposal area [SWMU 14-009], a former sump [SWMU 14-010], and a former magazine [AOC C-14-008] (Figure 6.8-1).

6.8.1 AOC 14-001(f), Bullet Test Facility

6.8.1.1 Site Description and Operation History

AOC 14-001(f) is the decommissioned bullet test facility located in the center of the western portion of Q-Site at TA-14 (Figure 6.8-1). AOC 14-001(f) is deferred for investigation per Table IV-2 of the Consent Order. The bullet test facility consisted of a control building (structure 14-34) constructed in 1957 and a target building (structure 14-39) constructed in 1973. A gun stand was located on a pad immediately outside the southeastern end of building 14-34, and oriented towards the target tube (structure 14-39) to the southeast. A 13-ft-square × 4.5-ft-deep reinforced concrete sump lies under the target tube. Firing was conducted from within building 14-34 or from the gun-stand mounted outside building 14-34 into targets consisting of explosives or explosives devices that were placed within a 10-ft-diameter steel tube partially filled with sand inside building 14-39. Depleted uranium was used both as a projectile and as a target. During the 1970s, small hand guns were fired from within building 14-34. After the late 1970s, all tests were conducted from the exterior gun stand. Guns ranged from a 0.22-caliber pellet gun to a 30-mm smooth-bore gun. Both the control building (structure 14-34) and the target building (structure 14-39), including the steel tube, remain in place. Currently, shot tests are conducted in both buildings.

It should be noted that the 1990 SWMU report only associates control building 14-34 with the bullet test facility (LANL 1990, 007512). In actuality, the facility consisted of building 14-34 (in and near where guns were fired) and building 14-39 (which housed the targets into which the guns were fired).

6.8.1.2 Relationship to Other SWMUs and AOCs

AOC 14-001(f) is the decommissioned bullet test facility. SWMU 14-002(b), a former HE-firing pedestal, and SWMU 14-002(f), a former junction box shelter, are located south of AOC 14-001(f). However, these two structures were installed in 1945 and removed in 1952, before the bullet test facility was constructed in 1957.

6.8.1.3 Summary of Previous Investigations

An RFI was conducted at AOC 14-001(f) in 1995 (LANL 1996, 054086, p. 5-29; LANL 1996, 055049, p. 1). Three samples were collected from three locations, two from within the bullet test facility and one from the underlying sump. These samples were field screened for lead, uranium, and radioactivity. They were submitted for off-site analyses, but the analytical results were screening-level data. The results were presented and discussed in the investigation work plan (LANL 2006, 091698, p. 117) and are not included in this report.

A voluntary corrective action (VCA) was conducted at AOC 14-001(f) in 1996 based on the presence of pieces of HE visible in the sand at the site and contamination determined during the Phase I investigation (LANL 1996, 055049, p. 1). During the VCA, all sand in the bullet test facility and beneath the sump was removed. Following the excavation, a radiological survey revealed readings above background on the interior surfaces of the steel tube and the sump. Pieces of depleted uranium were found and removed from the surfaces of the sump and some areas of the steel tube; however, uranium had not been completely removed from the steel tube interior (LANL 1996, 055049, p. 4). The radioactivity in the steel tube was determined to be fixed radioactivity, and those areas were painted and a sign posted in the bullet test facility in accordance with the Laboratory’s Environment, Safety, and Health Division requirements in effect at the time (LANL 1996, 055049, pp. 4–5). The sump drain was plugged using quick-dry cement. Confirmatory sampling was not conducted because all the sand had been removed and sealing the drain eliminated any potential for environmental release (LANL 1996, 055049, p. 5).

The 2006 investigation work plan mistakenly identified three 1997 samples as being collected at AOC 14-001(f) (LANL 2006, 091698, pp. 117, 457). Further evaluation indicated these three samples belong to the 1997 investigation at SWMU 14-003. No historical decision-level data exist for AOC 14-001(f).

6.8.1.4 Rationale for Deferred Investigation

Investigation of AOC 14-001(f) is deferred per Table IV-2 of the Consent Order. The NMED-approved investigation work plan proposed no investigation activities for this site (LANL 2006, 091698; NMED 2007, 095478).

6.8.2 SWMU 14-002(a), Former Firing Site

6.8.2.1 Site Description and Operation History

SWMU 14-002(a) is a former HE firing chamber (structure 14-2) that was located at TA-14 (Figure 6.8-1). SWMU 14-002(a) is deferred for investigation per Table IV-2 of the Consent Order. Installed in 1944, the firing chamber was constructed of steel-lined reinforced concrete and measured 21.5 ft long × 16 ft wide × 13 ft high. HE tests containing uranium as well as bullet-impact firing tests were conducted in the firing chamber. The SWMU 14-002(a) firing chamber was removed in 1973 to prepare for the construction of the target building [structure 14-39, AOC 14-001(f)].

6.8.2.2 Relationship to Other SWMUs and AOCs

SWMU 14-002(a) is the location of a former HE firing chamber that was installed in 1944, before building 14-39 [AOC 14-001(f)] was constructed near the location of the former firing chamber.

6.8.2.3 Summary of Previous Investigations

In 1995, an RFI was conducted at SWMU 14-002(a) (LANL 1996, 054086, p. 5-30; LANL 1997, 055678). One ruptured sandbag southeast of building 14-38, presumably associated with the firing chamber, was sampled. Two additional surface soil samples were collected during the 1995 RFI activities. These samples were submitted for off-site analyses, but the analytical results are screening-level data. The results were presented and discussed in the investigation work plan (LANL 2006, 091698, p. 118) and are not included in this report.

Based on the recommendations of the RFI report, a VCA was conducted at SWMU 14-002(a) in 1997 to remove the deteriorated sandbags and contaminated sand and asphalt (LANL 1997, 056611). Asphalt in the immediate vicinity of the sandbags had visible depleted uranium as well as high radioactivity screening results. The asphalt was vacuumed to remove loose contaminated soil and the asphalt was then removed. Four confirmation samples were collected and analyzed for HE and isotopic uranium. The 2006 investigation work plan mistakenly included sample 0214-97-0008 and location 14-01031 at this site (LANL 2006, 091698, pp. 118, 457), which is associated with SWMU 14-003 (location 14-01031 has been designated as location 14-614910 at SWMU 14-003). HMX was detected and isotopic uranium was detected above BVs in the four confirmation samples collected at SWMU 14-002(a). These analytical results are decision-level data and were presented and discussed in the investigation work plan (LANL 2006, 091698, p. 118).

6.8.2.4 Rationale for Deferred Investigation

Investigation of SWMU 14-002(a) is deferred per Table IV-2 of the Consent Order. The NMED-approved investigation work plan proposed no investigation activities for this site (LANL 2006, 091698; NMED 2007, 095478).

6.8.3 SWMU 14-002(b), Former Firing Site

6.8.3.1 Site Description and Operation History

SWMU 14-002(b) is a former HE-firing pedestal (structure 14-17) that was located at TA-14 (Figure 6.8-1). SWMU 14-002(b) is deferred for investigation per Table IV-2 of the Consent Order. Installed in 1945, the reinforced concrete pedestal measured 4 ft square × 2 ft thick. The pedestal was topped with a steel plate and surrounded on three sides by an 8-ft-high earthen berm. Small-caliber and up to 150-caliber guns were fired from the pedestal into HE targets that occasionally contained natural or depleted uranium. The SWMU 14-002(b) firing pedestal was removed in 1952. Currently, structures 14-34 (the control building associated with the bullet test facility) and 14-43 (an equipment storage building) partially cover the former location of the firing pedestal.

6.8.3.2 Relationship to Other SWMUs and AOCs

SWMU 14-002(b) is the location of a former HE-firing pedestal that was installed in 1945 and removed in 1952. The bullet test facility [AOC 14-001(f)] was constructed in the vicinity in 1957.

6.8.3.3 Summary of Previous Investigations

SWMU 14-002(b) was not sampled during the 1995 RFI but was field screened for radioactivity, and HE spot tests were performed (LANL 1996, 054086, p. 5-30). No radioactivity was detected above background, and HE spot test results were negative. No historical analytical data exist for this site.

6.8.3.4 Rationale for Deferred Investigation

Investigation of SWMU 14-002(b) is deferred per Table IV-2 of the Consent Order. The NMED-approved investigation work plan proposed no investigation activities for this site (LANL 2006, 091698; NMED 2007, 095478).

6.8.4 SWMU 14-002(f), Former Structure

6.8.4.1 Site Description and Operation History

SWMU 14-002(f) is a former junction box shelter (structure 14-12) that was located at TA-14 (Figure 6.8-1). Built in 1945, the wood-framed shelter measured 6 ft square × 6 ft tall and was surrounded on three sides with an earthen berm. The SWMU 14-002(f) shelter was removed in 1952 (LANL 1994, 034755, p. 5-3-4).

6.8.4.2 Relationship to Other SWMUs and AOCs

SWMU 14-002(f) is the location of a former junction box shelter that was installed in 1945 and removed in 1952. The bullet test facility [AOC 14-001(f)] was constructed in the vicinity in 1957.

6.8.4.3 Summary of Previous Investigations

SWMU 14-002(f) was not sampled during the 1995 RFI but was field screened for radioactivity and HE spot tests were performed (LANL 1996, 054086, p. 5-31). No radioactivity was detected above background and HE spot test results were negative. No historical analytical data exist for this site.

6.8.4.4 Rationale for Delayed Investigation

The RFI work plan for Operable Unit 1085 does not identify any releases from SWMU 14-002(f) but notes that the site may be contaminated because of its close proximity to other sites (LANL 1994, 034755, p. 5-3-4). Therefore, the source of potential contamination at this site appears to be the adjacent deferred firing sites, including SWMU 14-002(b). It is therefore proposed that site characterization and investigation be delayed until the adjacent deferred sites [AOC 14-001(f) and SWMUs 14-002(a) and 14-002(b)] are investigated (LANL 2011, 207481, pp. 3–4).

6.8.5 SWMU 14-009, Surface Disposal Area

6.8.5.1 Site Description and Operation History

SWMU 14-009 is a surface disposal area located south and west of building 14-43 at TA-14 (Figure 6.8-1). The disposal area measures approximately 30 ft × 140 ft and consists of sand and ruptured sandbags used during explosives tests performed at nearby firing sites [SWMUs 14-002(a) and 14-002(b)].

6.8.5.2 Relationship to Other SWMUs and AOCs

SWMU 14-009 is located on the canyon slope to the southwest of the other SWMUs and AOCs of Consolidated Unit 14-002(a)-99 and consists of sand and ruptured sandbags used during explosives tests performed at SWMUs 14-002(a,b).

6.8.5.3 Summary of Previous Investigations

During the 1995 RFI conducted at SWMU 14-009, samples were field screened for lead, uranium, and gross radioactivity, and HE spot tests were performed. Based on field-screening results showing the presence of depleted uranium and positive HE spot test results, seven surface (0–0.5 ft bgs) and two subsurface (1–1.5 ft bgs) samples were collected and submitted for off-site analysis of total lead and total uranium (LANL 1996, 054086, p. 5-31). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed inorganic chemicals detected above BVs.

6.8.5.4 Site Contamination

Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at SWMU 14-009:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Twenty samples were collected from 10 locations within the disposal area (locations 14-614514 through 14-614521, 14-614527, and 14-614528) from the surface interval (0–1 ft bgs) and from two depth intervals beneath the disposal area: the first 1 ft of native material beneath the disposal area, and a second depth interval ranging from 1.5–6 ft bgs. Eight samples were collected from four locations on the bench at the bottom of the slope below the disposal area (locations 14-614522 through 14-614524 and 14-614529), and six samples were collected from three locations in the drainage downgradient of the site (locations 14-614525, 14-614526, and 14-614530). Samples from these locations were collected at 0–1 ft and 1–2 ft bgs.
- All samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, VOCs (excluding surface samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.

The 2011 sampling locations at SWMU 14-009 are shown in Figure 6.8-1. Table 6.8-1 presents the 2011 samples collected and the analyses requested for SWMU 14-009. The geodetic coordinates of the 2011 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 levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

Soil and Rock Sample Analytical Results

Decision-level data at SWMU 14-009 consist of the results from 34 samples (13 soil, 17 Qbt 4, and 4 sediment) collected from 17 locations in 2011. The extent of contamination is not defined at SWMU 14-009. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 34 samples (13 soil, 17 Qbt 4, and 4 sediment) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.8-2 presents the inorganic chemicals above BVs. Figure 6.8-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Seventeen TAL metals (aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, mercury, nickel, selenium, thallium, vanadium, and zinc) were detected above BVs or not detected but had DLs above BV. Total cyanide was not detected above BV but had DLs above BV. Nitrate was detected. Perchlorate was not detected.

Organic Chemicals

All 34 samples (13 soil, 17 Qbt 4, and 4 sediment) were analyzed for explosive compounds and SVOCs, eight samples (two soil, four Qbt 4, and two sediment) were analyzed for PCBs, and 17 Qbt 4 samples were analyzed for VOCs. Table 6.8-3 presents the detected organic chemicals. Figure 6.8-3 shows the spatial distribution of detected organic chemicals.

Five explosive compounds (2,4-dinitrotoluene, HMX, PETN [pentaerythritol tetranitrate], RDX, and TATB); 13 SVOCs (anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, bis[2-ethylhexyl]phthalate, chrysene; di-n-butylphthalate, fluoranthene, indeno[1,2,3-cd]pyrene, N-nitrosodiphenylamine, phenanthrene, and pyrene); and two VOCs (acetone and 2-hexanone) were detected. PCBs were not detected.

Radionuclides

All 34 samples (13 soil, 17 Qbt 4, and 4 sediment) were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.8-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.8-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Cesium-137 and strontium-90 were detected in tuff. Uranium-234, uranium-235/236, and uranium-238 were detected above BVs.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. These comparisons determined at least in part whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) in four samples at locations 14-614514, 14-614515, 14-614527, and 14-614528. Aluminum was not detected above BV at the locations downgradient of the disposal area. The lateral extent of aluminum is defined. Concentrations detected below the soil BV (29,200 mg/kg) at locations 14-614514, 14-614515, 14-614527, and 14-614528 are presented in Table D-1. Concentrations decreased with depth at location 14-614515 and increased slightly with depth at locations 14-614514, 14-614527, and 14-614528. Figure G-13 is the scatter plot of Qbt 4 site data for aluminum that shows a linear trend with a positive slope for aluminum and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-2 indicates aluminum Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the soil BV, the aluminum Qbt 4 concentrations detected at the four locations were below the soil BV. No further sampling to define the vertical extent of aluminum at locations 14-614514, 14-614527, and 14-614528 is warranted.

Antimony was detected above the Qbt 2, 3, 4 BV (0.5 mg/kg) in two samples at locations 14-614519 and 14-614527 and was not detected above the Qbt 4 BV but had DLs above BV in six samples. Antimony was not detected above BV at the locations downgradient of the disposal area. The lateral extent of antimony is defined. Antimony was detected at concentrations of 0.68 mg/kg and 0.11 mg/kg below the soil BV of 0.83 mg/kg from 0–1 ft bgs at locations 14-614519 and 14-614527, respectively (Table D-1). Concentrations of antimony remained essentially the same with depth at location 14-614519 and increased with depth at location 14-614527. The vertical extent of antimony is not defined at location 14-614527.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in three samples at locations 14-614514, 14-614515, and 14-614519 and was detected above the sediment BV (3.98 mg/kg) in one sample (4.5 mg/kg) at location 14-614525. Concentrations of arsenic decreased downgradient along the drainage. The lateral extent of arsenic is defined. Concentrations detected below the soil BV (8.17 mg/kg) at locations 14-614514, 14-614515, and 14-614519 are presented in Table D-1. Concentrations of arsenic decreased with depth at locations 14-614514 and 14-614525, remained essentially the same with depth at location 14-614515, and increased with depth at location 14-614519. The arsenic Qbt 4 concentrations detected at locations 14-614514, 14-614515, and 14-614519 were below the maximum Qbt 2, 3, 4 background concentration (5 mg/kg). The vertical extent of arsenic is defined.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in eight samples at locations 14-614514 through 14-614519, 14-614527, and 14-614528. Barium was not detected above BV at the locations downgradient of the disposal area. The lateral extent of barium is defined. Concentrations detected below the soil BV (295 mg/kg) at locations 14-614514 through 14-614519, 14-614527, and 14-614528 are presented in Table D-1. Concentrations of barium decreased with depth at locations 14-614515 through

14-614519, remained essentially the same with depth at location 14-614514, and increased with depth at locations 14-614527 and 14-614528. Figure G-3 is the scatter plot of Qbt 4 site data for barium that shows a linear trend with a positive slope for barium and indicates concentrations across TA-14 were below or equal to the soil BV. In addition, Table G-1 indicates Qbt 4 barium concentrations are not different from soil background across TA-14, and Table G-2 indicates the barium Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the soil BV, the barium Qbt 4 concentrations detected at the eight locations were below the soil BV. No further sampling to define the vertical extent of barium at locations 14-614527 and 14-614528 is warranted.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in five samples at locations 14-614514, 14-614518, 14-614519, 14-614527, and 14-614528. Calcium was not detected above BV at the locations downgradient of the disposal area. The lateral extent of calcium is defined. Concentrations detected below the soil BV (6120 mg/kg) at locations 14-614514, 14-614518, 14-614519, 14-614527, and 14-614528 are presented in Table D-1. Concentrations of calcium decreased with depth at locations 14-614519, 14-614527, and 14-614528 but increased with depth at locations 14-614514 and 14-614518. Figure G-4 is the scatter plot of Qbt 4 site data for calcium that shows a linear trend with a positive slope for calcium and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 calcium concentrations are not different from soil background across TA-14, and Table G-2 indicates the calcium Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the soil BV, the calcium Qbt 4 concentrations detected at the five locations were below the soil BV. No further sampling to define the vertical extent of calcium at locations 14-614514 and 14-614518 is warranted.

Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in four samples at locations 14-614514, 14-614515, 14-614519, and 14-614528. Chromium was not detected above BV at the locations downgradient of the disposal area. The lateral extent of chromium is defined. Concentrations detected below the soil BV (19.3 mg/kg) at locations 14-614514, 14-614515, 14-614519, and 14-614528 are presented in Table D-1. Concentrations of chromium decreased with depth at location 14-614515, remained essentially the same with depth at locations 14-614514 and 14-614528, and increased with depth at location 14-614519. The chromium Qbt 4 concentrations detected at locations 14-614514, 14-614515, and 14-614528 were below the maximum Qbt 2, 3, 4 background concentration (13 mg/kg). The vertical extent of chromium is defined at locations 14-614514, 14-614515, and 14-614528 but is not defined at location 14-614519.

Cobalt was detected above the soil BV (8.64 mg/kg) in one sample (9.5 mg/kg) and above the Qbt 2, 3, 4 BV (3.14 mg/kg) in five samples at locations 14-614514, 14-614515, 14-614519, 14-614527, and 14-614528. Cobalt was not detected above BV at the locations downgradient of the disposal area. The lateral extent of cobalt is defined. Concentrations of cobalt decreased with depth at location 14-614519. Concentrations detected below the soil BV (8.64 mg/kg) at locations 14-614514, 14-614515, 14-614527, and 14-614528 are presented in Table D-1. Concentrations of cobalt decreased with depth at location 14-614515 and remained essentially the same with depth at locations 14-614514, 14-614527, and 14-614528. Figure G-6 is the scatter plot of Qbt 4 site data for cobalt that shows a linear trend with a positive slope for cobalt and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 cobalt concentrations are not different from soil background across TA-14, and Table G-2 indicates the cobalt Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth this SWMU). Compared with the soil BV, the cobalt Qbt 4 concentrations detected at the five locations were below the soil BV. No further sampling to define the vertical extent of cobalt at locations 14-614514, 14-614527, and 14-614528 is warranted.

Copper was detected above the soil BV (14.7 mg/kg) in three samples, above the Qbt 2, 3, 4 BV (4.66 mg/kg) in seven samples, and above the sediment BV (11.2 mg/kg) in two samples at eight locations. Concentrations of copper decreased downgradient along the drainage. The lateral extent of copper is defined. Concentrations of copper decreased with depth at locations 14-614519, 14-614520, 14-614526, 14-614528, and 14-614529. Copper was detected at concentrations of 10 mg/kg, 6.9 mg/kg, and 6.6 mg/kg below the soil BV from 0–1 ft bgs at locations 14-614514, 14-614515, and 14-614527, respectively (Table D-1). Concentrations of copper decreased at location 14-614514 and remained essentially the same with depth at locations 14-614515 and 14-614527. Figure G-7 is the scatter plot of Qbt 4 site data for copper that shows a linear trend with a positive slope for copper and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 copper concentrations are not different from soil background across TA-14, and Table G-2 indicates the copper Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the soil BV, the copper Qbt 4 concentrations detected at locations 14-614515 and 14-614527 were below the soil BV. No further sampling to define the vertical extent of copper at locations 14-614515 and 14-614527 is warranted.

Total cyanide was not detected above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg) but had DLs above BV. Because total cyanide was not detected above BV and all results reported between the BV and the individual sample’s respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Iron was detected above the Qbt 2, 3, 4 BV (14,500 mg/kg) in one sample (14,700 mg/kg) from 1.5–2.5 ft bgs at location 14-614519. Iron was not detected above BV at the locations downgradient of the disposal area. Iron was detected at a concentration of 9830 mg/kg below the soil BV (21,500 mg/kg) from 0–1 ft bgs at this location (Table D-1). Concentrations of iron increased with depth, but the concentration detected in Qbt 4 was below the maximum Qbt 2, 3, 4 background concentration (19,500 mg/kg). The lateral and vertical extent of iron are defined.

Lead was detected above the soil BV (22.3 mg/kg) in 4 samples, above the Qbt 2, 3, 4 BV (11.2 mg/kg) in 12 samples, and above the sediment BV (19.7 mg/kg) in 4 samples at 15 locations. Concentrations of lead decreased downgradient along the drainage. The lateral extent of lead is defined. Concentrations detected below the soil BV (22.3 mg/kg) at locations 14-614514 through 14-614517, 14-614522, 14-614527, and 14-614528 are presented in Table D-1. Concentrations of lead decreased with depth at locations 14-614514, 14-614516, 14-614517, 14-614519, 14-614521, 14-614523, 14-614525, 14-614526, 14-614528, 14-614529, and 14-614530, remained essentially the same with depth at locations 14-614522 and 14-614527, and increased with depth at locations 14-614515 and 14-614520. The lead Qbt 4 concentrations detected at locations 14-614514, 14-614516, 14-614517, 14-614522, 14-614527, and 14-614528 were equivalent to or below the maximum Qbt 2, 3, 4 background concentration (15.5 mg/kg). Figure G-8 is the scatter plot of Qbt 4 site data for lead that shows a linear trend with a positive slope for lead and indicates most concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 lead concentrations are not different from soil background across TA-14, and Table G-2 indicates the lead Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the maximum soil background concentration (28 mg/kg), the lead Qbt 4 concentration of 24.5 mg/kg detected at location 14-614515 was below the maximum soil background concentration, but the concentrations of 34.3 mg/kg and 45.5 mg/kg detected at location 14-614520 were not. No further sampling to define the vertical extent of lead at location 14-614515 is warranted, but the vertical extent of lead is not defined at location 14-614520.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in one sample (2100 mg/kg) from 5–6 ft bgs at location 14-614514. Magnesium was not detected above BV at the locations downgradient of the disposal area. Magnesium was detected at a concentration of 2590 mg/kg below the soil BV (4610 mg/kg) from 0–1 ft bgs at location 14-614514 (Table D-1). Concentrations of magnesium decreased with depth at this location and the concentration detected in Qbt 4 was below the maximum Qbt 2, 3, 4 background concentration (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Mercury was detected above the soil BV (0.1 mg/kg) in three samples, above the Qbt 2, 3, 4 BV (0.1 mg/kg) in one sample (0.343 mg/kg), and above the sediment BV (0.1 mg/kg) in one sample (0.147 mg/kg) at locations 14-614519, 14-614520, 14-614526, and 14-614528. Concentrations of mercury decreased along the drainage and decreased with depth at all four locations. The lateral and vertical extent of mercury are defined.

Nickel was detected above the soil BV (15.4 mg/kg) in one sample (24.7 mg/kg) and above the Qbt 2, 3, 4 BV (6.58 mg/kg) in two samples at locations 14-614514 and 14-614519. Nickel was not detected above BV at the locations downgradient of the disposal area. The lateral extent of nickel is defined. Nickel was detected at a concentration of 10.5 mg/kg below the soil BV from 0–1 ft bgs at location 14-614514 (Table D-1). Concentrations of nickel decreased with depth at location 14-614514 but increased with depth at location 14-614519. The vertical extent of nickel is not defined at location 14-614519.

Nitrate was detected in all 34 samples at all 17 locations, with a maximum concentration of 14.3 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Selenium was detected above the soil BV (1.52 mg/kg) in four samples, above the Qbt 2, 3, 4 BV (0.3 mg/kg) in 17 samples, and above the sediment BV (0.3 mg/kg) in four samples at 17 locations. Concentrations of selenium did not change substantially along the drainage. Concentrations detected below the soil BV (1.52 mg/kg) at the site are presented in Table D-1. Concentrations of selenium decreased with depth at location 14-614521, remained essentially the same with depth at locations 14-614515, 14-614518, 14-614519, 14-614523, 14-614524, 14-614527, and 14-614530, and increased with depth at locations 14-614514, 14-614516, 14-614517, 14-614520, 14-614522, 14-614525, 14-614526, 14-614528, and 14-614529. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows the majority of the detected concentrations of selenium are consistent across the site. In addition, Table G-2 indicates selenium Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the soil BV and the maximum soil background concentration (1.7 mg/kg), the selenium Qbt 4 concentrations detected at locations 14-614514 through 14-614519, 14-614527, and 14-614528 were below the soil BV or the maximum soil background concentration. Further sampling to define the lateral extent of selenium is not warranted. The vertical extent of selenium is defined at locations 14-614514 through 14-614519, 14-614521, 14-614523, 14-614524, 14-614527, 14-614528, and 14-614530 but is not defined at locations 14-614520, 14-614522, 14-614525, 14-614526, and 14-614529.

Thallium was detected above the soil BV (0.73 mg/kg) in one sample (0.82 mg/kg) from 0–1 ft bgs at location 14-614521. The Gehan and quantile tests indicated site concentrations are not different from background (Figure F-1.0-1 and Table F-1). The lateral and vertical extent of thallium are defined.

Vanadium was detected above the Qbt 2, 3, 4 BV (17 mg/kg) in four samples at locations 14-614514, 14-614518, 14-614527, and 14-614528. Vanadium was not detected above BV at the locations downgradient of the disposal area. The lateral extent of vanadium is defined. Concentrations detected below the soil BV (39.6 mg/kg) at locations 14-614514, 14-614518, 14-614527, and 14-614528 are presented in Table D-1. Concentrations of vanadium decreased with depth at location 14-614518, remained essentially the same with depth at location 14-614514, and increased with depth at locations 14-614527 and 14-614528. The concentrations detected in Qbt 4 at locations 14-614518, 14-614527, and 14-614528 were below the maximum Qbt 2, 3, 4 background concentration (21 mg/kg). The vertical extent of vanadium is defined at locations 14-614518, 14-614527, and 14-614528. Figure G-12 is the scatter plot of Qbt 4 site data for vanadium that shows a linear trend with a positive slope for vanadium and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 vanadium concentrations are not different from soil background across TA-14, and Table G-2 indicates the vanadium Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the soil BV, the vanadium Qbt 4 concentration of 24.7 mg/kg detected from 5–6 ft bgs at location 14-614514 was below the soil BV. No further sampling to define the vertical extent of vanadium at location 14-614514 is warranted.

Zinc was detected above the soil BV (48.8 mg/kg) in one sample (51.8 mg/kg) from 0–1 ft bgs at location 14-614524. The Gehan and quantile tests indicated site concentrations are not different from background (Figure F-1.0-2 and Table F-1). The lateral and vertical extent of zinc are defined.

Organic Chemicals

Acetone was detected in the six deeper samples at locations 14-614515, 14-614520, 14-614521, 14-614523, 14-614526, and 14-614530. The concentrations of acetone decreased downgradient. Surface samples were not analyzed for VOCs, but all concentrations detected at deeper depths were below EQLs. The lateral and vertical extent of acetone are defined.

Anthracene was detected in one sample (0.04 mg/kg) below the EQL from 0–1 ft bgs at location 14-614516. Anthracene was not detected in the deeper sample at this location and was not detected at the locations downgradient of the disposal area. The lateral and vertical extent of anthracene are defined.

Benzo(a)anthracene, benzo(a)pyrene, chrysene, and phenanthrene were detected in three samples at locations 14-614514, 14-614516, and 14-614517. Benzo(a)anthracene, benzo(a)pyrene, chrysene, and phenanthrene were not detected at the locations downgradient of the disposal area, were not detected in the deeper samples at locations 14-614514 and 14-614516, and were detected from 4.5–5.5 ft bgs at location 14-614517 with concentrations below EQLs. The lateral and vertical extent of benzo(a)anthracene, benzo(a)pyrene, chrysene, and phenanthrene are defined.

Benzo(b)fluoranthene was detected in four samples at locations 14-614514, 14-614516, and 14-614517 at concentrations below EQLs. Benzo(b)fluoranthene was not detected at the locations downgradient of the disposal area and was not detected in the deeper samples at locations 14-614514 and 14-614516. Its concentrations increased with depth at location 14-614517 but were below the EQLs. The lateral and vertical extent of benzo(b)fluoranthene are defined.

Benzo(k)fluoranthene was detected in two samples at locations 14-614514 and 14-614516 at concentrations below EQLs. Benzo(k)fluoranthene was not detected at the locations downgradient of the disposal area and was not detected in the deeper samples at both locations. The lateral and vertical extent of benzo(k)fluoranthene are defined.

Bis(2-ethylhexyl)phthalate; 2,4-dinitrotoluene; and N-nitrosodiphenylamine were detected in one sample from 0–1 ft bgs at location 14-614520. Concentrations of bis(2-ethylhexyl)phthalate and N-nitrosodiphenylamine were below EQLs. Bis(2-ethylhexyl)phthalate; 2,4-dinitrotoluene; and N-nitrosodiphenylamine were not detected at the locations downgradient of the disposal area and were not detected from 2–3 ft bgs at this location. The lateral and vertical extent of bis(2-ethylhexyl)phthalate; 2,4-dinitrotoluene; and N-nitrosodiphenylamine are defined.

Di-n-butylphthalate was detected in five samples at locations 14-614515, 14-614521, 14-614523, 14-614525, and 14-614529 at concentrations below EQLs. Di-n-butylphthalate was not detected in the drainage and was not detected in the deeper samples at locations 14-614521, 14-614523, 14-614525, and 14-614529. Di-n-butylphthalate was detected from 2.5–3.5 ft bgs at location 14-614515 with a concentration below the EQL. The lateral and vertical extent of di-n-butylphthalate are defined.

Fluoranthene and pyrene were detected in five samples at locations 14-614514, 14-614516, and 14-614517 at concentrations below EQLs. Fluoranthene and pyrene were not detected at the locations downgradient of the disposal area and were not detected from 2–3 ft bgs at location 14-614516. Concentrations of fluoranthene and pyrene decreased with depth at location 14-614514 and increased with depth at location 14-614517, but the concentrations were below EQLs. The lateral and vertical extent of fluoranthene and pyrene are defined.

Hexanone[2-] was detected in one sample (0.011 mg/kg) from 4.5–5.5 ft bgs at location 14-614517. Hexanone[2-] was not detected at the locations downgradient of the disposal area. The surface sample was not analyzed for VOCs, but the concentration detected from 4.5–5.5 ft bgs was below the EQL. The lateral and vertical extent of 2-hexanone are defined.

HMX was detected in 16 samples at nine locations. HMX was not detected at the most downgradient location 14-614530 on the canyon slope. The lateral extent of HMX is defined. Concentrations of HMX decreased with depth at locations 14-614521, 14-614524, 14-614525, and 14-614529 but increased with depth at locations 14-614517, 14-614519, 14-614520, 14-614526, and 14-614528. The vertical extent of HMX is not defined at locations 14-614517, 14-614519, 14-614520, 14-614526, and 14-614528.

Indeno(1,2,3-cd)pyrene was detected in one sample (0.041 mg/kg) below the EQL from 0–1 ft bgs at location 14-614514. Indeno(1,2,3-cd)pyrene was not detected at the locations downgradient of the disposal area and was not detected from 5–6 ft bgs at this location. The lateral and vertical extent of indeno(1,2,3-cd)pyrene are defined.

PETN was detected in one sample (0.43 mg/kg) from 0–1 ft bgs at location 14-614517. PETN was not detected at the locations downgradient of the disposal area and was not detected from 4.5–5.5 ft bgs at this location. The lateral and vertical extent of PETN are defined.

RDX was detected in five samples at locations 14-614519, 14-614520, 14-614526, and 14-614529. RDX was not detected at the most downgradient location 14-614530 on the canyon slope. The lateral extent of RDX is defined. Concentrations of RDX decreased with depth at locations 14-614520 and 14-614529 but increased with depth at locations 14-614519 and 14-614526. The vertical extent of RDX is not defined at locations 14-614519 and 14-614526.

TATB was detected in eight samples at locations 14-614516, 14-614519, 14-614520, 14-614527, and 14-614528. TATB was not detected at the locations downgradient of the disposal area. The lateral extent of TATB is defined. TATB was not detected from 2–3 ft bgs at location 14-614516, was detected from 2.5–3.5 ft bgs at location 14-614527 with a concentration below the EQL, and its concentrations decreased with depth at locations 14-614519, 14-614520, and 14-614528. The vertical extent of TATB is defined.

Radionuclides

Cesium-137 was detected in two Qbt 4 samples at locations 14-614516 and 14-614521. Cesium-137 was not detected or detected above FV at the locations downgradient of the disposal area. The lateral extent of cesium-137 is defined. Cesium-137 was detected at concentrations of 0.177 pCi/g and 0.964 pCi/g (below the soil FV of 1.65 pCi/g) from 0–1 ft bgs at locations 14-614516 and 14-614521, respectively (Table D-2). Concentrations of cesium-137 decreased with depth at both locations. The vertical extent of cesium-137 is defined.

Strontium-90 was detected in three Qbt 4 samples at locations 14-614514, 14-614520, and 14-614526. Strontium-90 was not detected or detected above the FV at the most downgradient location 14-614530 on the canyon slope. The lateral extent of strontium-90 is defined. Strontium-90 was not detected from 0–1 ft bgs at locations 14-614514 and 14-614526, and was detected at a concentration of 0.39 pCi/g (below the soil FV of 1.31 pCi/g) from 0–1 ft bgs at location 14-614520 (Table D-2). Concentrations of strontium-90 remained essentially the same with depth at location 14-614520 but increased with depth at locations 14-614514 and 14-614526. The vertical extent of strontium-90 is not defined at locations 14-614514 and 14-614526.

Uranium-234 was detected above the soil BV (2.59 pCi/g) in one sample (21 pCi/g), above the Qbt 2, 3, 4 BV (1.98 pCi/g) in two samples, and above the sediment BV (2.59 pCi/g) in one sample (8.34 pCi/g) at locations 14-614519, 14-614528, and 14-614529. Uranium-234 was not detected above BVs in the drainage downgradient of location 14-614529. The lateral extent of uranium-234 is defined. Concentrations of uranium-234 decreased with depth at locations 14-614528 and 14-614529 but increased with depth at location 14-614519. The vertical extent of uranium-234 is not defined at location 14-614519.

Uranium-235/236 was detected above the soil BV (0.2 pCi/g) in four samples, above the Qbt 2, 3, 4 BV (0.09 pCi/g) in two samples, and above the sediment BV (0.2 pCi/g) in two samples at locations 14-614519, 14-614520, and 14-614526 through 14-614529. Uranium-235/236 was not detected above BV at the most downgradient location 14-614530 on the canyon slope. The lateral extent of uranium-235/236 is defined. Concentrations of uranium-235/236 decreased with depth at five of the six locations but increased with depth at location 14-614519. The vertical extent of uranium-235/236 is not defined at location 14-614519.

Uranium-238 was detected above the soil BV (2.29 pCi/g) in five samples, above the Qbt 2, 3, 4 BV (1.93 pCi/g) in four samples, and above the sediment BV (2.29 pCi/g) in two samples at locations 14-614519, 14-614520, 14-614521, and 14-614526 through 14-614529. Uranium-238 was detected at a concentration of 162 pCi/g, exceeding the construction worker SAL of 160 pCi/g, from 0–1 ft bgs at location 14-614528. Uranium-238 was not detected above BV at the most downgradient location 14-614530 on the canyon slope. The lateral extent of uranium-238 is defined. Concentrations of uranium 238 decreased with depth at six of the seven locations but increased with depth at location 14-614519. The vertical extent of uranium-238 is not defined at location 14-614519.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, perchlorate, PCBs, SVOCs, VOCs, and gamma-emitting radionuclides are defined at SWMU 14-009.

The lateral and vertical extent are defined or no further sampling is warranted to define extent for inorganic chemicals, except for

- the vertical extent of antimony at location 14-614527;
- the vertical extent of chromium and nickel at location 14-614519;
- the vertical extent of lead at location 14-614520; and
- the vertical extent of selenium at locations 14-614520, 14-614522, 14-614525, 14-614526, and 14-614529.

The lateral and vertical extent of explosive compounds are defined, except for

- the vertical extent of HMX at locations 14-614517, 14-614519, 14-614520, 14-614526, and 14-614528; and
- the vertical extent of RDX at locations 14-614519 and 14-614526.

The lateral extent of strontium-90 is defined, but the vertical extent of strontium-90 is not defined at locations 14-614514 and 14-614526.

The lateral extent of isotopic uranium is defined, but the vertical extent of isotopic uranium is not defined at location 14-614519.

6.8.5.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 14-009 because extent is not defined for the site.

6.8.5.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 14-009 because extent is not defined for the site.

6.8.6 SWMU 14-010, Former Sump

6.8.6.1 Site Description and Operation History

SWMU 14-010 is a former HE sump that was located on the exterior south wall of a former firing chamber [structure 14-2, SWMU 14-002(a)] (Figure 6.8-1). The sump received waste from firing chamber 14-2 and discharged to an outfall located approximately 24 ft southeast of the sump. The SWMU 14-010 sump was removed in 1973. The drainline remains in place.

6.8.6.2 Relationship to Other SWMUs and AOCs

SWMU 14-010 is the location of a former HE sump that served the former firing chamber SWMU 14-002(a). The sump was removed in 1973 before building 14-39 [AOC 14-001(f)] was constructed in the vicinity.

6.8.6.3 Summary of Previous Investigations

During the 1995 RFI conducted at SWMU 14-010, samples were field screened for lead, uranium, and gross radioactivity, and HE spot tests were performed. Based on field-screening results, three surface (0–0.5 ft bgs) samples and one subsurface (1–1.5 ft bgs) sample were collected and submitted for off-site analysis of total lead and total uranium (LANL 1996, 054086, p. 5-29). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed inorganic chemicals detected above BVs and positive HE spot test results.

Based on the recommendations of the RFI report, a VCA was conducted at SWMU 14-010 in 1997 to excavate and remove contaminated surface soil and sediment from the 1995 RFI sampling locations in the drainage area (LANL 1997, 056611). Twelve confirmation sediment samples were collected following the removal of contaminated soil and sediment. All the samples were submitted for off-site analysis, six samples were submitted for HE analysis, and six samples were submitted for isotopic uranium. HMX was detected in all 12 confirmation samples, and TNT was detected in 3 confirmation samples. Uranium-234, uranium-235, and uranium-238 each was detected above their respective sediment BVs in one, two and four of the confirmation samples, respectively. Decision-level data from the 1997 VCA are included in this report. All decision-level analytical data collected during previous investigations are presented and evaluated in section 6.8.6.4.

6.8.6.4 Site Contamination

Soil and Rock Sampling

The location of the sump and drainline were substantially regraded during construction of the current buildings. Therefore, the location of the former sump and drainline could not be sampled, and samples were collected at the location of the former outfall and in the drainage downgradient of the outfall. As part of the 2011 investigation, the following activities were conducted at SWMU 14-010:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Ten samples were collected from five locations downgradient of the outfall (locations 14-614595 through 14-614599) at 0–1 ft and 3–4 ft bgs, except the first depth sampled at location 14-614595 was collected from 0.3–1.3 ft bgs to avoid a piece of asphalt at the surface. Samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, VOCs (excluding surface samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.

Historical and 2011 sampling locations at SWMU 14-010 are shown in Figure 6.8-1. Table 6.8-5 presents the historical and 2011 samples collected and the analyses requested for SWMU 14-010. The geodetic coordinates of the 2011 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 levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

Soil and Rock Sample Analytical Results

Decision-level data at SWMU 14-010 consist of the results from 22 samples (5 soil, 5 Qbt 4, and 12 sediment) collected from 11 locations in 1997 and 2011. The extent of contamination is not defined at SWMU 14-010. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

The 1997 samples were not analyzed for inorganic chemicals. Ten samples (5 soil and 5 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.8-6 presents the inorganic chemicals above BVs. Figure 6.8-5 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Seven TAL metals (antimony, arsenic, copper, lead, selenium, silver, and zinc) were detected above BVs. Total cyanide was not detected but had DLs above BV. Nitrate was detected and perchlorate was not detected.

Organic Chemicals

Sixteen samples (5 soil, 5 Qbt 4, and 6 sediment) were analyzed for explosive compounds, 10 samples (5 soil and 5 Qbt 4) were analyzed for SVOCs, 2 samples (1 soil and 1 Qbt 4) were analyzed for PCBs, and 5 Qbt 4 samples were analyzed for VOCs. Table 6.8-7 presents the detected organic chemicals. Figure 6.8-6 shows the spatial distribution of detected organic chemicals.

Four explosive compounds (HMX, RDX, TATB, and TNT) and two SVOCs (bis[2-ethylhexyl]phthalate and di-n-butylphthalate) were detected. PCBs and VOCs were not detected.

Radionuclides

Ten samples (5 soil and 5 Qbt 4) were analyzed for gamma-emitting radionuclides and strontium-90. Sixteen samples (5 soil, 5 Qbt 4, and 6 sediment) were analyzed for isotopic uranium. Table 6.8-8 presents the radionuclides detected or detected above BVs/FVs. Figure 6.8-7 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Cesium-137 was detected in tuff. Uranium-234, uranium-235/236, and uranium-238 were detected above BVs.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Antimony was detected above the Qbt 2, 3, 4 BV (0.5 mg/kg) in one sample (0.7 mg/kg) from 3–4 ft bgs at location 14-614596. Concentrations of antimony decreased downgradient. The lateral extent of antimony is defined. Antimony was detected at a concentration of 0.45 mg/kg (below the soil BV of

0.83 mg/kg) from 0–1 ft bgs at location 14-614596 (Table D-1). Figure G-1 is the scatter plot of Qbt 4 site data for antimony that shows a linear trend with a positive slope for antimony and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV. In addition, Table G-1 indicates Qbt 4 antimony concentrations are not different from soil background across TA-14. Compared with the soil BV, the concentration of 0.7 mg/kg detected in Qbt 4 at location 14-614596 was below the soil BV. No further sampling to define the vertical extent of antimony at location 14-614596 is warranted.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in three samples at locations 14-614595, 14-614596, and 14-614597. Concentrations of arsenic decreased downgradient. The lateral extent of arsenic is defined. Concentrations detected below the soil BV (8.17 mg/kg) at locations 14-614595, 14-614596, and 14-614597 are presented in Table D-1. Concentrations of arsenic increased with depth at these three locations, but the arsenic Qbt 4 concentrations were below or similar to the maximum Qbt 2, 3, 4 background concentration (5 mg/kg). The vertical extent of arsenic is defined.

Copper was detected above the soil BV (14.7 mg/kg) in two samples and above the Qbt 2, 3, 4 BV (4.66 mg/kg) in one sample (4.8 mg/kg) at locations 14-614596 and 14-614599. Concentrations of copper decreased downgradient and decreased with depth at both locations. The lateral and vertical extent of copper are defined.

Total cyanide was not detected but had DLs above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg). Because total cyanide was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Lead was detected above the soil BV (22.3 mg/kg) in two samples and above the Qbt 2, 3, 4 BV (11.2 mg/kg) in two samples at locations 14-614596, 14-614598, and 14-614599. Concentrations of lead decreased downgradient. The lateral extent of lead is defined. Concentrations of lead decreased with depth at location 14-614596. Lead was detected at a concentration of 17.8 mg/kg (below the soil BV) from 0–1 ft bgs at location 14-614598 (Table D-1). Concentrations of lead did not change substantially with depth at location 14-614598. Figure G-8 is the scatter plot of Qbt 4 site data for lead that shows a linear trend with a positive slope for lead and indicates most concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 lead concentrations are not different from soil background across TA-14, and Table G-2 indicates the lead Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the soil BV, the lead Qbt 4 concentration of 19.1 mg/kg detected at location 14-614596 was below the soil BV. No further sampling to define the vertical extent of lead at location 14-614598 is warranted. Concentrations of lead increased with depth at location 14-614599 and were above the maximum background concentration; the vertical extent is not defined at this location.

Nitrate was detected in five soil and five Qbt 4 samples at five locations, with a maximum concentration of 5.7 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Selenium was detected above the Qbt 2, 3, 4 BV (0.3 mg/kg) in five samples at locations 14-614595 through 14-614599. Concentrations detected below the soil BV (1.52 mg/kg) at these five locations are presented in Table D-1. Concentrations of selenium did not change substantially along the drainage and increased with depth at all five locations. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows the majority of the detected concentrations of selenium are consistent across the site. In addition, Table G-2 indicates the selenium Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this SWMU). Compared with the maximum soil background concentration (1.7 mg/kg), the selenium Qbt 4 concentrations detected at locations 14-614595, 14-614596, 14-614598, and 14-614599 were below or similar to the maximum soil background concentration. Further sampling to define the lateral and vertical extent of selenium at locations 14-614595, 14-614596, 14-614598, and 14-614599 is not warranted. However, the vertical extent is not defined at location 14-614597.

Silver was detected above the soil BV (1 mg/kg) in one sample (2 mg/kg) from 0–1 ft bgs at location 14-614599. Concentrations of silver decreased downgradient and decreased with depth at this location. The lateral and vertical extent of silver are defined.

Zinc was detected above the Qbt 2, 3, 4 BV (63.5 mg/kg) in one sample (88.2 mg/kg) from 3–4 ft bgs at location 14-614599. Concentrations of zinc decreased downgradient but increased with depth at this location. The lateral extent of zinc is defined, but the vertical extent of zinc is not defined at location 14-614599.

Organic Chemicals

Bis(2-ethylhexyl)phthalate was detected in three samples at locations 14-614595, 14-614596, and 14-614598. Concentrations of bis(2-ethylhexyl)phthalate decreased downgradient. The lateral extent of bis(2-ethylhexyl)phthalate is defined. Bis(2-ethylhexyl)phthalate was detected from 3–4 ft bgs at locations 14-614595 and 14-614596 with concentrations below EQLs and was not detected from 3–4 ft bgs at location 14-614598. The vertical extent of bis(2-ethylhexyl)phthalate is defined.

Di-n-butylphthalate was detected in one sample (0.46 mg/kg) from 0–1 ft bgs at location 14-614596. Di-n-butylphthalate was not detected in the drainage downgradient of location 14-614596 and was not detected from 3–4 ft bgs at this location. The lateral and vertical extent of di-n-butylphthalate are defined.

HMX was detected in 15 samples at 11 locations. Concentrations of HMX were below EQLs at locations 14-614597 and 14-614598 and decreased downgradient along the drainage. The lateral extent of HMX is defined. Only surface samples were collected in 1997. The vertical extent at the 1997 locations was evaluated by the adjacent 2011 locations: locations 14-01038 and 14-01039 were evaluated by location 14-614596, and locations 14-01040 through 14-01043 were evaluated by location 14-614599. Concentrations of HMX decreased with depth at locations 14-614595, 14-614596, 14-614598, and 14-614599, and HMX was not detected from 3–4 ft bgs at location 14-614597. The vertical extent of HMX is defined.

RDX was detected in one sample (0.38 mg/kg) from 0–1 ft bgs at location 14-614596. RDX was not detected in the drainage downgradient of location 14-614596 and was not detected from 3–4 ft bgs at this location. The lateral and vertical extent of RDX are defined.

TATB was detected in four samples at locations 14-614596 and 14-614599. TATB was not detected in the drainage downgradient of location 14-614599, and concentrations of TATB decreased with depth at both locations. The lateral and vertical extent of TATB are defined.

TNT was detected in three samples at locations 14-01038, 14-01041, and 14-01043. TNT was not detected in the drainage downgradient of location 14-01043. The lateral extent of TNT is defined. Only surface samples were collected in 1997. The vertical extent at the 1997 locations was evaluated by the adjacent 2011 locations: location 14-01038 was evaluated by location 14-614596, and locations 14-01041 and 14-01043 were evaluated by location 14-614599. TNT was not detected at location 14-614596, approximately 5 ft away from location 14-01038 and was not detected at location 14-614599, near locations 14-01041 and 14-01043. The vertical extent of TNT is defined.

Radionuclides

Cesium-137 was detected in one Qbt 4 sample (0.142 pCi/g) from 3–4 ft bgs at location 14-614597. Cesium-137 was not detected or detected above FV at the most downgradient location 14-614598 in the drainage. The lateral extent of cesium-137 is defined. Cesium-137 was not detected but had a DL of 0.1 pCi/g from 0–1 ft bgs at location 14-614597 (Table D-2). The concentration of cesium-137 was detected at a low level; therefore, no further sampling to define the vertical extent of cesium-137 at location 14-614597 is warranted.

Uranium-234 was detected above soil BV (2.59 pCi/g) in one sample (2.73 pCi/g) from 0–1 ft bgs at location 14-614596 and was detected above the sediment BV (2.59 pCi/g) in one sample (3.44 pCi/g) from 0–0.5 ft bgs at location 14-01038. Only a surface sample was collected at location 14-01038, and the vertical extent was evaluated by the adjacent location 14-614596, approximately 5 ft away from location 14-01038. Uranium-234 was not detected above BV in the drainage downgradient of location 14-614596, and concentrations of uranium-234 decreased with depth at this location. The lateral and vertical extent of uranium-234 are defined.

Uranium-235 was detected above sediment BV (0.2 pCi/g) in two samples at locations 14-01038 and 14-01039. Uranium-235/236 was detected above the soil BV (0.2 pCi/g) in one sample (0.22 pCi/g) from 0–1 ft bgs at location 14-614596, which is approximately 5 ft away from locations 14-01038 and 14-01039. Only surface samples were collected at locations 14-01038 and 14-01039, and the vertical extent was evaluated by the adjacent location 14-614596. Uranium-235/236 was not detected above BV in the drainage downgradient of location 14-614596, and concentrations of uranium-235/236 decreased with depth at this location. The lateral and vertical extent of uranium-235 and uranium-235/236 are defined.

Uranium-238 was detected above soil BV (2.29 pCi/g) in two samples and above Qbt 2, 3, 4 BV (1.93 pCi/g) in one sample at locations 14-614596 and 14-614599; it was detected above the sediment BV (2.29 pCi/g) in four samples at locations 14-01038, 14-01039, 14-01041, and 14-01042. Only surface samples were collected in 1997. The vertical extent at the 1997 locations was evaluated by the adjacent 2011 locations: locations 14-01038 and 14-01039 were evaluated by location 14-614596, and locations 14-01041 and 14-01042 were evaluated by location 14-614599. Uranium-238 was not detected above BV in the drainage downgradient of location 14-614599. The lateral extent of uranium-238 is defined. Concentrations of uranium-238 decreased with depth at locations 14-614596 and 14-614599. The concentration of 2.2975 pCi/g detected at location 14-01042 is equivalent to the sediment BV, and uranium-238 was not detected above the sediment BV (2.29 pCi/g) at location 14-01043, approximately 5 ft downgradient of location 14-01042. The vertical extent of uranium-238 is defined.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, perchlorate, explosive compounds, PCBs, VOCs, SVOCs, isotopic uranium, and strontium-90 are defined at SWMU 14-010.

The lateral and vertical extent are defined or no further sampling is warranted to define extent for inorganic chemicals, except for

- the vertical extent of lead and zinc at location 14-614599 and
- the vertical extent of selenium at location 14-614597.

The lateral and vertical extent are defined or no further sampling is warranted to define extent for gamma-emitting radionuclides at SWMU 14-010,

6.8.6.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 14-010 because extent is not defined for the site.

6.8.6.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 14-010 because extent is not defined for the site.

6.8.7 AOC C-14-008, Former Magazine

6.8.7.1 Site Description and Operation History

AOC C-14-008 is a former HE magazine (structure 14-11) located at TA-14 (Figure 6.8-1). Constructed in 1945, the wood-framed magazine measured 5 ft square × 5 ft high, with an earthen berm on three sides and on top. The magazine was removed in 1952.

6.8.7.2 Relationship to Other SWMUs and AOCs

AOC C-14-008 is the location of a former HE magazine located northeast of the other SWMUs and AOCs of Consolidated Unit 14-002(a)-99.

6.8.7.3 Summary of Previous Investigations

During the 1995 RFI conducted at AOC C-14-008, samples were field screened for lead, uranium, and gross radioactivity, and HE spot tests were performed. Based on field-screening results, two surface (0–0.5 ft bgs) samples were collected and submitted for off-site analysis of TAL metals, gamma-emitting radionuclides, and HE (LANL 1996, 054086, pp. 5-32–5-33). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed no inorganic chemicals detected above BVs, no radionuclides detected above BVs/FVs, and no detected HE.

6.8.7.4 Site Contamination

Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC C-14-008:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Ten samples were collected from five locations within and around the structure footprint (locations 14-614637 through 14-614641) at 0–1 ft and 3–4 ft bgs and were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs, SVOCs, and VOCs (excluding surface samples).

The 2011 sampling locations at AOC C-14-008 are shown in Figure 6.8-1. Table 6.8-9 presents the 2011 samples collected and the analyses requested for AOC C-14-008. The geodetic coordinates of the 2011 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 levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

Soil and Rock Sample Analytical Results

Decision-level data at AOC C-14-008 consist of the results from 10 samples (9 soil and 1 Qbt 4) collected from five locations in 2011. The extent of contamination is not defined at AOC C-14-008. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 10 samples (9 soil and 1 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.8-10 presents the inorganic chemicals above BVs. Figure 6.8-8 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Fourteen TAL metals (aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, nickel, selenium, and vanadium) were detected above BVs or not detected but had DLs above BV. Total cyanide was not detected but had DLs above BV. Nitrate and perchlorate were detected.

Organic Chemicals

All 10 samples (9 soil and 1 Qbt 4) were analyzed for explosive compounds, PCBs, and SVOCs, and 5 samples (4 soil and 1 Qbt 4) were analyzed for VOCs.

Organic chemicals were not detected at AOC C-14-008.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-008 based on the operational history of the site (LANL 2011, 207481, p. 4).

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the soil BV (29,200 mg/kg) in two samples at locations 14-614637 and 14-614639 and above the Qbt 2, 3, 4 BV (7340 mg/kg) in one sample (20,700 mg/kg) at location 14-614640. Concentrations of aluminum decreased laterally. The lateral extent of aluminum is defined. Concentrations detected below the soil BV at locations 14-614637, 14-614639, and 14-614640 are presented in Table D-1. Concentrations of aluminum increased with depth at all three locations, but the concentrations detected from 3–4 ft bgs at locations 14-614637 and 14-614639 were below the maximum soil background concentration (61,500 mg/kg). The vertical extent of aluminum is defined at locations 14-614637 and 14-614639. Figure G-13 is the scatter plot of Qbt 4 site data for aluminum that shows a linear trend with a positive slope for aluminum and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 aluminum concentrations are not different from soil background across TA-14, and Table G-2 indicates the aluminum Qbt 4 concentration is within the soil concentration range at this AOC. Compared with the soil BV, the aluminum Qbt 4 concentration of 20700 mg/kg detected from 3–4 ft bgs at location 14-614640 was below the soil BV. No further sampling to define the vertical extent of aluminum at location 14-614640 is warranted.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in one sample (3.5 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (8.17 mg/kg) at the site are presented in Table D-1. Concentrations of arsenic did not change substantially laterally and were below soil BV or the maximum Qbt 2, 3, 4 background concentration (5 mg/kg). Concentrations of arsenic increased with depth at location 14-614640, but the arsenic Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration. The lateral and vertical extent of arsenic are defined.

Barium was detected above the soil BV (295 mg/kg) in three samples at locations 14-614637, 14-614639, and 14-614641 and above the Qbt 2, 3, 4 BV (46 mg/kg) in one sample (270 mg/kg) at location 14-614640. Concentrations of barium either decreased or remained essentially the same laterally. Concentrations detected below the soil BV at locations 14-614637, 14-614639, 14-614640, and 14-614641 are presented in Table D-1. Concentrations of barium increased with depth at all four locations, but the concentrations detected in soil from 3–4 ft bgs at locations 14-614637, 14-614639, and 14-614641 were below the maximum soil background concentration (410 mg/kg). The vertical extent of barium is defined at locations 14-614637, 14-614639, and 14-614641. Figure G-3 is the scatter plot of Qbt 4 site data for barium that shows a linear trend with a positive slope for barium and indicates concentrations across TA-14 were below or equal to the soil BV. In addition, Table G-1 indicates Qbt 4 barium concentrations are not different from soil background across TA-14, and Table G-2 indicates the barium Qbt 4 concentration is within the soil concentration range at this AOC. Compared with the soil BV, the barium Qbt 4 concentration of 270 mg/kg detected from 3–4 ft bgs at location 14-614640 was below the soil BV. No further sampling to define the lateral and vertical extent of barium at location 14-614640 is warranted.

Beryllium was detected above the soil BV (1.83 mg/kg) in one sample (2 mg/kg) at location 14-614637 and above the Qbt 2, 3, 4 BV (1.21 mg/kg) in one sample (1.5 mg/kg) at location 14-614640. Concentrations of beryllium decreased laterally. The lateral extent of beryllium is defined. Beryllium was detected at a concentration of 0.95 mg/kg below the soil BV from 0–1 ft bgs at location 14-614640 (Table D-1). Concentrations of beryllium increased with depth at locations 14-614637 and 14-614640, but the concentrations detected from 3–4 ft bgs were below the respective maximum soil background concentration (3.95 mg/kg) and maximum Qbt 2, 3, 4 background concentration (1.8 mg/kg), respectively. The vertical extent of beryllium is defined.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in one sample (3830 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (6120 mg/kg) at the site are presented in Table D-1. Concentrations of calcium increased laterally to the south and increased with depth at location 14-614640. Figure G-4 is the scatter plot of Qbt 4 site data for calcium that shows a linear trend with a positive slope for calcium and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 calcium concentrations are not different from soil background across TA-14, and Table G-2 indicates the calcium Qbt 4 concentration is slightly above the soil concentration range at this AOC. Compared with the soil BV, the calcium Qbt 4 concentration of 3830 mg/kg detected from 3–4 ft bgs at location 14-614640 was below the soil BV. No further sampling to define the lateral and vertical extent of calcium at location 14-614640 is warranted.

Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in one sample (10.8 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (19.3 mg/kg) at the site are presented in Table D-1. Concentrations of chromium either decreased or remained essentially the same laterally and were below soil BV or the maximum Qbt 2, 3, 4 background concentration (13 mg/kg). Concentrations of chromium increased with depth at location 14-614640, but the chromium Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration. The lateral and vertical extent of chromium are defined.

Cobalt was detected above the Qbt 2, 3, 4 BV (3.14 mg/kg) in one sample (5.6 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (8.64 mg/kg) at the site are presented in Table D-1. Concentrations of chromium decreased laterally to the south and increased with depth at location 14-614640. The lateral extent of cobalt is defined. Figure G-6 is the scatter plot of Qbt 4 site data for cobalt that shows a linear trend with a positive slope for cobalt and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 cobalt concentrations are not different from soil background across TA-14, and Table G-2 indicates the cobalt Qbt 4 concentration is within the soil concentration range at this AOC. Compared with the soil BV, the cobalt Qbt 4 concentration of 5.6 mg/kg detected from 3–4 ft bgs at location 14-614640 was below the soil BV. No further sampling to define the vertical extent of cobalt at location 14-614640 is warranted.

Copper was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in one sample (8 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (14.7 mg/kg) at the site are presented in Table D-1. Concentrations of copper decreased laterally to the south and increased with depth at location 14-614640. The lateral extent of copper is defined. Figure G-7 is the scatter plot of Qbt 4 site data for copper that shows a linear trend with a positive slope for copper and indicates concentrations across TA 14 (except one concentration at SWMU 14-009) were below the soil BV. In addition, Table G-1 indicates Qbt 4 copper concentrations are not different from soil background across TA-14, and Table G-2 indicates the copper Qbt 4 concentration is within the soil concentration range at this AOC. Compared with the soil BV, the copper Qbt 4 concentration of 8 mg/kg detected from 3–4 ft bgs at location 14-614640 was below the soil BV. No further sampling to define the vertical extent of copper at location 14-614640 is warranted.

Total cyanide was not detected but had DLs above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg). Because total cyanide was not detected above BV and all results reported between the BV and the individual sample’s respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Iron was detected above the Qbt 2, 3, 4 BV (14,500 mg/kg) in one sample (15,500 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (21,500 mg/kg) at the site are presented in Table D-1. Concentrations of iron decreased laterally to the south and increased with depth at location 14-614640, but the iron Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration (19500 mg/kg). The lateral and vertical extent of iron are defined.

Lead was detected above the Qbt 2, 3, 4 BV (11.2 mg/kg) in one sample (14.3 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (22.3 mg/kg) at the site are presented in Table D-1. Concentrations of lead decreased laterally to the south and decreased with depth at location

14-614640, and the Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration (15.5 mg/kg). The lateral and vertical extent of lead are defined.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in one sample (2730 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (4610 mg/kg) at the site are presented in Table D-1. Concentrations of magnesium remained essentially the same laterally to the south and increased with depth at location 14-614640, but the magnesium Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in one sample (10 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (15.4 mg/kg) at the site are presented in Table D-1. Concentrations of nickel decreased laterally to the south and increased with depth at location 14-614640. The lateral extent of nickel is defined. Figure G-10 is the scatter plot of Qbt 4 site data for nickel that shows a linear trend with a positive slope for nickel and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 nickel concentrations are not different from soil background across TA-14, and Table G-2 indicates the nickel Qbt 4 concentration is within the soil concentration range at this AOC. Compared with the soil BV, the nickel Qbt 4 concentration of 10 mg/kg detected from 3–4 ft bgs at location 14-614640 was below the soil BV. No further sampling to define the vertical extent of nickel at location 14-614640 is warranted.

Nitrate was detected in 10 samples at five locations, with a maximum concentration of 1.2 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected at the site likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in one soil sample (0.0024 mg/kg) from 3–4 ft bgs at location 14-614639. Concentrations of perchlorate increased laterally to the east and increased with depth at location 14-614639, but the concentration detected from 3–4 ft bgs at location 14-614639 was below the EQL. The lateral and vertical extent of perchlorate are defined.

Selenium was detected above the soil BV (1.52 mg/kg) in four samples at locations 14-614637, 14-614638, 14-614639, and 14-614641 and above the Qbt 2, 3, 4 BV (0.3 mg/kg) in one sample (1.8 mg/kg) at location 14-614640. Concentrations detected below the soil BV (1.52 mg/kg) at the site are presented in Table D-1. Concentrations of selenium did not change substantially laterally. Further sampling for the lateral extent of selenium is not warranted. Concentrations of selenium decreased with depth at location 14-614641 and increased with depth at locations 14-614637 through 14-614640. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows the majority of the detected concentrations of selenium are consistent across the site. In addition, Table G-2 indicates the selenium Qbt 4 concentration is within the soil concentration range at this AOC. Compared with the maximum soil background concentration (1.7 mg/kg), the selenium Qbt 4 concentration of 1.8 mg/kg detected from 3–4 ft bgs at location 14-614640 was similar to the maximum soil background concentration. No further sampling to define the vertical extent at location 14-614640 is warranted. The vertical extent of selenium is not defined at locations 14-614637, 14-614638, and 14-614639.

Vanadium was detected above the Qbt 2, 3, 4 BV (17 mg/kg) in one sample (23.2 mg/kg) from 3–4 ft bgs at location 14-614640. Concentrations detected below the soil BV (39.6 mg/kg) at the site are presented in Table D-1. Concentrations of vanadium decreased laterally to the south and increased with depth at location 14-614640. The lateral extent of vanadium is defined. Figure G-12 is the scatter plot of Qbt 4 site data for vanadium that shows a linear trend with a positive slope for vanadium and indicates the concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 vanadium concentrations are not different from soil background across TA-14, and Table G-2 indicates the vanadium Qbt 4 concentration is within the soil concentration range at this AOC. Compared with the soil BV, the vanadium Qbt 4 concentration of 23.2 mg/kg detected from 3–4 ft bgs at location 14-614640 was below the soil BV. No further sampling to define the vertical extent of vanadium at location 14-614640 is warranted.

Organic Chemicals

Organic chemicals were not detected at AOC C-14-008.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-008.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, perchlorate, explosive compounds, PCBs, SVOCs, and VOCs are defined at AOC C-14-008.

The lateral and vertical extent are defined, or no further sampling to define extent is warranted for inorganic chemicals, except the vertical extent of selenium is not defined at locations 14-614637, 14-614638, and 14-614639.

6.8.7.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC C-14-008 because extent is not defined for the site.

6.8.7.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC C-14-008 because extent is not defined for the site.

6.9 Consolidated Unit 14-002(c)-99

Consolidated Unit 14-002(c)-99 consists of a decommissioned firing site [SWMU 14-002(c)] and two x-unit chambers [SWMUs 14-002(d) and 14-002(e)] (Figure 6.9-1).

6.9.1 SWMU 14-002(c), Decommissioned Firing Site

6.9.1.1 Site Description and Operation History

SWMU 14-002(c) is a decommissioned firing site (structure 14-5) located in the southeastern portion of TA-14 (Figure 6.9-1). Structure 14-5 consisted of a control building and firing pad. Constructed in 1944, the wood-framed control building measured 11 ft wide × 18 ft long × 10 ft high and was surrounded on three sides by an earthen berm. A 10-ft-square × 8-ft-high concrete firing pad faced with a 0.5-in. steel plate was attached to the exterior south wall of the control building. The firing site was used to conduct small-scale explosive tests until the mid-1950s. The control building was converted to a storage site in 1961 and used to store cyanogen gas from 1965 to the 1970s. In 1980, a 5-ft-diameter metal sphere was installed on the firing pad at the south side of building 14-5. The sphere was used to conduct slowcombustion experiments, which continued until 1985, when building operations ceased. The firing pad was removed at an unknown date. The control building was partially destroyed by the Cerro Grande fire in 2000; only the concrete portions of the roof and walls remain.

6.9.1.2 Relationship to Other SWMUs and AOCs

SWMUs 14-002(d) and 14-002(e), located approximately 7 ft southwest and southeast of SWMU 14-002(c), are two x-unit chambers that were used to remotely detonate the explosive tests at SWMU 14-002(c) from 1944 to the mid-1950s, when explosive operations ceased.

6.9.1.3 Summary of Previous Investigations

SWMU 14-002(c) was not sampled during the 1995 RFI because no environmental media were present inside the building (LANL 1996, 054086, p. 5-82). The site was field screened for radioactivity, and HE spot tests were performed. No radioactivity was detected above background and HE spot test results were negative. No historical decision-level data exist for SWMU 14-002(c).

6.9.1.4 Site Contamination

Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at SWMU 14-002(c):

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Four samples were collected from two locations (14-614486 and 14-614487) within the building footprint at 0–1 ft and 2–3 ft bgs. Eight samples were collected from four historical locations [sampled for SWMUs 14-002(d,e), section 6.9.2.3] at 1–2 ft and 5–6 ft bgs from locations 14-01089 and 14-01090 (west of building footprint) and 1–2 ft and 6–7 ft bgs from locations 14-01091 and 14-01092 (east of building footprint).
- All samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, VOCs (excluding surface samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.

The 2011 sampling locations at SWMU 14-002(c) are shown in Figure 6.9-1. Table 6.9-1 presents the 2011 samples collected and the analyses requested for SWMU 14-002(c). The geodetic coordinates of the 2011 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 levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

Soil and Rock Sample Analytical Results

Decision-level data at SWMU 14-002(c) consist of the results from 12 samples (8 soil and 4 Qbt 4) collected from six locations in 2011. The extent of contamination is not defined at SWMU 14-002(c). Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 12 samples (8 soil and 4 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.9-2 presents the inorganic chemicals above BVs. Figure 6.9-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Seventeen TAL metals (aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, selenium, thallium, vanadium, and zinc) were detected above BVs. Total cyanide was not detected but had DLs above BV. Nitrate and perchlorate were detected.

Organic Chemicals

All 12 samples (8 soil and 4 Qbt 4) were analyzed for explosive compounds and SVOCs, 6 samples (5 soil and 1 Qbt 4) were analyzed for PCBs, and 10 samples (6 soil and 4 Qbt 4) were analyzed for VOCs. Table 6.9-3 presents the detected organic chemicals. Figure 6.9-3 shows the spatial distribution of detected organic chemicals.

Two explosive compounds (HMX and RDX); two SVOCs (diethylphthalate and di-n-butylphthalate); and nine VOCs (acetone, chloroform, 1,4-dichlorobenzene, 1,1-dichloroethene, ethylbenzene, methylene chloride, toluene, trichlorofluoromethane, and total xylene) were detected. PCBs were not detected.

Radionuclides

All 12 samples (8 soil and 4 Qbt 4) were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90.

Radionuclides were not detected or detected above BVs/FVs at the site.

Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) in three samples at locations 14-01089 through 14-01091. Concentrations detected below the soil BV (29,200 mg/kg) at the site are presented in Table D-1. Concentrations of aluminum decreased laterally to the east and remained essentially the same to the west, decreased with depth at locations 14-01089 and 14-01090, and increased slightly with depth at location 14-01091. Figure G-13 is the scatter plot of Qbt 4 site data for aluminum that shows a linear trend with a positive slope for aluminum and indicates concentrations across TA-14 were below the soil

BV. In addition, Table G-1 indicates Qbt 4 aluminum concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of aluminum are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the aluminum Qbt 4 concentrations detected at locations 14-01089 through 14-01091 were below the soil BV. No further sampling to define the lateral and vertical extent of aluminum is warranted.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in three samples at locations 14-01089 through 14-01091. Concentrations detected below the soil BV (8.17 mg/kg) at the site are presented in Table D-1. Concentrations of arsenic decreased laterally to the east and remained essentially the same to the west, decreased with depth at locations 14-01089 and 14-01090, and increased with depth at location 14-01091. All arsenic Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (5 mg/kg). The lateral and vertical extent of arsenic are defined.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in four samples at locations 14-01089 through 14-01092. Concentrations detected below the soil BV (295 mg/kg) at the site are presented in Table D-1. Concentrations of barium decreased laterally to the east, increased slightly to the west, and decreased with depth at locations 14-01089 through 14-01092. The vertical extent of barium is defined. Figure G-3 is the scatter plot of Qbt 4 site data for barium that shows a linear trend with a positive slope for barium and indicates concentrations across TA-14 were below or equal to the soil BV. In addition, Table G-1 indicates Qbt 4 barium concentrations are not different from soil background across TA-14, and Table G-2 indicates the Qbt 4concentration range of barium is below the soil concentration range at this SWMU. Compared with the soil BV, the barium Qbt 4 concentrations detected at locations 14-01089 through 14-01092 were below the soil BV. No further sampling to define the lateral extent of barium is warranted.

Cadmium was detected above the soil BV (0.4 mg/kg) in one sample (0.43 mg/kg) from 1–2 ft bgs at location 14-01089. Cadmium was detected at a concentration of 0.099 mg/kg below the Qbt 2, 3, 4 BV (1.63 mg/kg) from 5–6 ft bgs at this location (Table D-1). Concentrations of cadmium decreased laterally to the west and decreased with depth at location 14-01089, and the cadmium soil concentration was below the maximum soil background concentration (2.6 mg/kg). The lateral and vertical extent of cadmium are defined.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in one sample (2480 mg/kg) from 5–6 ft bgs at location 14-01090. Calcium was detected at a concentration of 2030 mg/kg (below the soil BV of 6120 mg/kg) from 0–1 ft bgs at location 14-01090 (Table D-1). Concentrations of calcium increased laterally to the west and increased with depth at location 14-01090. Figure G-4 is the scatter plot of Qbt 4 site data for calcium that shows a linear trend with a positive slope for calcium and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 calcium concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of calcium are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV (6120 mg/kg), the calcium Qbt 4 concentration of 2480 mg/kg detected from 5–6 ft bgs at location 14-01090 was below the soil BV. No further sampling to define the lateral and vertical extent of calcium at location 14-01090 is warranted.

Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in two samples at locations 14-01090 and 14-01091. Concentrations of chromium decreased laterally to the east and increased laterally to the west at location 14-01090. Chromium was detected at concentrations of 11.4 mg/kg and 7.6 mg/kg (below the soil BV of 19.3 mg/kg) from 1–2 ft bgs at locations 14-01090 and 14-01091, respectively (Table D-1). Concentrations of chromium decreased with depth at location 14-01090 and remained essentially the same with depth at location 14-01091. The chromium Qbt 4 concentrations detected at locations 14-01090 and 14-01091 were below the maximum Qbt 2, 3, 4 background concentration (13 mg/kg). The lateral and vertical extent of chromium are defined.

Cobalt was detected above the Qbt 2, 3, 4 BV (3.14 mg/kg) in two samples at locations 14-01090 and 14-01091. Concentrations of cobalt decreased laterally to the east and increased laterally to the west at location 14-01090. Cobalt was detected at concentrations of 7 mg/kg and 4.4 mg/kg (below the soil BV of 8.64 mg/kg) from 1–2 ft bgs at locations 14-01090 and 14-01091, respectively (Table D-1). Concentrations of cobalt decreased with depth at location 14-01091 and increased slightly with depth at location 14-01090. Figure G-6 is the scatter plot of Qbt 4 site data for cobalt that shows a linear trend with a positive slope for cobalt and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 cobalt concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of cobalt are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the cobalt Qbt 4 concentrations detected at locations 14-01090 and 14-01091 were below the soil BV. No further sampling to define the lateral and vertical extent of cobalt at location 14-01090 is warranted.

Copper was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in two samples at locations 14-01090 and 14-01091. Concentrations of copper decreased laterally to the east, and the concentration of 6.6 mg/kg detected at location 14-01090 to the west of the site is similar to the maximum Qbt 2, 3, 4 background concentration (6.2 mg/kg). The lateral extent of copper is defined. Copper was detected at concentrations of 7.6 mg/kg and 7.3 mg/kg (below the soil BV of 14.7 mg/kg) from 1–2 ft bgs at locations 14-01090 and 14-01091, respectively (Table D-1). Concentrations of copper decreased with depth at both locations. The vertical extent of copper is defined.

Total cyanide was not detected but had DLs above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg). Because total cyanide was not detected above BV and all results reported between the BV and the individual sample’s respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Iron was detected above the Qbt 2, 3, 4 BV (14,500 mg/kg) in one sample (15,900 mg/kg) from 5–6 ft bgs at location 14-01090. Concentrations of iron increased laterally to the west at location 14-01090, but the concentration of 15,900 mg/kg was below the maximum Qbt 2, 3, 4 background concentration (19,500 mg/kg). The lateral extent of iron is defined. Iron was detected at a concentration of 16,700 mg/kg (below the soil BV of 21,500 mg/kg) from 1–2 ft bgs at location 14-01090 (Table D-1). Concentrations of iron decreased with depth at this location. The vertical extent of iron is defined.

Lead was detected above the Qbt 2, 3, 4 BV (11.2 mg/kg) in seven samples at locations 14-01089 through 14-01092, and 14-614487. Concentrations of lead decreased laterally to the east and increased laterally to the west. The lateral extent of lead is not defined to the west. Lead was detected at a concentration of 14.7 mg/kg (below the soil BV of 22.3 mg/kg) from 0–1 ft bgs at location 14-01092 (Table D-1). Concentrations of lead decreased with depth at locations 14-01089 and 14-01091 and increased with depth at locations 14-01090, 14-01092, and 14-614487. Figure G-8 is the scatter plot of Qbt 4 site data for lead that shows a linear trend with a positive slope for lead and indicates most concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 lead concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of lead (excluding the concentrations indicating possible contamination) are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the lead Qbt 4 concentration of 18 mg/kg detected from 6–7 ft bgs at location 14-01092 was below the soil BV. No further sampling to define the vertical extent of lead at location 14-01092 is warranted. The vertical extent of lead is not defined at locations 14-01090 and 14-614487 where concentrations exceed the maximum background concentration for soil.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in two samples at locations 14-01090 and 14-01091. Concentrations of magnesium decreased laterally to the east and increased laterally to the west at location 14-01090. Magnesium was detected at concentrations of 2430 mg/kg and 1710 mg/kg (below the soil BV of 4610 mg/kg) from 1–2 ft bgs at locations 14-01090 and 14-01091, respectively (Table D-1). Concentrations of magnesium increased with depth at both locations, but the concentrations detected in Qbt 4 were below the maximum Qbt 2, 3, 4 background concentration (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Manganese was detected above the Qbt 2, 3, 4 BV (482 mg/kg) in one sample (744 mg/kg) from 5–6 ft bgs at location 14-01090. Manganese was detected at a concentration of 401 mg/kg (below the soil BV of 671 mg/kg) from 1–2 ft bgs at this location (Table D-1). Concentrations of manganese increased laterally to the west and increased with depth at this location, but the manganese Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration (752 mg/kg). The lateral and vertical extent of manganese are defined.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in one sample (10.4 mg/kg) from 5–6 ft bgs at location 14-01090. Nickel was detected at a concentration of 9.9 mg/kg (below the soil BV of 15.4 mg/kg) from 1–2 ft bgs at this location (Table D-1). Concentrations of nickel increased laterally to the west and remained essentially the same with depth at this location. Figure G-10 is the scatter plot of Qbt 4 site data for nickel that shows a linear trend with a positive slope for nickel and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 nickel concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of nickel are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the nickel Qbt 4 concentration of 10.4 mg/kg detected from 5–6 ft bgs at location 14-01090 was below the soil BV. No further sampling to define the lateral and vertical extent of nickel at location 14-01090 is warranted.

Nitrate was detected in 12 samples at six locations, with a maximum concentration of 71.8 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected within the building footprint (locations 14-614486 and 14-614487), to the west (locations 14-01089 and 14-01090), and to the east (location 14-01092) likely reflect naturally occurring levels. Concentrations of nitrate increased with depth at location 14-01091. The lateral extent of nitrate is defined, but vertical extent of nitrate is not defined at location 14-01091.

Perchlorate was detected in three Qbt 4 and three soil samples at five locations. Concentrations of perchlorate detected at locations 14-01089, 14-01090, 14-01091, and 14-614486 were equivalent to or below the EQLs. Concentrations of perchlorate increased with depth at location 14-614487. The lateral extent of perchlorate is defined, but the vertical extent of perchlorate is not defined at location 14-614487.

Selenium was detected above the soil BV (1.52 mg/kg) in one sample (1.7 mg/kg) and above the Qbt 2, 3, 4 BV (0.3 mg/kg) in four samples at locations 14-01089 through 14-01092. Concentrations of selenium decreased laterally to the east, increased laterally to the west, and increased with depth at all four locations. The lateral extent of selenium is not defined to the west. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows the majority of the detected concentrations of selenium are consistent across the site. Compared with the maximum soil background concentration (1.7 mg/kg), the selenium Qbt 4 concentration of 1.8 mg/kg detected from 6–7 ft bgs at location 14-01092 was similar to the maximum soil background concentration. No further sampling to define the vertical extent of selenium at location 14-01092 is warranted. The vertical extent of selenium is not defined at locations 14-01089 through14-01091.

Thallium was detected above the Qbt 2, 3, 4 BV (1.1 mg/kg) in one sample (1.3 mg/kg) from 5–6 ft bgs at location 14-01090. Concentrations of thallium increased laterally to the west and increased with depth at this location, but the concentration detected in Qbt 4 was below the maximum Qbt 2, 3, 4 background concentration (1.7 mg/kg). The lateral and vertical extent of thallium are defined.

Vanadium was detected above the Qbt 2, 3, 4 BV (17 mg/kg) in one sample (18 mg/kg) from 6–7 ft bgs at location 14-01091. Vanadium was detected at a concentration of 22.8 mg/kg (below the soil BV of 39.6 mg/kg) from 0–1 ft bgs at this location (Table D-1). Concentrations of vanadium decreased laterally to the east and decreased with depth at this location, and the vanadium Qbt 4 concentration was below the maximum Qbt 4 background concentration (21 mg/kg). The lateral and vertical extent of vanadium are defined.

Zinc was detected above the soil BV (48.8 mg/kg) in three samples and above the Qbt 2, 3, 4 BV (63.5 mg/kg) in three samples at locations 14-01089, 14-01090, 14-01092, 14-614486, and 14-614487. Concentrations of zinc decreased laterally to the west, increased laterally to the east, decreased with depth at location 14-01089, and increased with depth at locations 14-01090, 14-01092, 14-614486, and 14-614487. The concentration of 69.8 mg/kg detected from 2–3 ft bgs at location 14-614487 is below the maximum soil background concentration (75.5 mg/kg). The vertical extent is defined at location 14-614487. The lateral extent of zinc is not defined to the east of location 14-01092, and the vertical extent of zinc is not defined at locations 14-01090, 14-01092, and 14-614486.

Organic Chemicals

Acetone was detected in one sample (0.082 mg/kg) from 2–3 ft bgs at location 14-614487. Acetone was not detected from 2–3 ft bgs at location 14-614486, approximately 5 ft from location 14-614487, and was not detected at locations outside the building footprint. The lateral and vertical extent of acetone are defined.

Chloroform; 1,1-dichloroethene; ethylbenzene; toluene; trichlorofluoromethane; and total xylene were each detected in one sample from 2–3 ft bgs at location 14-614487at concentrations below EQLs, Chloroform; 1,1-dichloroethene; ethylbenzene; toluene; trichlorofluoromethane; and total xylene were not detected at locations outside the building footprint. The lateral and vertical extent these organic chemicals are defined.

Dichlorobenzene[1,4-] was detected in one sample (0.0072 mg/kg) from 2–3 ft bgs at location 14-614487. Dichlorobenzene[1,4-] was not detected from 2–3 ft bgs at location 14-614486, approximately 5 ft from location 14-614487, and the concentration of 0.0072 mg/kg was not substantially above the EQL (0.0053 mg/kg). Dichlorobenzene[1,4-] was not detected at locations outside the building footprint. The lateral and vertical extent of 1,4-dichlorobenzene are defined.

Diethylphthalate was detected in one sample (0.092 mg/kg) below the EQL from 6–7 ft bgs at location 14-01091. Diethylphthalate was not detected at location 14-01092, farther east of the building footprint and was not detected at locations west of the building footprint. The lateral and vertical extent of diethylphthalate are defined.

Di-n-butylphthalate was detected in two samples at locations 14-01089 and 14-01091 at concentrations below EQLs. Di-n-butylphthalate was not detected in the deeper samples at both locations and was not detected at locations 14-01090 and 14-01092, farther west and east of the building footprint, respectively. The lateral and vertical extent of di-n-butylphthalate are defined.

HMX was detected in one sample (0.097 mg/kg) below the EQL from 1–2 ft bgs at location 14-01091. HMX was not detected in the deeper sample at this location. HMX was not detected at location 14-01092, farther east of the building footprint, and was not detected at locations west of the building footprint. The lateral and vertical extent of HMX are defined.

Methylene chloride was detected in three samples at locations 14-01092 and 14-614487. Methylene chloride was either not detected or the detections were below EQLs at locations outside the building footprint. The lateral extent of methylene chloride is defined. Concentrations of methylene chloride remained essentially the same with depth at location 14-01092 and were below EQLs. Methylene chloride was detected at a concentration of 0.019 mg/kg from 2–3 ft bgs at location 14-614487 and was not detected from 2–3 ft bgs at location 14-614486, approximately 5 ft from location 14-614487. The vertical extent of methylene chloride is defined.

RDX was detected in one sample (1.2 mg/kg) from 1–2 ft bgs at location 14-01091. RDX was not detected in the sample from 6–7 ft bgs at this location, was not detected at location 14-01092, farther east of the building footprint, and was not detected at locations west of the building footprint. The lateral and vertical extent of RDX are defined.

Radionuclides

Radionuclides were not detected or detected above BVs/FVs at SWMU 14-002(c). The lateral and vertical extent of radionuclides are defined at the site.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, explosive compounds, PCBs, SVOCs, VOCs, gamma-emitting radionuclides, isotopic uranium, and strontium-90 are defined at SWMU 14-002(c).

The lateral and vertical extent are defined or no further sampling to define extent is warranted for inorganic chemicals, except for

- the lateral extent of lead to the west at location 14-01090 and the vertical extent of lead at locations 14-01090 and 14-614487;
- the lateral extent of selenium to the west at location 14-01090 and the vertical extent of selenium at locations 14-01089, 14-01090, and 14-01091; and
- the lateral extent of zinc at location 14-01092 and the vertical extent of zinc at locations 14-01090, 14-01092, and 14-614486.

The lateral extent of nitrate is defined, but vertical extent of nitrate is not defined at location 14-01091.

The lateral extent of perchlorate is defined, but the vertical extent of perchlorate is not defined at location 14-614487.

6.9.1.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 14-002(c) because extent is not defined for the site.

6.9.1.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 14-002(c) because extent is not defined for the site.

6.9.2 SWMU 14-002(d), X-unit Chamber

6.9.2.1 Site Description and Operation History

SWMU 14-002(d) is an x-unit chamber (structure 14-14) located at TA-14 approximately 7 ft southwest of structure 14-5 (Figure 6.9-1). SWMU 14-002(d) is deferred for investigation per Table IV-2 of the Consent Order. Constructed in 1944, the x-unit chamber was one of two voltage distribution systems installed at the SWMU 14-002(c) firing site. The x-unit chamber was constructed of reinforced concrete and measured approximately 3 ft wide × 4 ft long × 3 ft high. The x-unit housed the firing voltage distribution system used for the remote detonation of small-scale explosives tests at structure 14-5. The x-unit was used from 1944 to the mid-1950s when explosives operations ceased. It is not known whether the chamber is still in place.

The 1994 RFI work plan for Operable Unit 1085 incorrectly identified SWMU 14-002(d) as a firing pad. Engineering drawings confirm it is an x-unit chamber (LASL 1949, 207439).

6.9.2.2 Relationship to Other SWMUs and AOCs

SWMU 14-002(d), located approximately 7 ft southwest of SWMU 14-002(c), is one of the two x-unit chambers that were used to remotely detonate the explosive tests at the SWMU 14-002(c) firing site from 1944 to the mid-1950s when explosive operations ceased.

6.9.2.3 Summary of Previous Investigations

During the 1995 RFI conducted at SWMUs 14-002(d and e), samples were field screened for lead, uranium, and gross radioactivity, and HE spot tests were performed. Based on field-screening results, four surface (0–0.5 ft bgs) samples were collected from location around the sides of control building 14-5, and four surface (0–0.5 ft bgs) samples were collected on the drainage immediately south of building 14-5 (LANL 1996, 054086, pp. 5-88–5-93). All eight samples were submitted for off-site analysis of TAL metals, gamma-emitting radionuclides, and HE. Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed lead, thallium, and uranium detected above BVs, uranium-235 and uranium-238 detected above BVs, and no detected HE.

6.9.2.4 Rationale for Deferred Investigation

Investigation of SWMU 14-002(d) is deferred per Table IV-2 of the Consent Order. The NMED-approved investigation work plan proposed no investigation activities for this site (LANL 2006, 091698; NMED 2007, 095478).

6.9.3 SWMU 14-002(e), X-unit Chamber

6.9.3.1 Site Description and Operation History

SWMU 14-002(e) is an x-unit chamber (structure 14-15) located at TA-14 approximately 7 ft southeast of structure 14-5 (Figure 6.9-1). SWMU 14-002(e) is deferred for investigation per Table IV-2 of the Consent Order. Constructed in 1944, the x-unit chamber was one of two voltage distribution systems installed at the SWMU 14-002(c) firing site. The x-unit chamber was constructed of reinforced concrete and measured approximately 3 ft wide × 4 ft long × 3 ft high. The x-unit housed the firing voltage distribution system used for the remote detonation of small-scale explosives tests at structure 14-5. The x-unit was used from 1944 to the mid-1950s when explosives operations ceased. It is not known whether the chamber is still in place.

The 1994 RFI work plan for Operable Unit 1085 incorrectly identified SWMU 14-002(e) as a firing pad. Engineering drawings confirm that it is an x-unit chamber (LASL 1949, 207439).

6.9.3.2 Relationship to Other SWMUs and AOCs

SWMU 14-002(e), located approximately 7 ft southeast of SWMU 14-002(c), is one of the two x-unit chambers that were used to remotely detonate the explosive tests at the SWMU 14-002(c) firing site from 1944 to the mid-1950s when explosive operations ceased.

6.9.3.3 Summary of Previous Investigations

Previous investigations are summarized in section 6.9.2.3. No historical decision-level data exist for SWMU 14-002(e).

6.9.3.4 Rationale for Deferred Investigation

Investigation of SWMU 14-002(e) is deferred per Table IV-2 of the Consent Order. The NMED-approved investigation work plan proposed no investigation activities for this site (LANL 2006, 091698; NMED 2007, 095478).

6.10 SWMU 14-003, Former Burning Area

6.10.1 Site Description and Operation History

SWMU 14-003 is a former burning area located approximately 300 ft northeast of structure 14-5 in the southeastern portion of TA-14 (Figure 6.10-1). The burning area measured approximately 30 ft wide × 40 ft long and was surrounded on three sides by a U-shaped, 3-ft-high soil berm. The area was used for burning combustible HE-contaminated debris and for flash-burning noncombustible HE-contaminated debris from test shots. Burning operations began in 1951 and ceased in the 1960s. In 1997, soil was excavated and removed, and the site, including the berms, was regraded during a VCA performed at the site.

6.10.2 Relationship to Other SWMUs and AOCs

SWMU 14-003 is the location of a former burning area that operated from 1951 to the 1960s. It is located east of the other SWMUs and AOCs at TA-14 and is not associated with the other sites.

6.10.3 Summary of Previous Investigations

During the 1995 RFI conducted at SWMU 14-003, samples were field screened for radioactivity and HE spot tests were performed. Based on field-screening results, two surface (0–0.5 ft bgs) samples were collected and submitted for off-site analysis of TAL metals (LANL 1996, 054086, p. 5-93). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed 12 metals detected above BVs, detected HE, and uranium-235 and uranium-238 detected above BVs.

Based on the results of the RFI, a VCA was conducted at SWMU 14-003 in 1997 to determine the extent of contamination, remove contaminated soil, and collect confirmation samples to verify that clean up goals were met (LANL 2001, 071096). Extensive field screening for metals, HE, and radioactivity was conducted using a 34- × 28-ft grid with 2-ft-square intervals. Based on the screening results, excavation was conducted in two areas to remove lead- and HE-contaminated soil, respectively. After soil removal, 12 confirmation samples were collected from 12 locations and were submitted for off-site analyses of TAL metals, uranium, and HE. Barium and silver were detected above BVs. Amino-4,6-dinitrotoluene[2-] (2-ADNT) and TNT were detected. Two feet of soil was removed from the berm and used to fill in the areas excavated within the burn area. The site was regraded and a mixture of native grass seed was applied. A best management practice in the form of straw bales was put in place to prevent runoff from the site (LANL 2001, 071096, p. 7-8). Decision-level data from the 1997 VCA are included in this investigation report. All decision-level analytical data collected during previous investigations are presented and evaluated in section 6.10.4.3.

Although the VCA report was completed in September 1997, it was not submitted to NMED because of a reprioritization of sites during a reorganization of the former Environmental Restoration Project.

6.10.4 Site Contamination

6.10.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at SWMU 14-003:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Fourteen samples were collected from seven locations within the former burning area (locations 14-614501 through 14-614506 and 14-614511) from the surface (0–1 ft bgs) and from the first 1 ft of native material beneath the burning area (second depths ranging from 3.5–6 ft bgs). Twelve samples were collected from six locations surrounding and east of the burning area (locations 14-614507 through 14-614510, 14-614512, and 14-614513) at 0–1 ft and 3–4 ft bgs.
- All samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, dioxins and furans, explosive compounds, PCBs (20% of samples), SVOCs, VOCs (excluding surface samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.

Historical and 2011 sampling locations at SWMU 14-003 are shown in Figure 6.10-1. Table 6.10-1 presents the historical and 2011 samples collected and the analyses requested for SWMU 14-003. The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.10.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.10.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 14-003 consist of the results from 38 samples (26 soil, 11 Qbt 4, and 1 sediment) collected from 25 locations in 1997 and 2011. The extent of contamination is defined at SWMU 14-003. Therefore, COPCs for the site are identified below.

Inorganic Chemicals

All 38 samples (26 soil, 11 Qbt 4, and 1 sediment) were analyzed for TAL metals. In addition, 12 samples (11 soil and 1 sediment) were analyzed for total uranium, and 26 samples (15 soil and 11 Qbt 4) were analyzed for total cyanide, nitrate, and perchlorate. Table 6.10-2 presents the inorganic chemicals above BVs. Plate 3 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Twenty-three metals (aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, thallium, uranium, vanadium, and zinc) were detected above BVs or not detected but had DLs above BV. Total cyanide was not detected but had DLs above BV. Nitrate and perchlorate were detected.

Aluminum was detected above the soil BV (29,200 mg/kg) in three samples, with a maximum concentration of 42,000 mg/kg, and above the Qbt 2, 3, 4 BV (7340 mg/kg) in 11 samples, with a maximum concentration of 17,000 mg/kg. The Gehan tests indicated site concentrations are different from background in both soil and tuff (Figures F-2.0-1 and F-2.0-2, Table F-2). Aluminum is identified as a COPC in soil and tuff.

Antimony was not detected above BV but had DLs (4.46 mg/kg to 13 mg/kg) above the soil BV (0.5 mg/kg) and the maximum soil background concentration (1 mg/kg) in 11 samples. Antimony is identified as a COPC in soil. Antimony was not detected but had a DL (12 mg/kg) above the sediment BV (0.83 mg/kg). Antimony is identified as a COPC in sediment.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in five samples, with a maximum concentration of 3.5 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-3, Table F-2). Arsenic is identified as a COPC in tuff.

Barium was detected above the soil BV (295 mg/kg) in eight samples, with a maximum concentration of 1800 mg/kg, and above the Qbt 2, 3, 4 BV (46 mg/kg) in 11 samples, with a maximum concentration of 265 mg/kg. The Gehan tests indicated site concentrations are different from background in both soil and tuff (Figures F-2.0-4 and F-2.0-5, Table F-2). Barium is identified as a COPC in soil and tuff. Barium was detected above the sediment BV (127 mg/kg) in one sample (170 mg/kg). Barium is identified as a COPC in sediment.

Beryllium was detected above the soil BV (1.83 mg/kg) in one sample (2.1 mg/kg). The Gehan test indicated site concentrations are not different from background, but the quantile test indicated site concentrations are different from background (Figure F-2.0-6, Table F-2). Beryllium is identified as a COPC in soil.

Cadmium was not detected above BV but had DLs (0.446 mg/kg to 0.64 mg/kg) above soil BV (0.4 mg/kg) in 11 samples. All 11 DLs were below the maximum soil background concentration (2.6 mg/kg). Cadmium is not identified as a COPC in soil. Cadmium was not detected but had a DL (0.58 mg/kg) above the sediment BV (0.4 mg/kg) in one sample. Cadmium is identified as a COPC in sediment.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in seven samples, with a maximum concentration of 5030 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-7, Table F-2). Calcium is identified as a COPC in tuff.

Chromium was detected above the soil BV (19.3 mg/kg) in one sample (21 mg/kg). The Gehan and quantile tests indicated site concentrations are not different from background (Figure F-2.0-8, Table F-2). Chromium is not identified as a COPC in soil. Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in 11 samples, with a maximum concentration of 10.9 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-9, Table F-2). Chromium is identified as a COPC in tuff.

Cobalt was detected above the soil BV (8.64 mg/kg) in one sample (9.4 mg/kg). The Gehan test indicated site concentrations are different from background (Figure F-2.0-10, Table F-2). Cobalt is identified as a COPC in soil. Cobalt was detected above the Qbt 2, 3, 4 BV (3.14 mg/kg) in 11 samples, with a maximum concentration of 7.8 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-11, Table F-2). Cobalt is identified as a COPC in tuff. Cobalt was detected above the sediment BV (4.73 mg/kg) in one sample (6.7 mg/kg). Cobalt is identified as a COPC in sediment.

Copper was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in 11 samples, with a maximum concentration of 7.9 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-12, Table F-2). Copper is identified as a COPC in tuff.

Total cyanide was not detected but had DLs (0.53 mg/kg to 0.57 mg/kg) above the soil BV (0.5 mg/kg) in 15 samples. Cyanide is identified as a COPC in soil. Total cyanide was not detected but had DLs (0.52 mg/kg to 0.56 mg/kg) above the Qbt 2, 3, 4 BV (0.5 mg/kg) in 11 samples. Cyanide is identified as a COPC in tuff.

Iron was detected above the soil BV (21,500 mg/kg) in one sample (22,000 mg/kg). The Gehan and quantile tests indicated site concentrations are not different from background (Figure F-2.0-13, Table F-2). Iron is not identified as a COPC in soil. Iron was detected above the Qbt 2, 3, 4 BV (14,500 mg/kg) in one sample (15,200 mg/kg). The Gehan test indicated site concentrations are different from background (Figure F-2.0-14, Table F-2). Iron is identified as a COPC in tuff.

Lead was detected above the Qbt 2, 3, 4 BV (11.2 mg/kg) in seven samples, with a maximum concentration of 13.8 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-15, Table F-2). Lead is identified as a COPC in tuff.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in 10 samples, with a maximum concentration of 2360 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-16, Table F-2). Magnesium is identified as a COPC in tuff.

Manganese was detected above the Qbt 2, 3, 4 BV (482 mg/kg) in one sample (486 mg/kg). The Gehan test indicated site concentrations are different from background (Figure F-2.0-17, Table F-2). Manganese is identified as a COPC in tuff.

Mercury was not detected but had DLs (0.12 mg/kg to 0.13 mg/kg) above the soil BV (0.1 mg/kg) in five samples. Mercury is identified as a COPC in soil. Mercury was not detected but had a DL (0.12 mg/kg) above the sediment BV (0.1 mg/kg). Mercury is identified as a COPC in sediment.

Nickel was detected above the soil BV (15.4 mg/kg) in one sample (17 mg/kg). The Gehan test indicated site concentrations are different from background (Figure F-2.0-18, Table F-2). Nickel is identified as a COPC in soil. Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in nine samples, with a maximum concentration of 8.5 mg/kg. The quantile test indicated site concentrations are different from background (Figure F-2.0-19, Table F-2). Nickel is identified as a COPC in tuff.

Nitrate was detected in 15 soil and 9 Qbt 4 samples, with a maximum concentration of 17.5 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected likely reflect naturally occurring levels. Nitrate is not identified as a COPC.

Perchlorate was detected in one soil sample (0.0022 mg/kg) and in three Qbt 4 samples, with a maximum concentration of 0.029 mg/kg. No background data are available for perchlorate. Perchlorate is identified as a COPC in soil and tuff.

Potassium was detected above the soil BV (3460 mg/kg) in one sample (3500 mg/kg). The Gehan and quantile tests indicated site concentrations are not different from background (Figure F-2.0-20, Table F-2). Potassium is not identified as a COPC in soil.

Selenium was not detected but had DLs (1.7 mg/kg and 2.1 mg/kg) above the soil BV (1.52 mg/kg) in two samples. One DL was above the maximum soil background concentration (1.7 mg/kg). Selenium is identified as a COPC in soil. Selenium was detected above the Qbt 2, 3, 4 BV (0.3 mg/kg) in four samples, with a maximum concentration of 1.1 mg/kg, and was not detected but had DLs (1 mg/kg to 1.6 mg/kg) above BV in seven samples. Selenium is identified as a COPC in tuff. Selenium was not detected but had a DL (1.2 mg/kg) above the sediment BV (0.3 mg/kg) in one sample. Selenium is identified as a COPC in sediment.

Silver was detected above the soil BV (1 mg/kg) in two samples, with a maximum concentration of 1.97 mg/kg, and was not detected but had DLs (2.4 mg/kg to 2.6 mg/kg) above the soil BV in five samples. Silver is identified as a COPC in soil. Silver was not detected but had a DL (2.3 mg/kg) above the sediment BV (1 mg/kg) in one sample. Silver is identified as a COPC in sediment.

Thallium was detected above the soil BV (0.73 mg/kg) in four samples, with a maximum concentration of 1.2 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-21, Table F-2). Thallium is identified as a COPC in soil.

Uranium was detected above the soil BV (1.82 mg/kg) in seven samples, with a maximum concentration of 4.61 mg/kg, and was not detected but had DLs (2.98 mg/kg to 3.72 mg/kg) above the soil BV in four samples. The Gehan test indicated site concentrations are different from background (Figure F-2.0-22, Table F-2). Uranium is identified as a COPC in soil. Uranium was detected above the sediment BV (2.22 mg/kg) in one sample (3.33 mg/kg). Uranium is identified as a COPC in sediment.

Vanadium was detected above the Qbt 2, 3, 4 BV (17 mg/kg) in 10 samples, with a maximum concentration of 22.7 mg/kg. The Gehan test indicated site concentrations are different from background (Figure F-2.0-23, Table F-2). Vanadium is identified as a COPC in tuff. Vanadium was detected above the sediment BV (19.7 mg/kg) at a concentration (21 mg/kg) that was equivalent to the maximum sediment background concentration (20 mg/kg) in one sample. Vanadium is not identified as a COPC in sediment.

Zinc was detected above the soil BV (48.8 mg/kg) in three samples, with a maximum concentration of 71 mg/kg. The Gehan test and box plot indicated site concentrations are statistically lower than background (Figure F-2.0-24, Table F-2). Zinc is not identified as a COPC in soil.

In summary, the inorganic COPCs identified at SWMU 14-003 are aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, mercury, nickel, perchlorate, selenium, silver, thallium, uranium, and vanadium.

Organic Chemicals

All 38 samples (26 soil, 11 Qbt 4, and 1 sediment) were analyzed for explosive compounds, 26 samples (15 soil and 11 Qbt 4) were analyzed for dioxins and furans and SVOCs, 6 samples (3 soil and 3 Qbt 4) were analyzed for PCBs, and 13 samples (2 soil and 11 Qbt 4) were analyzed for VOCs. Table 6.10-3 presents the detected organic chemicals. Plate 4 shows the spatial distribution of detected organic chemicals.

PCBs were not detected.

Five explosive compounds (2-ADNT, HMX, PETN, TATB, and TNT); seven dioxins and furans (1,2,3,4,6,7,8-heptachlorodibenzodioxin; 1,2,3,4,6,7,8-heptachlorodibenzofuran; 1,2,3,4,7,8-hexachlorodibenzofuran; 1,2,3,4,6,7,8,9-octachlorodibenzodioxin; 1,2,3,4,6,7,8,9-octachlorodibenzofuran; 2,3,4,7,8-pentachlorodibenzofuran; 2,3,7,8-tetrachlorodibenzofuran); one SVOC (bis[2-ethylhexyl]phthalate); and one VOC (methylene chloride) were detected. These organic chemicals are retained as COPCs at SWMU 14-003.

Radionuclides

Twenty-six samples (15 soil and 11 Qbt 4) were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.10-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.10-2 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Cesium-134 was detected in one Qbt 4 sample (0.052 pCi/g). Cesium-134 is identified as a radionuclide COPC at SWMU 14-003.

Cesium-137 was detected in one Qbt 4 sample (0.141 pCi/g). Cesium-137 is identified as a radionuclide COPC at SWMU 14-003.

6.10.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic COPCs

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the soil BV (29,200 mg/kg) in three samples at locations 14-614910, 14-614911, and 14-614912 and above the Qbt 2, 3, 4 BV (7340 mg/kg) in 11 samples at 11 locations. Concentrations of aluminum decreased laterally and decreased downgradient of the burn area. The lateral extent of aluminum is defined. Only surface samples were collected in 1997. The vertical extent at the 1997 locations was evaluated by the adjacent 2011 locations: location 14-614910 was evaluated by location 14-614511, and locations 14-14-614911 and 14-614912 were evaluated by location 14-614504. Concentrations detected below the soil BV at the other 11 locations are presented in Table D-1. Concentrations of aluminum decreased with depth at locations 14-614501, 14-614502, 14-614503, 14-614506, and 14-614510 and increased with depth at locations 14-614504, 14-614505, 14-614507, 14-614511, 14-614512, and 14-614513. Figure G-13 is the scatter plot of Qbt 4 site data for aluminum that shows a linear trend with a positive slope for aluminum and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 aluminum concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of aluminum are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the aluminum Qbt 4 concentrations detected at the 11 locations were below the soil BV. No further sampling to define the vertical extent for aluminum at locations 14-614504, 14-614505, 14-614507, 14-614511, 14-614512, and 14-614513 is warranted.

Antimony was not detected above the soil or sediment BV (both 0.83 mg/kg) but had DLs above BV. Because antimony was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of antimony are defined.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in five samples at locations 14-614502, 14-614503, 14-614507, 14-614511, and 14-614513. Concentrations of arsenic decreased laterally, except to the north at location 14-614507, but the arsenic Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration (5 mg/kg) at this location. Arsenic was detected above the Qbt 2, 3, 4 BV at the most downgradient location 14-614543, but the concentration was below the maximum Qbt 2, 3, 4 background concentration. The lateral extent of arsenic is defined. Concentrations detected below the soil BV (8.17 mg/kg) at the five locations are presented in Table D-1. Concentrations of arsenic remained essentially the same with depth at locations 14-614502, 14-614503, 14-614507, and 14-614511 and increased with depth at location 14-614513, but all arsenic Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (5 mg/kg). The vertical extent of arsenic is defined.

Barium was detected above the soil BV (295 mg/kg) in eight samples and above the Qbt 2, 3, 4 BV (46 mg/kg) in 11 samples at 17 locations, and it was detected above the sediment BV (127 mg/kg) in one sample (170 mg/kg) at location 14-01035. Concentrations of barium decreased laterally and decreased downgradient of the burn area. The lateral extent of barium is defined. Only surface samples were collected in 1997. The vertical extent at the 1997 locations was evaluated by the adjacent 2011 locations: location 14-01035 was evaluated by location 14-614513, locations 14-614909 and 14-614910 were evaluated by location 14-614511, locations 14-14-614911, 14-614912, and 14-614916 were evaluated by location 14-614504, and location 14-614914 was evaluated by location 14-614512. Concentrations detected below the soil BV at locations 14-614501, 14-614503, 14-614505, 14-614506, 14-614507, and 14-614510 are presented in Table D-1. Concentrations of barium decreased with depth at locations 14-614501, 14-614502, 14-614504, 14-614505, 14-614506, 14-614511, and 14-614512, remained essentially the same with depth at locations 14-614507 and 14-614510, and increased slightly with depth at locations 14-614503 and 14-614513. Figure G-3 is the scatter plot of Qbt 4 site data for barium that shows a linear trend with a positive slope for barium and indicates concentrations across TA-14 were below or equal to the soil BV. In addition, Table G-1 indicates Qbt 4 barium concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of barium are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the barium Qbt 4 concentrations detected at these four locations were below the soil BV. No further sampling to define the vertical extent of barium at locations 14-614503, 14-614507, 14-614510, and 14-614513 is warranted.

Beryllium was detected above the soil BV (1.83 mg/kg) in one sample (2.1 mg/kg) from 0–0.83 ft bgs at location 14-614910. Only a surface sample was collected at this location, but the concentration was below the maximum soil background concentration (3.95 mg/kg). The lateral and vertical extent of beryllium are defined.

Cadmium was not detected above the soil or sediment BV (both 0.4 mg/kg) but had DLs above BV. Because cadmium was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of cadmium are defined.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in seven samples at locations 14-614503 through 14-614507, 14-614511, and 14-614512. Concentrations of calcium decreased laterally and decreased downgradient of the burn area. The lateral extent of calcium is defined. Concentrations detected below the soil BV (6120 mg/kg) at the seven locations are presented in Table D-1. Concentrations of calcium increased with depth at all seven locations, but the calcium Qbt 4 concentrations detected at locations 14-614506 and 14-614507 were similar to the maximum Qbt 2, 3, 4 background concentration (2230 mg/kg). Figure G-4 is the scatter plot of Qbt 4 site data for calcium that shows a linear trend with a positive slope for calcium and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 calcium concentrations are not different from soil background across TA-14. Compared with the soil BV, the calcium Qbt 4 concentrations detected at the seven locations were below the soil BV. No further sampling to define the vertical extent for calcium is warranted.

Chromium was detected above the soil BV (19.3 mg/kg) in one sample (21 mg/kg) at location 14-614910 and above the Qbt 2, 3, 4 BV (7.14 mg/kg) in 11 samples at locations 14-614501 through 14-614507 and 14-614510 through 14-614513. The chromium Qbt 4 concentrations detected laterally and downgradient of the burn area were below the maximum Qbt 2, 3, 4 background concentration (13 mg/kg). The lateral extent of chromium is defined. Only a surface sample was collected at location 14-614910, but the concentration detected was below the maximum soil background concentration (36.5 mg/kg). Concentrations detected below the soil BV at the other 11 locations are presented in Table D-1. Concentrations of chromium decreased with depth at locations 14-614501 through 14-614504, 14-614506, and 14-614510, remained essentially the same with depth at locations 14-614505, 14-614507, and 14-614511, and increased with depth at locations 14-614512 and 14-614513. All 11 chromium Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration. The vertical extent of chromium is defined.

Cobalt was detected above the soil BV (8.64 mg/kg) in 1 sample (9.4 mg/kg) at location 14-614912, above the Qbt 2, 3, 4 BV (3.14 mg/kg) in 11 samples at locations 14-614501 through 14-614507 and 14-614510 through 14-614513, and above the sediment BV (4.73 mg/kg) in 1 sample (6.7 mg/kg) at location 14-01035. Concentrations of cobalt decreased laterally and downgradient of the burn area. The lateral extent of cobalt is defined. Only surface samples were collected in 1997. The vertical extent at the 1997 locations was evaluated by the adjacent 2011 locations: location 14-01035 was evaluated by location 14-614513, and location 14-614912 was evaluated by location 14-614504. Concentrations detected below the soil BV at locations 14-614501, 14-614502, 14-614503, 14-614505, 14-614506, 14-614507, 14-614510, 14-614511, and 14-614512 are presented in Table D-1. Concentrations of cobalt decreased with depth at locations 14-614501, 14-614503, 14-614504, 14-614505, 14-614506, 14-614507, 14-614510, 14-614512, and 14-614513 and increased slightly with depth at locations 14-614502 and 14-614511. Figure G-6 is the of Qbt 4 site data for cobalt that shows a linear trend with a positive slope for cobalt and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 cobalt concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of cobalt are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the cobalt Qbt 4 concentrations detected at locations 14-614502 and 14-614511 were below the soil BV. No further sampling to define the vertical extent of cobalt at locations 14-614502 and 14-614511 is warranted.

Copper was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in 11 samples at locations 14-614501 through 14-614507 and 14-614510 through 14-614513. Concentrations of copper detected within the burn area were similar to those detected laterally and downgradient of the burn area. Concentrations detected below the soil BV at the 11 locations are presented in Table D-1. Concentrations of copper decreased with depth at locations 14-614501, 14-614502, 14-614506, and 14-614512, remained essentially the same with depth at locations 14-614503, 14-614504, and 14-614511, and increased slightly with depth at locations 14-614505, 14-614507, 14-614510, and 14-614513. The copper Qbt 4 concentrations detected at locations 14-614501, 14-614502, 14-614504, 14-614505, 14-614506, 14-614510, and 14-614512 were below or similar to the maximum Qbt 2, 3, 4 background concentration (6.2 mg/kg). Figure G-7 is the scatter plot of Qbt 4 site data for copper that shows a linear trend with a positive slope for copper and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV. In addition, Table G-1 indicates Qbt 4 copper concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of copper are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the copper Qbt 4 concentrations detected at locations 14-614503, 14-614507, 14-614511, and 14-614613 were below the soil BV. No further sampling to define the lateral and vertical extent for copper is warranted.

Total cyanide was not detected but had DLs above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg). Because total cyanide was not detected above BV and all results reported between the BV and the individual sample’s respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Iron was detected above the soil BV (21,500 mg/kg) in one sample (22,000 mg/kg) at location 14-614910 and above the Qbt 2, 3, 4 BV (14,500 mg/kg) in one sample (15,200 mg/kg) at location 14-614513. Iron was not detected above BV laterally and was detected above the Qbt 2, 3, 4 BV at the most downgradient location 14-614543, but the concentration was below the maximum Qbt 2, 3, 4 background concentration (19,500 mg/kg). The lateral extent of iron is defined. Only a surface sample was collected at location 14-614910, but the concentration detected was below the maximum soil background concentration (36,000 mg/kg). Iron was detected at a concentration of 11,500 mg/kg below the soil BV from 0–1 ft bgs at location 14-614513 (Table D-1). Concentrations of iron increased with depth at this location, but the iron Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration. The vertical extent of iron is defined.

Lead was detected above the Qbt 2, 3, 4 BV (11.2 mg/kg) in seven samples at locations 14-614502, 14-614503, 14-614506, 14-614507, 14-614511, 14-614512, and 14-614513. Concentrations of lead detected within the burn area were similar to those detected laterally and downgradient of the burn area. Concentrations detected below the soil BV at the seven locations are presented in Table D-1. Concentrations of lead decreased with depth at all seven locations. All the lead Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (15.5 mg/kg). The lateral and vertical extent of lead are defined.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in 10 samples at locations 14-614502 through 14-614507 and 14-614510 through 14-614513. Concentrations of magnesium detected within the burn area were similar to those detected laterally and downgradient of the burn area. Concentrations detected below the soil BV at the 10 locations are presented in Table D-1. Concentrations of magnesium decreased with depth at locations 14-614503 and 14-614506 and increased with depth at the other eight locations. All the magnesium Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Manganese was detected above the Qbt 2, 3, 4 BV (482 mg/kg) in one sample (486 mg/kg) from 3.5–4.5 ft bgs at location 14-614511. Concentrations of manganese decreased laterally and downgradient of the burn area. Manganese was detected at a concentration of 436 mg/kg below the soil BV (671 mg/kg) from 0–1 ft bgs at this location (Table D-1). Concentrations of manganese increased with depth, but the concentration detected in Qbt 4 was below the maximum Qbt 2, 3, 4 background concentration (752 mg/kg). The lateral and vertical extent of manganese are defined.

Mercury was not detected but had DLs above the soil or sediment (both 0.1 mg/kg). Because mercury was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of mercury are defined.

Nickel was detected above the soil BV (15.4 mg/kg) in one sample (17 mg/kg) at location 14-614910 and above the Qbt 2, 3, 4 BV (6.58 mg/kg) in nine samples at locations 14-614502 through 14-614505, 14-614507, and 14-614510 through 14-614513. The nickel Qbt 4 concentrations detected within the burn area were similar to those detected laterally and downgradient of the burn area. Only a surface sample was collected at location 14-614910, but the concentration detected was below the maximum soil background concentration (29 mg/kg). Concentrations detected below the soil BV at the nine locations are presented in Table D-1. Concentrations of nickel decreased with depth at locations 14-614502 through 14-614505 and 14-614510, remained essentially the same with depth at locations 14-614507, 14-614511, and 14-614512, and increased slightly at location 14-614513. Figure G-10 is the scatter plot of Qbt 4 site data for nickel that shows a linear trend with a positive slope for nickel and indicates concentrations across TA-14 (except at SWMU 14-009) were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 nickel concentrations are not different from soil background across TA-14, and Table G-2 indicates the Qbt 4 concentration range of nickel is slightly below the soil concentration range at this SWMU. Compared with the soil BV, the nickel Qbt 4 concentrations detected at the nine locations were below the soil BV. No further sampling to define the lateral and vertical extent for nickel is warranted.

Perchlorate was detected in one soil and three Qbt 4 samples at locations 14-614506, 14-614507, 14-614510, and 14-614511. Perchlorate was not detected at the lateral locations except at location 14-614507, with a concentration below the EQL, and was not detected at the most downgradient location 14-614513. The lateral extent of perchlorate is defined. Perchlorate was detected in the deeper samples at locations 14-614506 and 14-614510, but the concentrations were below EQLs. Perchlorate was not detected in the deeper sample at location 14-614507 but was detected at a concentration of 0.029 mg/kg from 3.5–4.5 ft bgs at location 14-614511. Perchlorate was not detected from 4.5–5.5 ft and 5–6 ft bgs at locations 14-614504 and 14-614505, respectively, and was detected at a concentration of 0.0049 mg/kg below the EQL from 5–6 ft bgs at location 14-614506, all three located approximately 10 ft away from location 14-614511. No further sampling to define the vertical extent of perchlorate at location 14-614511 is warranted.

Selenium was detected above the Qbt 2, 3, 4 BV (0.3 mg/kg) in four samples at locations 14-614501 through 14-614503 and 14-614511. Selenium was not detected above BV but had DLs above the soil BV (1.52 mg/kg) in two samples, was not detected above BV but had DLs above the Qbt 2, 3, 4 BV in seven samples, and was not detected but had a DL (1.2 mg/kg) above the sediment BV (0.3 mg/kg) in one sample. Selenium was not detected above BV at the lateral locations and at the most downgradient location 14-614513. The lateral extent of selenium is defined. Concentrations detected or with DLs below the soil BV (1.52 mg/kg) at locations 14-614501 through14-614503 and 14-614511 are presented in Table D-1. Concentrations of selenium increased with depth at locations 14-614501, 14-614502, and 14-614511 and remained essentially the same with depth at location 14-614503. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows that the majority of the detected concentrations of selenium are consistent across the site. Compared with the soil BV, the selenium Qbt 4 concentrations detected at the four locations were below the soil BV. No further sampling to define the vertical extent of selenium is warranted.

Silver was detected above the soil BV (1 mg/kg) in two samples at locations 14-614915 and 14-614916, was not detected but had DLs above the soil BV in five samples, and had a DL (2.3 mg/kg) above the sediment BV (1 mg/kg) in one sample. Silver was not detected above BV at the lateral locations and at the most downgradient location 14-614513. The lateral extent of silver is defined. Only surface samples were collected in 1997. The vertical extent at the 1997 locations was evaluated by the adjacent 2011 locations: locations 14-614915 and 14-614916 were evaluated by location 14-614504. Silver was detected above BV in the surface samples at locations 14-614915 and 14-614916 but was not detected above BV in the deeper samples at location 14-614504. The vertical extent of silver is defined.

Thallium was detected above the soil BV (0.73 mg/kg) in four samples at locations 14-614909, 14-614910, 14-614912, and 14-614913. Only surface samples were collected at these four locations, but all concentrations detected were below or similar to the maximum soil background concentration (1 mg/kg). The lateral and vertical extent of thallium are defined.

Uranium was detected above the soil BV (1.82 mg/kg) in seven samples at locations 14-614909 through 14-614915, was detected above the sediment BV (2.22 mg/kg) in one sample (3.33 mg/kg) at location 14-01035, and was not detected but had DLs above the soil BV in four samples. Concentrations of uranium decreased downgradient. The lateral extent of uranium is defined. Only surface samples were collected at locations 14-614909 through 14-614914, but the concentrations detected at these locations were below or similar to the maximum soil background concentration (3.6 mg/kg). Only surface samples were collected at locations 14-01035 and 14-614915. However, samples were collected at two depths at locations 14-614513 (collocated with 14-01035) and 14-614504 (approximately 10 ft away from location 14-614915) and were analyzed for isotopic uranium. Isotopic uranium was not detected or detected above BVs at these two locations. Therefore, the vertical extent of uranium is defined.

Vanadium was detected above the Qbt 2, 3, 4 BV (17 mg/kg) in 10 samples at 10 locations and above the sediment BV (19.7 mg/kg) in one sample (21 mg/kg) at location 14-01035. Only a surface sample was collected at location 14-01035, but the concentration detected was similar to the maximum sediment background concentration (20 mg/kg). The vanadium Qbt 4 concentrations detected within the burn area were similar to those detected laterally and downgradient of the burn area. Concentrations detected below the soil BV at the other 10 locations are presented in Table D-1. Concentrations of vanadium decreased with depth at all 10 locations. All the vanadium Qbt 4 concentrations were below or similar to the maximum Qbt 2, 3, 4 background concentration (21 mg/kg). The lateral and vertical extent of vanadium are defined.

Organic COPCs

ADNT[2-] was detected in two surface samples at locations 14-614916 and 14-614511. ADNT[2-] was not detected at the lateral and downgradient locations. The lateral extent of 2-ADNT is defined. ADNT[2-] was not detected in the samples with depth ranging from 0–5.5 ft bgs at location 14-614504, immediately adjacent to location 14-614916. ADNT[2-] was not detected in the deeper sample at location 14-614511. The vertical extent of 2-ADNT is defined.

Bis(2-ethylhexyl)phthalate was detected in two surface samples at locations 14-614502 and 14-614511. Bis(2-ethylhexyl)phthalate was not detected at the lateral and downgradient locations and was not detected in the deeper samples at both locations. The lateral and vertical extent of bis(2-ethylhexyl)phthalate are defined.

Seven dioxins and furans were detected at 13 locations. All concentrations of dioxin and furan congeners were below EQLs, except for two concentrations of 1,2,3,4,6,7,8,9-octachlorodibenzodioxin. Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-] was detected at concentrations of 0.0000187 mg/kg and 0.0000147 mg/kg from 0–1 ft bgs at locations 14-614508 and 14-614513, respectively. These two concentrations decreased with depth at both locations and were located to the south and east of the SWMU. However, both concentrations are similar to those detected for 1,2,3,4,6,7,8,9-

octachlorodibenzodioxin at TA-21 during the DP Site Aggregate Area investigation (LANL 2008, 102760). Because the DP Site Aggregate Area data were reviewed by NMED and determined not to warrant additional sampling for dioxins and furans (NMED 2008, 102290), no additional sampling for lateral extent of 1,2,3,4,6,7,8,9-octachlorodibenzodioxin is warranted at SWMU 14-003. Concentrations of dioxins and furans congeners either decreased with depth or were detected in the deeper samples with concentrations below EQLs at all locations. The vertical extent of dioxins and furans is defined.

HMX was detected in two samples at location 14-614511. HMX was not detected at the lateral and downgradient locations. The lateral extent of HMX is defined. Concentrations of HMX increased with depth at location 14-614511. However, the concentration of 0.13 mg/kg detected from 3.5–4.5 ft bgs at this location was similar to the EQL (0.11 mg/kg). The vertical extent of HMX is defined.

Methylene chloride was detected in four samples at locations 14-614501, 14-614502, 14-614503, and 14-614511. Methylene chloride was not detected at the lateral and downgradient locations. Surface samples were not analyzed for VOCs, but all concentrations detected at deeper depths were below EQLs. The lateral and vertical extent of methylene chloride are defined.

PETN was detected in one sample (0.13 mg/kg) below the EQL from 0–1 ft bgs at location 14-614511. PETN was not detected at the lateral and downgradient locations and was not detected in the deeper sample at this location The lateral and vertical extent of PETN are defined.

TATB was detected in three samples at locations 14-614501, 14-614511, and 14-614513. TATB was not detected at the lateral locations, was detected at the most downgradient location 14-614513 with a concentration below the EQL, and was not detected in the deeper samples at the three locations. The lateral and vertical extent of TATB are defined.

TNT was detected in one sample (0.131 mg/kg) from 0–0.5 ft bgs at location 14-614916. TNT was not detected at the lateral and downgradient locations. The lateral extent of TNT is defined. TNT was not detected in the samples with depth ranging from 0–5.5 ft bgs at location 14-614504, immediately adjacent to location 14-614916. The vertical extent of TNT is defined.

Radionuclide COPCs

Cesium-134 was detected in one Qbt 4 sample (0.052 pCi/g) from 3.5–4.5 ft bgs at location 14-614502. Cesium-134 was not detected at the lateral and downgradient locations. The lateral extent of cesium-134 is defined. Cesium-134 was not detected in the samples with depths ranging from 0–5.5 ft bgs at location 14-614504, approximately 10 ft southeast of location 14-614502. The vertical extent of cesium-134 is defined.

Cesium-137 was detected in one Qbt 4 sample (0.141 pCi/g) from 3–4 ft bgs at location 14-614512. Cesium-137 was not detected or detected above the soil FV at lateral locations 14-614507, 14-614508, and 14-614509, and concentrations decreased downgradient. The lateral extent of cesium-137 is defined. Cesium-137 was detected at a concentration of 0.198 pCi/g (below the soil FV of 1.65 pCi/g) from 0–1 ft bgs at location 14-614512 (Table D-2). Concentrations of cesium-137 decreased with depth at this location. The vertical extent of cesium-137 is defined.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, perchlorate, dioxins and furans, explosive compounds, PCBs, SVOCs, VOCs, gamma-emitting radionuclides, isotopic uranium, and strontium-90 are defined at SWMU 14-003.

The lateral and vertical extent are defined or no further sampling to define extent is warranted for inorganic chemicals at SWMU 14-003.

6.10.5 Summary of Human Health Risk Screening

The human health risk-screening assessments are presented in section H-4.0 in Appendix H.

Industrial Scenario

The total excess cancer risk for the industrial scenario is 2×10^{-6}, 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 dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489).

Construction Worker Scenario

No carcinogens were retained as COPCs under the construction worker scenario. The HI is approximately 2, which is above the NMED target HI of 1 (NMED 2009, 108070). The HI is primarily from manganese. As discussed in the uncertainty analysis (section H-4.3-2, Appendix H), the single detected concentration of manganese above the Qbt 2, 3, 4 BV is within the range of Qbt 2, 3, 4 background concentrations and is similar to the Qbt 2, 3, 4 BV. In addition, the construction worker SSL (463 mg/kg) is less than the Qbt 2, 3, 4 BV and the maximum Qbt 2, 3, 4 background concentration. Therefore, the hazard quotient (HQ) for manganese does not reflect a potential risk to the construction worker above that which would result from exposure to naturally occurring levels, and the construction worker HI is overestimated. Without manganese, the construction worker HI is 0.9, which is below the NMED target HI of 1. Furthermore, Qbt 4 at TA-14 is weathered tuff to approximately 10 ft bgs and more closely resembles soil. Comparing the Qbt 4 concentration (486 mg/kg) with the soil BV (671 mg/kg) indicates the concentration is not above the soil BV, which further supports the overestimation of potential risk to the construction worker. The total dose for the construction worker scenario is 0.4 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489).

Residential Scenario

The total excess cancer risk for the residential scenario is 9×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The residential cancer risk includes the contribution from the vapor-intrusion pathway. The HI is 1, which is equivalent to the NMED target HI of 1 (NMED 2009, 108070). The total dose for the residential scenario is 1 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489).

Based on the risk-screening assessment results, no potential unacceptable risk or dose exists for the industrial, construction worker, and residential scenarios at SWMU 14-003.

6.10.6 Summary of Ecological Risk Screening

The ecological risk-screening assessments are presented in section H-5.0 in Appendix H.

No potential ecological risks exist for any receptor at SWMU 14-003 based on minimum ESL comparisons, HI analyses, comparisons to background concentrations, potential effects to populations (individuals for threatened and endangered [T&E] species), and LOAEL analysis.

6.11 AOC 14-004(a), Storage Area

6.11.1 Site Description and Operation History

AOC 14-004(a) is a storage area located within magazine 14-22 in the southeastern portion of TA-14 (Figure 6.11-1). Magazine 14-22 housed a storage area for small quantities of HE (less than 5-gal. amounts) that were removed for disposal at frequent intervals. The dates when the magazine was used as an HE storage area are not known.

6.11.2 Relationship to Other SWMUs and AOCs

AOC 14-004(a) is a storage area housed in a magazine (structure 14-22). The magazine is currently in use. The nearby sites under investigation include the location of a former HE-preparation building AOC C-14-003, the location of a former electronics shop AOC C-14-004, and the location of a former storage building AOC C-14-007. AOC C-14-003 is located approximately 70 ft to the northeast of AOC 14-004(a), AOC C-14-004 is approximately 120 ft south, and AOC C-14-007 is approximately 150 ft southwest.

6.11.3 Summary of Previous Investigations

No previous investigation has been conducted at AOC 14-004(a).

6.11.4 Rationale for Delayed Investigation

Sampling was proposed at AOC 14-004(a) in the FIP (LANL 2011, 207481, p. 5). However, during field activities, the magazine (structure 14-22) was found to be in use and the floor is concrete instead of an earthen floor originally believed. It is therefore proposed that site characterization and investigation of AOC 14-004(a) be delayed until the decommissioning of the magazine (structure 14-22).

6.12 SWMU 14-006, Decommissioned Sump and Outfall

6.12.1 Site Description and Operation History

SWMU 14-006 is a decommissioned HE sump (structure 14-31), associated drainline, and outfall that are located at TA-14 approximately 45 ft east of control building 14-23 (Figure 6.12-1). Installed in 1952, the steel-lined sump is constructed of reinforced concrete and measures approximately 4.5 ft wide × 8 ft long × 5 ft deep. The sump received discharges from sink and floor drains in building 14-23 and discharged to an outfall approximately 55 ft southeast of the sump. The sump has been filled with concrete and its outlet is plugged (date not known). Currently the outfall receives stormwater only.

6.12.2 Relationship to Other SWMUs and AOCs

The decommissioned HE sump of SWMU 14-006 was installed in 1952 and served control building 14-23. This SWMU is not associated with other SWMUs or AOCs at TA-14.

6.12.3 Summary of Previous Investigations

During the 1995 RFI conducted at SWMU 14-006, samples were field screened for metals, gross radioactivity, and HE spot tests were performed. Based on field-screening results, three surface (0–0.5 ft bgs) samples and three subsurface (1.5–2 ft bgs and 4 ft bgs) were collected and submitted for off-site analysis of TAL metals, gamma spectroscopy, and HE (LANL 1996, 054086, pp. 5-42–5-50). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed twelve metals detected above BVs, detected HE and polycyclic aromatic hydrocarbons, and uranium-235 and uranium-238 detected above BVs.

6.12.4 Site Contamination

6.12.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at SWMU 14-006:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Fourteen samples were collected from seven locations along the inlet drainline (locations 14-614539 and 14-614532); below the sump inlet, the sump, and the sump outlet (locations 14-614533, 14-614531, and 14-614534, respectively); and along the outlet drainline (locations 14-614540 and 14-614535). These samples were collected at two depth intervals—the first at the bottom of the drainline or sump and the second at least 3 ft below the first depth.
- Eight samples were collected from four locations at and downgradient of the outfall (locations 14-614536 through 14-614538 and 14-614541) at 0–1 ft and 3–4 ft bgs.
- All samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, VOCs (excluding surface samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.

The 2011 sampling locations at SWMU 14-006 are shown in Figure 6.12-1. Table 6.12-1 presents the 2011 samples collected and the analyses requested for SWMU 14-006. The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.12.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.12.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 14-006 consist of the results from 22 samples (7 soil and 15 Qbt 4) collected from 11 locations in 2011. The extent of contamination is not defined at SWMU 14-006. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 22 samples (7 soil and 15 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.12-2 presents the inorganic chemicals above BVs. Figure 6.12-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Seventeen TAL metals (aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, mercury, nickel, selenium, vanadium, and zinc) and total cyanide were detected above BVs. Nitrate and perchlorate were detected.

Organic Chemicals

All 22 samples (7 soil and 15 Qbt 4) were analyzed for explosive compounds and SVOCs, 4 samples (1 soil and 3 Qbt 4) were analyzed for PCBs, and 18 samples (3 soil and 15 Qbt 4) were analyzed for VOCs. Table 6.12-3 presents the detected organic chemicals. Figure 6.12-3 shows the spatial distribution of detected organic chemicals.

Seven explosive compounds (4-amino-2,6-dinitrotoluene [4-ADNT]; 2-ADNT; HMX; PETN; RDX; TATB; and TNT] and 18 SVOCs (acenaphthene; anthracene; benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; benzo[g,h,i]perylene; benzo[k]fluoranthene; bis[2-ethylhexyl]phthalate; chrysene; dibenz[a,h]anthracene; dibenzofuran; fluoranthene; fluorene; indeno[1,2,3-cd]pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; and pyrene) were detected.

PCBs and VOCs were not detected.

Radionuclides

All 22 samples (7 soil and 15 Qbt 4) were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.12-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.12-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Strontium-90 was detected in one soil sample and one Qbt 4 sample.

6.12.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) in seven samples at seven locations. Concentrations of aluminum decreased downgradient along the drainage. The lateral extent of aluminum is defined. Concentrations detected below the soil BV (29,200 mg/kg) at locations 14-614534, 14-614535, 14-614537, and 14-614539 are presented in Table D-1. Concentrations of aluminum decreased with depth at locations 14-614531 through 14-614535, increased with depth at location 14-614537, and remained essentially the same with depth at location 14-614539. Figure G-13 is the scatter plot of Qbt 4 site data for aluminum that shows a linear trend with a positive slope for aluminum and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 aluminum concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of aluminum are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the aluminum Qbt 4 concentrations detected at the seven locations were below the soil BV. No further sampling to define the vertical extent of aluminum at locations 14-614537 and 14-614539 is warranted.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in seven samples at locations 14-614532 through 14-614537 and 14-614539. Concentrations of arsenic decreased downgradient along the drainage. The lateral extent of arsenic is defined. Concentrations detected below the soil BV (8.17 mg/kg) at locations 14-614534 through 14-614537 and 14-614539 are presented in Table D-1. Concentrations of arsenic decreased with depth at locations 14-614532, 14-614533, 14-614534, and 14-614537, remained the same with at location 14-614536, and increased with depth at locations 14-614535 and 14-614539. The arsenic Qbt 4 concentrations detected at locations 14-614532, 14-614633, 14-614534, 14-614536, 14-614537, and 14-614539 were below the maximum Qbt 2, 3, 4 background concentration (5 mg/kg). Figure G-2 is the scatter plot of Qbt 4 site data for arsenic that shows a linear trend with a positive slope for arsenic and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 arsenic concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of arsenic (except for one Qbt 4 concentration) are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the arsenic Qbt 4 concentrations detected at the seven locations were below the soil BV. No further sampling to define the vertical extent of arsenic at location 14-614535 is warranted.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in seven samples at locations 14-614531 through 14-614534, 14-614537, 14-614539, and 14-614540. Concentrations of barium decreased downgradient along the drainage. The lateral extent of barium is defined. Concentrations detected below the soil BV (295 mg/kg) at locations 14-614534, 14-614537, and 14-614539 are presented in Table D-1. Concentrations of barium decreased with depth at locations 14-614531 through 14-614534, 14-614539, and 14-614540 and remained essentially the same with depth at location 14-614537, with the barium Qbt 4 concentration below the maximum Qbt 2, 3, 4 background concentration (51.6 mg/kg). The vertical extent of barium is defined.

Beryllium was detected above the Qbt 2, 3, 4 BV (1.21 mg/kg) in two samples at locations 14-614535 and 14-614539. Beryllium was not detected above BV at the locations in the drainage. The lateral extent of beryllium is defined. Beryllium was detected at concentrations of 1.5 mg/kg and 1.1 mg/kg below the soil BV (1.83 mg/kg) in shallower samples at locations 14-614535 and 14-614539, respectively (Table D-1). Concentrations of beryllium remained essentially the same with depth at location 14-614535 and increased slightly with depth at location 14-614539, but the beryllium Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (1.8 mg/kg). The vertical extent of beryllium is defined.

Cadmium was detected above the soil BV (0.4 mg/kg) in two samples at locations 14-614536 and 14-614538. Concentrations of cadmium decreased downgradient along the drainage. The lateral extent of cadmium is defined. Cadmium was detected at concentrations of 0.096 mg/kg and 0.035 mg/kg below the Qbt 2, 3, 4 BV (1.63 mg/kg) from 3–4 ft bgs at locations 14-614536 and 14-614538, respectively (Table D-1). Concentrations of cadmium decreased with depth at both locations, and the cadmium soil concentrations were below the maximum soil background concentration (2.6 mg/kg). The vertical extent of cadmium is defined.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in seven samples at locations 14-614531 through 14-614535, 14-614539, and 14-614540. Calcium was not detected above BV at the locations in the drainage. The lateral extent of calcium is defined. Concentrations detected below the soil BV (6120 mg/kg) at locations 14-614534, 14-614535, and 14-614539 are presented in Table D-1. Concentrations of calcium decreased with depth at locations 14-614531 through 14-614535 and 14-614540 and remained essentially the same with depth at location 14-614539. The vertical extent of calcium is defined.

Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in four samples at locations 14-614532, 14-614535, 14-614537, and 14-614539. Concentrations of chromium decreased downgradient along the drainage. The lateral extent of chromium is defined. Concentrations detected below the soil BV (19.3 mg/kg) at locations 14-614535, 14-614537, and 14-614539 are presented in Table D-1. Concentrations of chromium decreased with depth at locations 14-614532 and 14-614535 and increased with depth at locations 14-614537 and 14-614539, but all chromium Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (13 mg/kg). The lateral and vertical extent of chromium are defined.

Cobalt was detected above the Qbt 2, 3, 4 BV (3.14 mg/kg) in one sample (6.1 mg/kg) from 6–7 ft bgs at location 14-614539. Cobalt was not detected above BV at the locations in the drainage. The lateral extent of cobalt is defined. Cobalt was detected at a concentration of 5.3 mg/kg (below the soil BV of 8.64 mg/kg) in the shallower sample at location 14-614539 (Table D-1). Figure G-6 is the scatter plot of Qbt 4 site data for cobalt that shows a linear trend with a positive slope for cobalt and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 cobalt concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of cobalt are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the cobalt Qbt 4 concentration of 6.1 mg/kg detected at location 14-614539 was below the soil BV. No further sampling to define the vertical extent of cobalt at location 14-614539 is warranted.

Copper was detected above the soil BV (14.7 mg/kg) in three samples and above the Qbt 2, 3, 4 BV (4.66 mg/kg) in 11 samples at 10 locations. Concentrations of copper decreased downgradient along the drainage. The lateral extent of copper is defined. Concentrations detected below the soil BV at locations 14-614534, 14-614535, and 14-614537 are presented in Table D-1. Concentrations of copper decreased with depth at locations 14-614531 through 14-614539 and remained essentially the same with depth at location 14-614540. The copper Qbt 4 concentrations were below or similar to the maximum Qbt 2, 3, 4 background concentration (6.2 mg/kg) at locations 14-614531, 14-614533, 14-614534, 14-614537, and 14-614540. The vertical extent of copper is defined.

Total cyanide was detected above soil BV (0.5 mg/kg) in one sample (0.57 mg/kg) from 0–1 ft bgs at location 14-614538 and was not detected but had DLs above BV in all the other samples. Concentrations of cyanide decreased downgradient along the drainage and decreased with depth at location 14-614538. The lateral and vertical extent of cyanide are defined.

Iron was detected above the Qbt 2, 3, 4 BV (14500 mg/kg) in one sample (16,300 mg/kg) from 6–7 ft bgs at location 14-614539. Iron was not detected above BV at the locations in the drainage. The lateral extent of iron is defined. Iron was detected at a concentration of 14,100 mg/kg below the soil BV (21,500 mg/kg) from 2–3 ft bgs at this location (Table D-1). Concentrations of iron increased with depth, but the iron Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration (19,500 mg/kg). The vertical extent of iron is defined.

Lead was detected above the soil BV (22.3 mg/kg) in three samples and above the Qbt 2, 3, 4 BV (11.2 mg/kg) in three samples at locations 14-614531, 14-614535, 14-614536, 14-614538, and 14-614539. Concentrations of lead decreased downgradient along the drainage. The lateral extent of lead is defined. Lead was detected at a concentration of 22.3 mg/kg, which is equivalent to the soil BV from 1–2 ft bgs at location 14-614535 (Table D-1). Concentrations of lead decreased with depth at all five locations. The vertical extent of lead is defined.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in five samples at locations 14-614532 through 14-614535 and 14-614539. Magnesium was not detected above BV at the locations in the drainage. The lateral extent of magnesium is defined. Concentrations detected below the soil BV (4610 mg/kg) at locations 14-614534, 14-614535, and 14-614539 are presented in Table D-1. Concentrations of magnesium decreased with depth at locations 14-614532 through 14-614535 and increased with depth at location 14-614539. The magnesium Qbt 4 concentrations detected at locations 14-614532 through 14-614535 were below the maximum Qbt 2, 3, 4 background concentration (2820 mg/kg). Figure G-9 is the scatter plot of Qbt 4 site data for magnesium that shows a linear trend with a positive slope for magnesium and indicates the concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 magnesium concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of magnesium are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the magnesium Qbt 4 concentration detected at location 14-614539 was below the soil BV, and no further sampling to define the vertical extent of magnesium at location 14-614539 is warranted.

Mercury was detected above the soil BV (0.1 mg/kg) in one sample (0.234 mg/kg) from 0–1 ft bgs at location 14-614636. Concentrations of mercury decreased downgradient along the drainage and decreased with depth at this location. The lateral and vertical extent of mercury are defined.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in five samples at locations 14-614532, 14-614534, 14-614535, 14-614539, and 14-614540. Nickel was not detected above BV at the locations in the drainage. The lateral extent of nickel is defined. Concentrations detected below the soil BV (15.4 mg/kg) at locations 14-614534, 14-614535, and 14-614539 are presented in Table D-1. Concentrations of nickel decreased with depth at location 14-614532, 14-614535, and 14-614540 and increased with depth at locations 14-614534 and 14-614539. Figure G-10 is the scatter plot of Qbt 4 site data for nickel that shows a linear trend with a positive slope for nickel and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 nickel concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of nickel are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the nickel Qbt 4 concentrations detected at locations 14-614534 and 14-614539 were below the soil BV, and no further sampling to define the vertical extent of nickel at locations 14-614534 and 14-614539 is warranted.

Nitrate was detected in all 22 samples at the 11 locations, with a maximum concentration of 8.1 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in five soil and eight Qbt 4 samples at nine locations. Concentrations of perchlorate decreased downgradient along the drainage. The lateral extent of perchlorate is defined. Concentrations of perchlorate increased with depth at locations 14-614531, 14-614533, 14-614535, 14-614536, and 14-614537, remained essentially the same with depth at locations 14-614538 and 14-614541, and decreased with depth at locations 14-614539 and 14-614540. Concentrations of perchlorate were below or similar to EQLs at locations 14-614531, 14-614533, 14-614539, and 14-614540. The vertical extent of perchlorate is not defined at locations 14-614535, 14-614536, and 14-614537.

Selenium was detected above the soil BV (1.52 mg/kg) in four samples and above the Qbt 2, 3, 4 BV (0.3 mg/kg) in 15 samples at 11 locations. Concentrations of selenium decreased downgradient along the drainage. The lateral extent of selenium is defined. Concentrations of selenium increased with depth at locations 14-614531 through 14-614536 and 14-614539 through 14-614541 and remained essentially the same with depth at locations 14-614537 and 14-614538. The vertical extent of selenium is not defined at locations 14-614531 through 14-614536 and 14-614539 through 14-614541.

Vanadium was detected above the Qbt 2, 3, 4 BV (17 mg/kg) in two samples at locations 14-614532 and 14-614539. Vanadium was not detected above BV at the locations in the drainage. The lateral extent of vanadium is defined. Vanadium was detected at a concentration of 22.4 mg/kg below the soil BV (39.6 mg/kg) from 2–3 ft bgs at location 14-614539 (Table D-1). Concentrations of vanadium decreased with depth at location 14-614532 and remained essentially the same with depth at location 14-614539. Vanadium Qbt 4 concentrations were below or similar to the maximum Qbt 2, 3, 4 background concentration (21 mg/kg). The lateral and vertical extent of vanadium are defined.

Zinc was detected above the soil BV (48.8 mg/kg) in three samples at locations 14-614536, 14-614538, and 14-614541. Concentrations of zinc decreased downgradient along the drainage and decreased with depth at all three locations. The lateral and vertical extent of zinc are defined.

Organic Chemicals

Acenaphthene was detected in four samples at locations 14-614536, 14-614538, 14-614540, and 14-614541. Concentrations of acenaphthene decreased downgradient along the drainage, and acenaphthene was not detected in the deeper samples at all four locations. The lateral and vertical extent of acenaphthene are defined.

ADNT[4-] and 2-ADNT were detected in two samples at locations 14-614534 and 14-614536. ADNT[4-] and 2-ADNT were not detected downgradient of location 14-614536 in the drainage and were not detected in the deeper samples at both locations. The lateral and vertical extent of 4-ADNT and 2-ADNT are defined.

Anthracene, dibenzofuran, and fluorene were detected in three samples at locations 14-614536, 14-614538, and 14-614540. Anthracene, dibenzofuran, and fluorene were not detected at the most downgradient location 14-614541 and were not detected in the deeper samples at all three locations. The lateral and vertical extent of anthracene, dibenzofuran, and fluorene are defined.

Benzo(a)anthracene; benzo(a)pyrene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; indeno(1,2,3-cd)pyrene; and phenanthrene were detected in five samples at locations 14-614534, 14-614536, 14-614538, 14-614540, and 14-614541. Benzo(a)pyrene was detected at a concentration of 9.2 mg/kg, exceeding the industrial SSL of 2.34 mg/kg, from 0–1 ft bgs at location 14-614536. Concentrations of benzo(a)anthracene; benzo(a)pyrene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; indeno(1,2,3-cd)pyrene; and phenanthrene decreased downgradient along the drainage and they were not detected in the deeper samples at the five locations. The lateral and vertical extent of benzo(a)anthracene; benzo(a)pyrene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; indeno(1,2,3-cd)pyrene; and phenanthrene are defined.

Benzo(b)fluoranthene was detected in six samples at locations 14-614534, 14-614536, 14-614537, 14-614538, 14-614540, and 14-614541. Concentrations of benzo(b)fluoranthene decreased downgradient along the drainage and benzo(b)fluoranthene was not detected in the deeper samples at all six locations. The lateral and vertical extent of benzo(b)fluoranthene are defined.

Bis(2-ethylhexyl)phthalate was detected in four samples at locations 14-614532, 14-614537, 14-614538, and 14-614540. Bis(2-ethylhexyl)phthalate was not detected at the most downgradient location 14-614541. The lateral extent of bis(2-ethylhexyl)phthalate is defined. Concentrations of bis(2-ethylhexyl)phthalate were below or equivalent to EQLs at locations 14-614532, 14-614538, and 14-614540. Bis(2-ethylhexyl)phthalate was not detected from 0–1 ft bgs at location 14-614537. The vertical extent of bis(2-ethylhexyl)phthalate is not defined at location 14-614537.

Dibenz(a,h)anthracene and RDX were detected in two samples at locations 14-614536 and 14-614538. Dibenz(a,h)anthracene and RDX were not detected at the most downgradient location 14-614541 and were not detected in the deeper samples at both locations. The lateral and vertical extent of dibenz(a,h)anthracene and RDX are defined.

Fluoranthene and pyrene were detected in seven samples at six locations. Concentrations of fluoranthene and pyrene decreased downgradient along the drainage, they were not detected in the deeper samples at locations14-614534, 14-614537, 14-614538, 14-614540, and 14-614541, and decreased with depth at location 14-614536. The lateral and vertical extent of fluoranthene and pyrene are defined.

HMX was detected in 20 samples at 11 locations. Concentrations of HMX remained essentially the same downgradient. The lateral extent of HMX is not defined. Concentrations of HMX decreased with depth at locations 14-614531, 14-614533, 14-614534, 14-614535, 14-614536, 14-614538, 14-614539, 14-614540, and 14-614541. HMX was not detected in the shallower sample at location 14-614532, and concentrations of HMX increased with depth at location 14-614537. The vertical extent of HMX is not defined at locations 14-614532 and 14-614537.

Methylnaphthalene[2-] and naphthalene were detected in two samples at locations 14-614536 and 14-614540. Methylnaphthalene[2-] and naphthalene were not detected downgradient of location 14-614536 in the drainage and were not detected in the deeper samples at both locations. The lateral and vertical extent of 2-methylnaphthalene and naphthalene are defined.

PETN was detected in one sample (1.7 mg/kg) from 5–6 ft bgs at location 14-614533. PETN was not detected downgradient of location 14-614533 and was not detected in the deeper sample at this location. The lateral and vertical extent of PETN are defined.

TATB was detected in 16 samples at 10 locations. Concentrations of TATB decreased downgradient along the drainage. The lateral extent of TATB is defined. Concentrations of TATB decreased with depth at locations 14-614531, 14-614533 through 14-614538, 14-614540, and 14-614541. TATB was not detected in the shallower sample at location 14-614532. The vertical extent of TATB is not defined at location 14-614532.

TNT was detected in six samples at locations 14-614532, 14-614534, 14-614536, 14-614538, and 14-614541. Concentrations of TNT decreased downgradient along the drainage. The lateral extent of TNT is defined. TNT was not detected in the shallower sample at location 14-614532. TNT was not detected in the deeper samples at locations 14-614534, 14-614538, and 14-614541, and concentrations of TNT decreased with depth at location 14-614536. The vertical extent of TNT is not defined at location 14-614532.

Radionuclides

Strontium-90 was detected in one soil sample (0.33 mg/kg) from 1–2 ft bgs at location 14-614535 and in one Qbt 4 sample (0.38 mg/kg) from 8–9 ft bgs at location 14-614532. Strontium-90 was not detected at locations in the drainage. The lateral extent of strontium-90 is defined. Strontium-90 was not detected in the shallower sample at location 14-614532 and was not detected in the deeper sample at location 14-614535. The vertical extent of strontium-90 is not defined at location 14-614532.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, PCBs, VOCs, gamma-emitting radionuclides, and isotopic uranium are defined at SWMU 14-006.

The lateral and vertical extent are defined or no further sampling to define extent is warranted for inorganic chemicals, except the vertical extent of selenium is not defined at locations 14-614531 through 14-614536, 14-614539, 14-614540, and 14-614541.

The lateral extent of perchlorate is defined, but the vertical extent of perchlorate is not defined at locations 14-614535, 14-614536, and 14-614537.

The lateral and vertical extent of explosive compounds are defined, except for

- the lateral extent of HMX and the vertical extent of HMX at locations 14-614532 and 14-614537; and
- the vertical extent of TATB and TNT at location 14-614532.

The lateral and vertical extent of SVOCs are defined, except the vertical extent of bis(2-ethylhexyl)phthalate is not defined at location14-614537.

The lateral extent of strontium-90 is defined, but the vertical extent of strontium-90 is not defined at location 14-614532.

6.12.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 14-006 because extent is not defined for the site.

6.12.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 14-006 because extent is not defined for the site.

6.13 SWMU 14-007, Decommissioned Septic System

6.13.1 Site Description and Operation History

SWMU 14-007 is a decommissioned septic system located at TA-14, approximately 70 ft northeast of building 14-6 (Figure 6.13-1). The septic system consists of an inactive septic tank (structure 14-19) installed in 1944 and an inactive drain field installed in 1988. The reinforced concrete tank measures 4 ft wide × 7 ft long × 6 ft deep and has a capacity of 640 gal. The drain field is approximately 9 ft wide × 18 ft long. The septic system received effluent from a photoprocessing sink and the restroom in building 14-6, a shop and dark room that was later converted to storage. Originally, the tank discharged to an outfall located 130 ft northeast of the septic tank. In 1988, a drain field and a new drainline (from the septic tank to the drain field) were installed and the portion of the original drainline that discharged to the outfall was decommissioned in place. The septic tank and drain field were disconnected in 1992 when building 14-6 was connected to the SWSC.

6.13.2 Relationship to Other SWMUs and AOCs

The decommissioned septic system of SWMU 14-007 was installed in 1944 and served building 14-6. This SWMU is not associated with other SWMUs or AOCs at TA-14.

6.13.3 Summary of Previous Investigations

During the 1995 RFI conducted at SWMU 14-007, samples were field screened for metals, gross radioactivity, and HE spot tests were performed. Based on field-screening results, three surface (0–0.5 ft bgs) samples and three subsurface (1.5–2 ft bgs and 5 ft bgs) were collected and submitted for off-site analysis of TAL metals, total cyanide, HE, and SVOCs and by gamma spectroscopy (LANL 1996, 054086, pp. 5-75–5-81). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed five metals detected above BVs, and uranium-235 and uranium-238 detected above BVs.

6.13.4 Site Contamination

6.13.4.1 Soil and Rock Sampling

During 2011 sampling, the inlet drainline to the septic tank was located and samples were collected next to the drainline. The FIP proposed to remove the septic tank and collect samples at the septic tank inlet, outlet, and beneath the tank. However, because of safety concerns associated with removing the septic tank, it was not removed but instead was filled with cement during field activities. Samples were collected next to the septic tank. The outlet drainline was not located; consequently, samples were collected at the sampling locations proposed in the FIP. The drain field was located and sampled as proposed. As part of the 2011 investigation, the following activities were conducted at SWMU 14-007:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Twenty-seven samples were collected from nine locations along the inlet drainline (locations 14-614551 and 14-614552); at the tank inlet, the tank, and the tank outlet (locations 14-614542, 14-614544, and 14-614543, respectively); and along the outlet drainline (locations 14-614553, 14-614545, 14-614549, and 14-614550). Samples at location 14-614551 were collected at 2.5–3.5 ft and 5.5–6.5 ft bgs; samples at location 14-614544 were collected at 0–1 ft, 3–4 ft, 6–7 ft, and 9–10 ft bgs; and samples at the other locations were collected at 0–1 ft, 3–4 ft, and 6–7 ft bgs.
- Eight samples were collected from four locations (14-614546, 14-614547, 14-614548, and 14-614554) at and downgradient of the outfall at 0–1 ft and 3–4 ft bgs.
- Twenty-four samples were collected from eight locations (14-614555 through 14-614562) within and around the drain field at 0–1 ft, 3–4 ft, and 6–7 ft bgs.
- All samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, VOCs (excluding surface samples), gamma-emitting radionuclides, isotopic uranium, and strontium-90.

The 2011 sampling locations at SWMU 14-007 are shown in Figure 6.13-1. Table 6.13-1 presents the 2011 samples collected and the analyses requested for SWMU 14-007. The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.13.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.13.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 14-007 consist of the results from 59 samples (43 soil and 16 Qbt 4) collected from 21 locations in 2011. The extent of contamination is not defined at SWMU 14-007. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 59 samples (43 soil and 16 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.13-2 presents the inorganic chemicals above BVs. Figure 6.13-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Nineteen TAL metals (aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, vanadium, and zinc) were detected above BVs. Total cyanide was not detected above BV but had DLs above BV. Nitrate and perchlorate were detected.

Organic Chemicals

All 59 samples (43 soil and 16 Qbt 4) were analyzed for explosive compounds and SVOCs, 14 samples (10 soil and 4 Qbt 4) were analyzed for PCBs, and 39 samples (23 soil and 16 Qbt 4) were analyzed for VOCs. Table 6.13-3 presents the detected organic chemicals. Figure 6.13-3 shows the spatial distribution of detected organic chemicals.

Two explosive compounds (HMX and TATB); five SVOCs (acenaphthene, bis[2-ethylhexyl]phthalate, di-n-butylphthalate, di-n-octylphthalate, and fluoranthene); and five VOCs (acetone; 1,3-dichlorobenzene; 4-isopropyltoluene; methylene chloride; and trichloroethene) were detected. PCBs were not detected.

Radionuclides

All 59 samples (43 soil and 16 Qbt 4) were analyzed for gamma-emitting radionuclides, isotopic uranium, and strontium-90. Table 6.13-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.13-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Cesium-137 and strontium-90 were each detected in one soil sample.

6.13.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) in 14 samples at 12 locations. Aluminum was not detected above BV in the drainage downgradient of the outfall. The lateral extent of aluminum is defined for the drainline. Aluminum was not detected above the soil BV, and the concentrations in Qbt 4 were similar at the drain field as well as laterally and downgradient of the drain field. Figure G-13 is the scatter plot of Qbt 4 site data for aluminum that shows a linear trend with a positive slope for aluminum and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 aluminum concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of aluminum are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV (29,200 mg/kg), the aluminum Qbt 4 concentrations detected at the site were below the soil BV. No further sampling to define the lateral extent of aluminum for the drain field is warranted. Concentrations detected below the soil BV at locations 14-614542, 14-614543, 14-614545, 14-614550, 14-614555, 14-614556, 14-614558, 14-614559, 14-614561, and 14-614562 are presented in Table D-1. Overall, concentrations of aluminum decreased with depth at all 12 locations. The vertical extent of aluminum is defined.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in eight samples at locations 14-614542, 14-614543, 14-614553, 14-614555, 14-614558, 14-614560, and 14-614562. Arsenic was not detected above BV in the drainage downgradient of the outfall and was not detected above the soil BV. Arsenic concentrations in Qbt 4 were below the maximum Qbt 2, 3, 4 background concentration (5 mg/kg) at the drain field as well as laterally and downgradient of the drain field. The lateral extent of arsenic is defined. Concentrations detected below the soil BV (8.17 mg/kg) at these seven locations are presented in Table D-1. Overall, concentrations of arsenic decreased with depth at locations 14-614542 and 14-614553, remained essentially the same with depth at locations 14-614543, 14-614555, 14-614558, and 14-614560, and increased with depth at location 14-614562. However, all concentrations detected in Qbt 4 were below the maximum Qbt 2, 3, 4 background concentration. The vertical extent of arsenic is defined.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in 15 samples at 13 locations. Barium was not detected above BV in the drainage downgradient of the outfall. The lateral extent of barium is defined for the drainline. Barium was not detected above the soil BV, and the concentrations in Qbt 4 were similar at the drain field as well as laterally and downgradient of the drain field. Figure G-3 is the scatter plot of Qbt 4 site data for barium that shows a linear trend with a positive slope for barium and indicates concentrations across TA-14 were below or equal to the soil BV. In addition, Table G-1 indicates Qbt 4 barium concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of barium are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV (295 mg/kg), the barium Qbt 4 concentrations were below the soil BV. No further sampling to define the lateral extent of barium for the drain field is warranted. Concentrations detected below the soil BV at locations 14-614542, 14-614543, 14-614545, 14-614550, 14-614555, 14-614556, 14-614557, 14-614558, 14-614559, 14-614561, and 14-614562 are presented in Table D-1. Overall, concentrations of barium decreased with depth at all 13 locations. The vertical extent of barium is defined.

Beryllium was detected above the Qbt 2, 3, 4 BV (1.21 mg/kg) in two samples at locations 14-614553 and 14-614562. Beryllium was not detected above BV in the drainage downgradient of the outfall and was not detected above the soil BV. The concentration of beryllium in Qbt 4 was below the maximum Qbt 2, 3, 4 background concentration (1.8 mg/kg) at the drain field as well as laterally and downgradient of the drain field. The lateral extent of beryllium is defined. Concentrations detected below the soil BV (1.83 mg/kg) at these two locations are presented in Table D-1. Concentrations of beryllium decreased with depth at location 14-614553 and increased with depth at location 14-614562, but the beryllium Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration. The vertical extent of beryllium is defined.

Cadmium was detected above the soil BV (0.4 mg/kg) in two samples at locations 14-614542 and 14-614543. Cadmium was not detected above BV in the drainage downgradient of the outfall and was not detected above BV at the drain field as well as laterally and downgradient of the drain field. The lateral extent of cadmium is defined. Concentrations of cadmium decreased with depth at both locations, and the detected concentrations were below the maximum soil background concentration (2.6 mg/kg). The vertical extent of cadmium is defined.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in 10 samples at locations 14-614545, 14-614550, 14-614553, 14-614555, 14-614556, 14-614557, 14-614560, 14-614561, and 14-614562. Calcium was not detected above BV in the drainage downgradient of the outfall. The lateral extent of calcium is defined for the drainline. Calcium was not detected above the soil BV, and the concentrations in Qbt 4 were similar at the drain field as well as laterally and downgradient of the drain field. Concentrations detected below the soil BV (6120mg/kg) at the nine locations are presented in Table D-1. Concentrations of calcium increased with depth at these nine locations. Figure G-4 is the scatter plot of Qbt 4 site data for calcium that shows a linear trend with a positive slope for calcium and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 calcium concentrations are not different from soil background across TA-14. Compared with the soil BV, the calcium Qbt 4 concentrations at the site were below the soil BV. No further sampling to define the lateral extent for the drain field or the vertical extent of calcium is warranted.

Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in 10 samples at locations 14-614542, 14-614543, 14-614545, 14-614550, 14-614553, 14-614555, 14-614560, and 14-614562. Chromium was not detected above BV in the drainage downgradient of the outfall and was not detected above the soil BV. The concentrations of chromium in Qbt 4 were below the maximum Qbt 2, 3, 4 background concentration (13 mg/kg) at the drain field as well as laterally and downgradient of the drain field. The lateral extent of chromium is defined. Concentrations detected below the soil BV (19.3 mg/kg) at these eight locations are presented in Table D-1. Overall, concentrations of chromium decreased with depth at locations 14-614542, 14-614543, 14-614550, 14-614553, 14-614555, and 14-614560 and remained essentially the same with depth at locations 14-614545 and 14-614562. The chromium Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (13 mg/kg). The vertical extent of chromium is defined.

Cobalt was detected above the soil BV (8.64 mg/kg) in one sample (15.8 mg/kg) and above the Qbt 2, 3, 4 BV (3.14 mg/kg) in eight samples at locations 14-614542, 14-614543, 14-614545, 14-614553, 14-614555, 14-6145580, and 14-614560. Cobalt was not detected above BV in the drainage downgradient of the outfall. The lateral extent of cobalt is defined for the drainline. Cobalt was not detected above the soil BV, and the concentrations in Qbt 4 were similar at the drain field as well as laterally and downgradient of the drain field. Concentrations detected below the soil BV at locations 14-614542, 14-614545, 14-614555, and 14-614558 are presented in Table D-1. Concentrations of cobalt decreased with depth at locations 14-614542, 14-614543, 14-614545, 14-614553, and 14-614560, increased slightly with depth at location 14-614555, and remained essentially the same with depth at location 14-614558. Figure G-6 is the scatter plot of Qbt 4 site data for cobalt that shows a linear trend with a positive slope for cobalt and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 cobalt concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of cobalt are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the cobalt Qbt 4 concentrations detected at and surrounding the drain field and at locations 14-614555 and 14-614558 were below or similar to the soil BV. No further sampling to define the lateral extent for the drain field or the vertical extent of cobalt at locations 14-614555 and 14-614558 is warranted.

Copper was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in 13 samples at 11 locations. Copper was not detected above BV in the drainage downgradient of the outfall. The lateral extent of copper is defined for the drainline. Copper was not detected above the soil BV and the concentrations in Qbt 4 were similar at the drain field as well as laterally and downgradient of the drain field. Concentrations detected below the soil BV (14.7 mg/kg) at the 11 locations are presented in Table D-1. Overall, concentrations of copper decreased with depth at locations 14-614542, 14-614543, 14-614545, 14-614550, 14-614553, 14-614556, 14-614558, 14-614560, 14-614561, and 14-614562 and remained essentially the same with depth at location 14-614555. The copper Qbt 4 concentrations detected at locations 14-614545, 14-614550, 14-614553, 14-614556, 14-614558, and 14-614561 were below the maximum Qbt 2, 3, 4 background concentration (6.2 mg/kg). Figure G-7 is the scatter plot of Qbt 4 site data for copper that shows a linear trend with a positive slope for copper and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV. In addition, Table G-1 indicates Qbt 4 copper concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of copper are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the copper Qbt 4 concentrations detected at the 11 locations were below the soil BV. No further sampling to define the lateral extent of copper for the drain field or the vertical extent of copper at location14-614555 is warranted.

Total cyanide was not detected above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg) but had DLs above BV. Because total cyanide was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Iron was detected above the Qbt 2, 3, 4 BV (14,500 mg/kg) in one sample (16,800 mg/kg) from 6–7 ft bgs at location 14-614562. Iron was not detected above BV in the drainage downgradient of the outfall and was not detected above the soil BV. The concentration of iron in Qbt 4 was below the maximum Qbt 2, 3, 4 background concentration (19,500 mg/kg) at the drain field as well as laterally and downgradient of the drain field. The lateral extent of iron is defined. Iron was detected at concentrations of 13,500 mg/kg and 14,600 mg/kg below the soil BV (21,500 mg/kg) from 0–1 ft bgs and 3–4 ft bgs at this location (Table D-1). Concentrations of iron increased with depth, but the iron Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration. The vertical extent of iron is defined.

Lead was detected above the Qbt 2, 3, 4 BV (11.2 mg/kg) in five samples at locations 14-614543, 14-614553, 14-614555, 14-614558, and 14-614560. Lead was not detected above BV in the drainage downgradient of the outfall. The lateral extent of lead is defined for the drainline. Lead was not detected above the soil BV, and the concentrations in Qbt 4 were similar at the drain field as well as laterally and downgradient of the drain field. Figure G-8 is the scatter plot of Qbt 4 site data for lead that shows a linear trend with a positive slope for lead and indicates most concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 lead concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of lead are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV (22.3 mg/kg), the lead Qbt 4 concentrations at the site are below the soil BV. No further sampling to define the lateral extent for the drain field is warranted. Concentrations detected below the soil BV at locations 14-614543, 14-614555, and 14-614558 are presented in Table D-1. Concentrations of lead decreased with depth at all five locations. The vertical extent of lead is defined.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in 12 samples at locations 14-614542, 14-614543, 14-614545, 14-614550, 14-614553, 14-614555, 14-614556, 14-614560, 14-614561, and 14-614562. Magnesium was not detected above BV in the drainage downgradient of the outfall. The lateral extent of magnesium is defined for the drainline. Magnesium was not detected above the soil BV, and the concentrations in Qbt 4 were similar at the drain field as well as laterally and downgradient of the drain field. Concentrations detected below the soil BV (4610 mg/kg) at the 10 locations are presented in Table D-1. Overall, concentrations of magnesium decreased with depth at locations 14-614542, 14-614543, 14-614550, 14-614553, 14-614555, 14-614556, and 14-614561, remained essentially the same with depth at location 14-614545, and increased with depth at locations 14-614560 and 14-614562. The magnesium Qbt 4 concentrations detected at locations 14-614542, 14-614543, 14-614545, 14-614550, 14-614553, 14-614555, 14-614556, 14-614560, and 14-614561 were below the maximum Qbt 2, 3, 4 background concentration (2820 mg/kg). Figure G-9 is the scatter plot of Qbt 4 site data for magnesium that shows a linear trend with a positive slope for magnesium and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 magnesium concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of magnesium are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the magnesium Qbt 4 concentration detected at location 14-614562 was below the soil BV, and no further sampling to define the lateral extent for the drain field or the vertical extent of magnesium at location 14-614562 is warranted.

Manganese was detected above the soil BV (671 mg/kg) in one sample (739 mg/kg) and above the Qbt 2, 3, 4 BV (482 mg/kg) in three samples at locations 14-614543, 14-614558, and 14-614560. Manganese was not detected above BV in the drainage downgradient of the outfall and was not detected above the soil BV and the concentrations in Qbt 4 were below the maximum Qbt 2, 3, 4 background concentration (752 mg/kg) at the drain field as well as laterally and downgradient of the drain field. The lateral extent of manganese is defined. Manganese was detected at concentrations of 451 mg/kg and 414 mg/kg below the soil BV from 0–1 ft bgs and 3–4 ft bgs at location 14-614558 (Table D-1). Concentrations of manganese decreased with depth at locations 14-614543 and 14-614560 and increased with depth at location 14-614558, but the concentration detected in Qbt 4 was below the maximum Qbt 2, 3, 4 background concentration. The vertical extent of manganese is defined.

Mercury was detected above the soil BV (0.1 mg/kg) in three samples at locations 14-614546, 14-614547, and 14-614548. The quantile and slippage tests indicated site concentrations are not different from background (Figure F-3.0-1 and Table F-3). The lateral and vertical extent of mercury are defined.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in 12 samples at 10 locations. Nickel was not detected above BV in the drainage downgradient of the outfall. The lateral extent of nickel is defined for the drainline. Nickel was not detected above the soil BV, and the concentrations in Qbt 4 were similar at the drain field as well as laterally and downgradient of the drain field. Concentrations detected below the soil BV (15.4 mg/kg) at locations 14-614542, 14-614543, 14-614555, 14-614558, and 14-614562 are presented in Table D-1. Concentrations of nickel decreased with depth at locations 14-614542, 14-614543, 14-614545, 14-614553, 14-614555, 14-614556, 14-614559, and 14-614560 and increased with depth at locations 14-614558 and 14-614562. Figure G-10 is the scatter plot of Qbt 4 site data for nickel that shows a linear trend with a positive slope for nickel and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 nickel concentrations are not different from soil background across TA-14, and Table G-2 indicates concentration ranges of nickel are similar between Qbt 4 and soil at this SWMU. Compared with the soil BV, the nickel Qbt 4 concentrations detected at locations 14-614558 and 14-614562 were below the soil BV, and no further sampling to define the lateral extent of nickel for the drain field or the vertical extent of nickel at locations 14-614558 and 14-614562 is warranted.

Nitrate was detected in 33 soil and 14 Qbt 4 samples at 21 locations, with a maximum concentration of 9.3 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in 11 soil and 8 Qbt 4 samples at 13 locations. Perchlorate was not detected or was detected at a concentration below the EQL in the drainage downgradient of the outfall. The lateral extent of perchlorate is defined for the drainline. Perchlorate was not detected or was detected at concentrations below EQLs at the drain field as well as laterally and downgradient of the drain field, except at location14-614560. Concentrations of perchlorate decreased with depth at locations 14-614543, 14-614549, 14-614550, 14-614551, 14-614553, and 14-614561 and increased with depth at locations 14-614554 through 14-614558, 14-614560, and 14-614562. All concentrations of perchlorate detected were below or equivalent to EQLs, except at location 14-614560 where it was detected at a concentration of 0.0071 mg/kg from 6–7 ft bgs. This concentration was at a low level and was not substantially above the EQL (0.0057 mg/kg). No further sampling to define the lateral and vertical extent of perchlorate at location 14-614560 is warranted.

Selenium was detected above the soil BV (1.52 mg/kg) in 6 samples and above the Qbt 2, 3, 4 BV (0.3 mg/kg) in 16 samples at 16 locations. Selenium was not detected above BV in the drainage downgradient of the outfall. The lateral extent of selenium is defined for the drainline. Concentrations of selenium detected at concentrations at the drain field were similar to those detected laterally and downgradient of the drain field. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows the majority of the detected concentrations of selenium are consistent across the site. In addition, Table G-2 indicates concentration ranges of selenium are similar between Qbt 4 and soil at this SWMU. Further sampling to define the lateral extent of selenium for the drain field is not warranted. Compared with the maximum soil background concentration, the selenium Qbt 4 concentrations detected at locations 14-614542, 14-614543, 14-614545, 14-614549, 14-614550, 14-614552, 14-614553, 14-614555, 14-614556, 14-614557, 14-614560, 14-614561, and 14-614562 were below or equivalent to the maximum soil background concentration. Concentrations of selenium increased with depth at locations 14-614544, 14-614558, and 14-614559, and the vertical extent of selenium is not defined at these locations.

Silver was detected above the soil BV (1 mg/kg) in 10 samples and above the Qbt 2, 3, 4 BV (1 mg/kg) in two samples at locations 14-614543, 14-614545, 14-614546, 14-614547, 14-614548, 14-614553, and 14-614554. Concentrations of silver decreased along the drainage downgradient of the outfall, and silver was not detected above BV at the drain field as well as laterally and downgradient of the drain field. The lateral extent of silver is defined. Concentrations of silver decreased with depth at all seven locations. The vertical extent of silver is defined.

Vanadium was detected above the Qbt 2, 3, 4 BV (17 mg/kg) in five samples at locations 14-614542, 14-614543, 14-614553, 14-614555, and 14-614560. Vanadium was detected above BV at location 14-614560 at a concentration similar to the maximum Qbt 2, 3, 4 background concentration (21 mg/kg). Vanadium was not detected above BV in the drainage downgradient of the outfall and was not detected above BV at the drain field as well as laterally and downgradient of the drain field, except at location 14-614560. The lateral extent of vanadium is defined. Concentrations detected below the soil BV (39.6 mg/kg) at locations 14-614542, 14-614543, and 14-614555 are presented in Table D-1. Overall, concentrations of vanadium decreased with depth at all five locations. The vertical extent of vanadium is defined.

Zinc was detected above the soil BV (48.8 mg/kg) in three samples at locations 14-614547, 14-614548, and 14-614551. Concentrations of zinc decreased along the drainage downgradient of the outfall, and zinc was not detected above BV at the drain field as well as laterally and downgradient of the drain field. The lateral extent of zinc is defined. Concentrations of zinc decreased with depth at all three locations. The vertical extent of zinc is defined.

Organic Chemicals

Acenaphthene was detected in two samples at locations 14-614545 and 14-614548 at concentrations below EQLs. Acenaphthene was not detected downgradient of location 14-614548 in the drainage, was not detected laterally and downgradient of the drain field, was not detected in the deeper samples at location 14-614545. It was detected in the deeper sample at location 14-614548 with a concentration below the EQL. The lateral and vertical extent of acenaphthene are defined.

Acetone was detected in 10 samples at nine locations. Acetone was not detected downgradient of location 14-614548 in the drainage and was not detected laterally and downgradient of the drain field. Surface samples were not analyzed for VOCs, but all concentrations detected at deeper depths were below EQLs. The lateral and vertical extent of acetone are defined.

Bis(2-ethylhexyl)phthalate was detected in seven samples at locations 14-614542, 14-614543, 14-614551, 14-614554, 14-614555, and 14-614556. Bis(2-ethylhexyl)phthalate was not detected in the drainage and laterally and downgradient of the drain field. The lateral extent of bis(2-ethylhexyl)phthalate is defined. Bis(2-ethylhexyl)phthalate was not detected in the deeper samples at locations 14-614542, 14-614543, and 14-614554 and was detected in the deeper samples at locations 14-614551 and 14-614556, but the concentrations were below EQLs. Concentrations of bis(2-ethylhexyl)phthalate increased with depth at location 14-614555. However, bis(2-ethylhexyl)phthalate was not detected in the samples with depths ranging from 0–7 ft bgs at location 14-614550, approximately 5 ft to the south of location 14-614555, and it was not detected from 0–1 ft bgs and 3–4 bgs. It was detected at a concentration below the EQL from 6–7 ft bgs at location 14-614556, approximately 10 ft (to the east) downgradient of location 14-614555. The vertical extent of bis(2-ethylhexyl)phthalate is defined.

Dichlorobenzene[1,3-] was detected in one sample (0.00034 mg/kg) from 3–4 ft bgs at location 14-614546. Dichlorobenzene[1,3-] was not detected downgradient of location 14-614546 in the drainage, was not detected laterally and downgradient of the drain field, and was detected in the deeper sample at location 14-614546 with a concentration below the EQL. The lateral and vertical extent of 1,3-dichlorobenzene are defined.

Di-n-butylphthalate was detected in one sample (0.055 mg/kg) below the EQL from 0–1 ft bgs at location 14-614543. Di-n-butylphthalate was not detected in the drainage, was not detected laterally and downgradient of the drain field, and was not detected in the deeper samples at location 14-614543. The lateral and vertical extent of di-n-butylphthalate are defined.

Di-n-octylphthalate was detected in one sample (0.32 mg/kg) below the EQL from 0–1 ft bgs at location 14-614542. Di-n-octylphthalate was not detected in the drainage, was not detected laterally and downgradient of the drain field, and was not detected in the deeper samples at location 14-614542. The lateral and vertical extent of di-n-butylphthalate are defined.

Fluoranthene was detected in one sample (0.036 mg/kg) below the EQL from 0–1 ft bgs at location 14-614552. Fluoranthene was not detected in the drainage, was not detected laterally and downgradient of the drain field, and was not detected in the deeper samples at location 14-614552. The lateral and vertical extent of fluoranthene are defined.

HMX was detected in two samples at locations 14-614542 and 14-614552. HMX was not detected in the drainage, was not detected laterally and downgradient of the drain field, was not detected in the deeper samples at location 14-614542. It was detected in a deeper sample at location 14-614552 with a concentration below the EQL. The lateral and vertical extent of HMX are defined.

Isopropyltoluene[4-] was detected in one sample (0.0006 mg/kg) from 3–4 ft bgs at location 14-614548. Isopropyltoluene[4-] was not detected downgradient of location 14-614548 in the drainage and was not detected laterally and downgradient of the drain field. The surface sample was not analyzed for VOCs, but the concentration detected from 3–4 ft bgs was below the EQL. The lateral and vertical extent of 4-isopropyltoluene are defined.

Methylene chloride was detected in nine samples at nine locations. Methylene chloride was not detected downgradient of location 14-614548 in the drainage and was not detected laterally and downgradient of the drain field. Surface samples were not analyzed for VOCs, but all concentrations detected at deeper depths were below EQLs. The lateral and vertical extent of methylene chloride are defined.

TATB was detected in 19 samples at 14 locations. TATB was detected at a concentration of 1.3 mg/kg from 0–1 ft bgs at location 14-614554. However, TATB was not detected at location 14-614558, approximately 15 ft to the southeast downgradient of location 14-614554. The lateral extent of TATB is defined in the drainage downgradient of the drainline. TATB was detected at a concentration of 0.093 mg/kg below the EQL at location 14-614559 and was not detected laterally (locations 14-614558 and 14-614560) and downgradient (location 14-614562) of the drain field. The lateral extent of TATB is defined for the drain field. Concentrations of TATB decreased with depth at all 14 locations. The vertical extent of TATB is defined.

Trichloroethene was detected in two samples at locations 14-614543 and 14-614549. Trichloroethene was not detected in the drainage, was not detected laterally and downgradient of the drain field, and was detected in the deepest samples at both locations with concentrations below EQLs. The lateral and vertical extent of trichloroethene are defined.

Radionuclides

Cesium-137 was detected in one soil sample (0.146 pCi/g) from 3–4 ft bgs at location 14-614543. Cesium-137 was not detected or detected above the soil FV in the drainage or laterally and downgradient of the drain field. The lateral extent of cesium-137 is defined. Cesium-137 was not detected in Qbt 4 from 6–7 ft at this location. The vertical extent of cesium-137 is defined.

Strontium-90 was detected in one soil sample (0.46 pCi/g) from 3–4 ft bgs at location 14-614556. Strontium-90 was not detected or detected above the soil FV in the drainage or laterally and downgradient of the drain field. The lateral extent of strontium-90 is defined. Strontium-90 was not detected in Qbt 4 from 6–7 ft bgs at this location. The vertical extent of strontium-90 is defined.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, perchlorate, explosive compounds, PCBs, SVOCs, VOCs, gamma-emitting radionuclides, isotopic uranium, and strontium-90 are defined at SWMU 14-007.

The lateral and vertical extent are defined, or no further sampling to define extent is warranted for inorganic chemicals, except the vertical extent of selenium is not defined at locations 14-614544, 14-614558, and 14-614559.

6.13.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for SWMU 14-007 because extent is not defined for the site.

6.13.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for SWMU 14-007 because extent is not defined for the site

6.14 AOC C-14-001, Former Magazine

6.14.1 Site Description and Operation History

AOC C-14-001 is the location of a former magazine (structure 14-1) in the south-central portion of TA-14 (Figure 6.14-1). Constructed in 1944, the wood-framed magazine measured 9 ft wide × 11 ft long × 8 ft high and was covered with an earthen berm on three sides and the top. The magazine was destroyed by burning in 1963.

6.14.2 Relationship to Other SWMUs and AOCs

AOC C-14-001 is a former magazine located at least 450 ft west of the other SWMUs and AOCs at TA-14. It is not associated with other SWMUs or AOCs at TA-14.

6.14.3 Summary of Previous Investigations

During the 1995 RFI conducted at AOC C-14-001, samples were field screened for metals, gross radioactivity, and HE spot tests were performed. Based on field-screening results, three near-surface (0.5–1 ft bgs) samples were collected and submitted for off-site analysis of TAL metals and HE (LANL 1996, 054086, pp. 5-93–5-94). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed three metals detected above BVs and HE was detected.

6.14.4 Site Contamination

6.14.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC C-14-001:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Ten samples were collected from five locations within and around the structure footprint at 0–1 ft and 3–4 ft bgs. Samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, and VOCs (excluding surface samples).

The 2011 sampling locations at AOC C-14-001 are shown in Figure 6.14-1. Table 6.14-1 presents the 2011 samples collected and the analyses requested for AOC C-14-001. The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.14.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.14.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC C-14-001 consist of the results from 10 samples (6 soil and 4 Qbt 4) collected from five locations in 2011. The extent of contamination is defined at AOC C-14-001. Therefore, the COPCs for the site are identified below.

Inorganic Chemicals

All 10 samples (6 soil and 4 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.14-2 presents the inorganic chemicals above BVs. Figure 6.14-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Eight TAL metals (aluminum, antimony, barium, calcium, chromium, cobalt, nickel, and selenium) were detected above BVs or not detected but had DLs above BV. Total cyanide was not detected above BV but had DLs above BV. Nitrate was detected and perchlorate was not detected.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) and the maximum Qbt 2, 3, 4 background concentration (8370 mg/kg) in four samples, with a maximum concentration of 10,200 mg/kg. Aluminum is identified as a COPC in tuff.

Antimony was not detected but had DLs (0.53 mg/kg to 0.54 mg/kg) above Qbt 2, 3, 4 BV (0.5 mg/kg) in four samples. Antimony is identified as a COPC in tuff.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) and the maximum Qbt 2, 3, 4 background concentration (51.6 mg/kg) in four samples, with a maximum concentration of 104 mg/kg. Barium is identified as a COPC in tuff.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) and the maximum Qbt 2, 3, 4 background concentration (2230 mg/kg) in one sample (5300 mg/kg). Calcium is identified as a COPC in tuff.

Chromium was detected above the soil BV (19.3 mg/kg) and the maximum soil background concentration (36.5 mg/kg) in one sample (75.5 mg/kg) and was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) and the maximum Qbt 2, 3, 4 background concentration (13 mg/kg) in one sample (21.5 mg/kg). Chromium is identified as a COPC in soil and tuff.

Cobalt was detected above the Qbt 2, 3, 4 BV (3.14 mg/kg) in four samples, with a maximum concentration of 4.3 mg/kg. Cobalt is identified as a COPC in tuff.

Total cyanide was not detected above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg) but had DLs (0.53 mg/kg to 0.57 mg/kg) above the soil and tuff BV (0.5 mg/kg). Total cyanide is identified as a COPC in soil and tuff.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) and the maximum Qbt 2, 3, 4 background concentration (7 mg/kg) in one sample (12.2 mg/kg). Nickel is identified as a COPC in tuff.

Nitrate was detected in all 10 samples at the five locations, with a maximum concentration of 0.77 mg/kg. Nitrate is naturally occurring, and the concentrations detected likely reflect naturally occurring levels. Nitrate is not identified as a COPC.

Selenium was detected above the Qbt 2, 3, 4 BV (0.3 mg/kg) in four samples, with a maximum concentration of 1.4 mg/kg. Selenium is identified as a COPC in tuff.

In summary, the inorganic COPCs identified at AOC C-14-001 are aluminum, antimony, barium, calcium, chromium, cobalt, total cyanide, nickel, and selenium.

Organic Chemicals

All 10 samples (6 soil and 4 Qbt 4) were analyzed for explosive compounds and SVOCs. Two samples (one soil and one Qbt 4) were analyzed for PCBs. Five samples (one soil and four Qbt 4) were analyzed for VOCs. Table 6.14-3 presents the detected organic chemicals. Figure 6.14-3 shows the spatial distribution of detected organic chemicals.

One SVOC (benzoic acid) was detected. Explosive compounds, PCBs, and VOCs were not detected.

Benzoic acid is retained as a COPC at AOC C-14-001.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-001 based on site operation history (LANL 2011, 207481, p. 6).

6.14.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic COPCs

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) in four samples from 3–4 ft bgs at locations 14-614606 through 14-614609. Concentrations detected below the soil BV (29,200 mg/kg) at the site are presented in Table D-1. Concentrations of aluminum either decreased or remained essentially the same laterally. The lateral extent of aluminum is defined. Concentrations of aluminum decreased with depth at locations 14-614606, 14-614607, and 14-614609 and increased slightly with depth at location 14-614608. Figure G-13 is the scatter plot of Qbt 4 site data for aluminum that shows a linear trend with a positive slope for aluminum and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 aluminum concentrations are not different from soil background across TA-14, and Table G-2 indicates the soil concentration is the same as the maximum Qbt 4 concentration of aluminum at this AOC. Compared with the soil BV, the aluminum Qbt 4 concentration detected at location 14-614608 was below the soil BV, and no further sampling to define the vertical extent for aluminum at location 14-614608 is warranted.

Antimony was not detected but had DLs above BV. Because antimony was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in four samples from 3–4 ft bgs at locations 14-614606 through 14-614609. Concentrations detected below the soil BV (295 mg/kg) at the site are presented in Table D-1. Concentrations of barium decreased laterally, decreased with depth at locations 14-614606, 14-614607, and 14-614609, and remained essentially the same with depth at location 14-614608. The lateral and vertical extent of barium are defined.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in one sample (5300 mg/kg) from 3–4 ft bgs at location 14-614606. Calcium was detected at a concentration of 2150 mg/kg (below the soil BV of 6120 mg/kg) from 0–1 ft bgs at this location (Table D-1). Concentrations of calcium increased laterally to the northeast and increased with depth at this location. Figure G-4 is the scatter plot of Qbt 4 site data for calcium that shows a linear trend with a positive slope for calcium and indicates the concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 calcium concentrations are not different from soil background across TA-14. Compared with the soil BV, the calcium Qbt 4 concentration of 5300 mg/kg detected at location 14-614606 was below the soil BV. No further sampling to define the lateral and vertical extent for calcium at location 14-614606 is warranted.

Chromium was detected above the soil BV (19.3 mg/kg) in one sample (75.5 mg/kg) at location 14-614605 and above the Qbt 2, 3, 4 BV (7.14 mg/kg) in one sample (21.5 mg/kg) at location 14-614606. Chromium was detected at a concentration of 7.7 mg/kg (below the soil BV) from 0–1 ft bgs at location 14-614606 (Table D-1). Concentrations of chromium decreased laterally. The lateral extent of chromium is defined. Concentrations of chromium decreased with depth at location 14-614605 but increased with depth at location 14-614606. Figure G-5 is the scatter plot of Qbt 4 site data for chromium that shows a linear trend with a positive slope for chromium and indicates most concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 chromium concentrations are not different from soil background across TA-14, and Table G-2 indicates the soil concentration is within the Qbt 4 concentration range of chromium at this AOC. Compared with the maximum soil background concentration (36.5 mg/kg), the chromium Qbt 4 concentration of 21.5 mg/kg detected from 3–4 ft bgs at location 14-614606 was below the maximum soil background concentration. No further sampling to define the vertical extent for chromium at location 14-614606 is warranted.

Cobalt was detected above the Qbt 2, 3, 4 BV (3.14 mg/kg) in four samples from 3–4 ft bgs at locations 14-614606 through 14-614609. Concentrations detected below the soil BV (8.64 mg/kg) at the site are presented in Table D-1. Concentrations of cobalt either decreased or remained essentially the same laterally and decreased with depth at all four locations. The lateral and vertical extent of cobalt are defined.

Total cyanide was not detected above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg) but had DLs above BV. Because total cyanide was not detected above BV, and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in one sample (12.2 mg/kg) from 3–4 ft bgs at location 14-614606. Nickel was detected at a concentration of 6.2 mg/kg (below the soil BV of 15.4 mg/kg) from 0–1 ft bgs at location 14-614606 (Table D-1). Concentrations of nickel increased laterally to the northeast and increased with depth at this location. Figure G-10 is the scatter plot of Qbt 4 site data for nickel that shows a linear trend with a positive slope for nickel and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 nickel concentrations are not different from soil background across TA-14, and Table G-2 indicates the soil concentration is within the Qbt 4 concentration range of nickel at this AOC. Compared with the soil BV, the nickel Qbt 4 concentration of 12.2 mg/kg detected in Qbt 4 at location 14-614606 was below the soil BV. No further sampling to define the lateral and vertical extent for nickel at location 14-614606 is warranted.

Selenium was detected above the Qbt 2, 3, 4 BV (0.3 mg/kg) in four samples from 3–4 ft bgs at locations 14-614606 through 14-614609. Concentrations detected below the soil BV (1.52 mg/kg) at the site are presented in Table D-1. Concentrations of selenium remained essentially the same laterally and with depth at these four locations. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows the majority of the detected concentrations of selenium are consistent across the site. In addition, Table G-2 indicates the soil concentration is the same as the maximum Qbt 4 concentration of selenium at this AOC. Compared with the soil BV, the selenium Qbt 4 concentrations detected at the four locations were below the soil BV. No further sampling to define the lateral and vertical extent for selenium is warranted.

Organic COPCs

Benzoic acid was detected in one sample (0.36 mg/kg) from 3–4 ft bgs at location 14-614609. The surface sample was not analyzed for VOCs, but the concentration detected from 3–4 ft bgs was below the EQL. The lateral and vertical extent of benzoic acid are defined.

Radionuclide COPCs

Samples were not analyzed for radionuclides at AOC C-14-001.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, perchlorate, explosive compounds, PCBs, SVOCs, and VOCs are defined at AOC C-14-001.

The lateral and vertical extent are defined or no further sampling to define extent is warranted for inorganic chemicals at AOC C-14-001.

6.14.5 Summary of Human Health Risk Screening

The human health risk-screening assessments are presented in section H-4.0 in Appendix H. Because no carcinogens were retained as COPCs at AOC C-14-001, no carcinogenic risk exists at AOC C-14-001. Radionuclides were not analyzed at AOC C-14-001.

Industrial Scenario

The HI for industrial scenario is 0.06, which is below the NMED target HI of 1 (NMED 2009, 108070).

Construction Worker Scenario

The HI for construction worker scenario is 0.6, which is below the NMED target HI of 1 (NMED 2009, 108070).

Residential Scenario

The HI for residential scenario is 0.6, which is below the NMED target HI of 1 (NMED 2009, 108070).

In summary, because no carcinogens were retained as COPCs at AOC C-14-001, no carcinogenic risk exists at AOC C-14-001. The human health risk-screening assessments indicated no potential unacceptable noncarcinogenic risk exists for the industrial, construction worker, and residential scenarios at AOC C-14-001.

6.14.6 Summary of Ecological Risk Screening

The ecological risk-screening assessments are presented in section H-5.0 in Appendix H.

No potential ecological risks exist for any receptor at AOC C-14-001 based on minimum ESL comparisons, HI analyses, comparisons to background concentrations, and potential effects to populations (individuals for T&E species).

6.15 AOC C-14-002, Former Building

6.15.1 Site Description and Operation History

AOC C-14-002 is the location of a former control building (structure 14-3) in the southeastern portion of TA-14 (Figure 6.15-1). Constructed in 1944, the wood-frame building measured 8 ft wide × 14 ft long × 8 ft high with a 6-ft-square × 8-ft-high addition. The building was removed in 1952. The location of the former building is currently beneath the paved access road to the bullet test facility.

6.15.2 Relationship to Other SWMUs and AOCs

The location of AOC C-14-002 is currently paved over. Former firing sites SWMUs 14-002(a,b) are the likely source of any potential contamination at AOC C-14-002.

6.15.3 Summary of Previous Investigations

No previous investigation has been conducted at AOC C-14-002.

6.15.4 Rationale for Delayed Investigation

The RFI work plan for Operable Unit 1085 did not identify any releases from AOC C-14-002 itself but noted the area may have residual contamination because of its location (LANL 1994, 034755, p. 5-3-5). Therefore, the source of potential contamination at this site appears to be the adjacent deferred active firing sites, including SWMUs 14-002(a,b). It is therefore proposed that site characterization and investigation be delayed until the adjacent deferred sites [SWMUs 14-002(a,b)] undergo investigation (LANL 2011, 207481, p. 6).

6.16 AOC C-14-003, Former Building

6.16.1 Site Description and Operation History

AOC C-14-003 is the location of a former HE-preparation building (structure 14-4) in the southeastern portion of TA-14 (Figure 6.16-1). Constructed in 1944, the wood-framed building measured 12 ft wide × 25 ft long × 8 ft high. The building was removed in 1952.

6.16.2 Relationship to Other SWMUs and AOCs

AOC C-14-003 is not associated with other SWMUs and AOCs at TA-14. The nearby sites under investigation include AOC 14-004(a), a storage area housed in a magazine, and AOC C-14-005, the location of a former storage building. AOC 14-004(a) is located approximately 30 ft southwest, and AOC C-14-005 is approximately 100 ft northeast.

6.16.3 Summary of Previous Investigations

During the 1995 RFI conducted at AOC C-14-003, samples were field screened for metals, gross radioactivity, and HE spot tests were performed. Based on field-screening results, two surface (0–0.25 ft and 0–0.5 ft bgs) samples were collected and submitted for off-site analysis of TAL metals, gamma spectroscopy, and HE (LANL 1996, 054086, p. 5-53). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed uranium-238 detected above BVs and HE was detected.

The 1995 RFI was conducted at the former site boundary that has been modified during this investigation (section 6.16.4).

6.16.4 Rationale for Delayed Investigation

Sampling was proposed at AOC C-14-003 in the FIP (LANL 2011, 207481, pp. 6–7). However, a 1946 aerial photo (SNL 1946, 015397) was found during the investigation, and the site boundary was subsequently modified based on this new information (Figure 6.16-1). The revised site boundary is approximately 30 ft to the west of the site boundary presented in the FIP. Therefore, the proposed 2011 sampling locations are not applicable to the site. The revised site boundary is partially covered by the berm area north of the active magazine (structure 14-22) [AOC 14-004(a)]. It is therefore proposed that site characterization and investigation be delayed until the decommissioning of the AOC 14-004(a) magazine.

6.17 AOC C-14-004, Former Building

6.17.1 Site Description and Operation History

AOC C-14-004 is the location of a former electronics shop (structure 14-7) that was approximately 75 ft west of building 14-23 in the southeastern portion of TA-14 (Figure 6.17-1). Constructed in 1945, the wood-framed building with concrete foundation measured 15 ft wide × 24 ft long × 9 ft high. The building, including the concrete foundation, was removed in 1952.

6.17.2 Relationship to Other SWMUs and AOCs

AOC C-14-004 is not associated with other SWMUs and AOCs at TA-14. The nearby sites under investigation include AOC 14-004(a), a storage area housed in a magazine, and the location of a former storage building AOC C-14-007. AOC 14-004(a) is located approximately 120 ft north, and AOC C-14-007 is approximately 100 ft west.

6.17.3 Summary of Previous Investigations

During the 1995 RFI conducted at AOC C-14-004, samples were field screened for metals, gross radioactivity, and HE spot tests were performed. Based on field-screening results, two surface (0–0.25 ft bgs) samples were collected and submitted for off-site analysis of SVOCs (LANL 1996, 054086, pp. 5-53–5-57). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed one organic chemical detected, 4-chloro-3-methyl phenol.

6.17.4 Site Contamination

6.17.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC C-14-004:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Twelve samples were collected from six locations within and around the structure footprint at 0–1 ft and 3–4 ft bgs. Samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, and VOCs (excluding surface samples).

The 2011 sampling locations at AOC C-14-004 are shown in Figure 6.17-1. Table 6.17-1 presents the 2011 samples collected and the analyses requested for AOC C-14-004. The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.17.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.17.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC C-14-004 consist of the results from 12 samples (6 soil and 6 Qbt 4) collected from six locations in 2011. The extent of contamination is not defined at AOC C-14-004. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 12 samples (6 soil and 6 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.17-2 presents the inorganic chemicals above BVs. Figure 6.17-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Fourteen TAL metals (aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, nickel, selenium, and vanadium) were detected above BVs or not detected but had DLs above BV. Total cyanide was not detected but had DLs above BV. Nitrate and perchlorate were detected.

Organic Chemicals

All 12 samples (6 soil and 6 Qbt 4) were analyzed for explosive compounds and SVOCs, 4 samples (2 soil and 2 Qbt 4) were analyzed for PCBs, and 6 samples (1 soil and 5 Qbt 4) were analyzed for VOCs. Table 6.17-3 presents the detected organic chemicals. Figure 6.17-3 shows the spatial distribution of detected organic chemicals.

Two explosive compounds (HMX and TATB) and one VOC (acetone) were detected. PCBs and SVOCs were not detected.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-004 based on site operation history (LANL 2011, 207481, p. 7).

6.17.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) in four samples at locations 14-614622, 14-614623, 14-614624, and 14-614642. Concentrations detected below the soil BV (29200 mg/kg) at locations 14-614622, 14-614623, and 14-614624 are presented in Table D-1. Concentrations of aluminum decreased laterally. The lateral extent of aluminum is defined. Concentrations of aluminum increased with depth at locations 14-614622, 14-614623, 14-614624, and 14-614642. Figure G-13 is the scatter plot of Qbt 4 site data for aluminum that shows a linear trend with a positive slope for aluminum and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 aluminum concentrations are not different from soil background across TA-14, and Table G-2 indicates the soil concentration is within the Qbt 4 concentration range of aluminum at this AOC. Compared with the soil BV, the aluminum Qbt 4 concentrations detected at locations 14-614622, 14-614623, 14-614624, and 14-614642 were below the soil BV. No further sampling to define the vertical extent for aluminum is warranted.

Antimony was not detected above BV but had DLs above BV. Because antimony was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of antimony are defined.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in three samples at locations 14-614622, 14-614623, and 14-614624. Concentrations detected below the soil BV (8.17 mg/kg) at these three locations are presented in Table D-1. Concentrations of arsenic decreased laterally, remained essentially the same with depth at location 14-614622, and increased with depth at locations 14-614623 and 14-614624. All three arsenic Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (5 mg/kg). The lateral and vertical extent of arsenic are defined.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in five samples at locations 14-614622, 14-614623, 14-614624, and 14-614642. Concentrations of barium decreased with depth at location 14-614642. Concentrations detected below the soil BV (295 mg/kg) at locations 14-614622, 14-614623, and 14-614624 are presented in Table D-1. Concentrations of barium decreased laterally. The lateral extent of barium is defined. Concentrations of barium decreased with depth at location 14-614642 and increased with depth at locations 14-614622, 14-614623, and 14-614624. Figure G-3 is the scatter plot of Qbt 4 site data for barium that shows a linear trend with a positive slope for barium and indicates concentrations across TA-14 were below or equal to the soil BV. In addition, Table G-1 indicates Qbt 4 barium concentrations are not different from soil background across TA-14, and Table G-2 indicates the soil concentration is within the Qbt 4 concentration range of barium at this AOC. Compared with the soil BV, the barium Qbt 4 concentrations detected at locations 14-614622, 14-614623, and 14-614624 were below or equal to the soil BV. No further sampling to define the vertical extent for barium is warranted.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in three samples at locations 14-614622, 14-614623, and 14-614624. Concentrations detected below the soil BV (6120 mg/kg) at these three locations are presented in Table D-1. Concentrations of calcium decreased laterally to the west, north, and south, increased laterally to the east at location 14-614624, and increased with depth locations 14-614622, 14-614623, and 14-614624. Figure G-4 is the scatter plot of Qbt 4 site data for calcium that shows a linear trend with a positive slope for calcium and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 calcium concentrations are not different from soil background across TA-14, and Table G-2 indicates the soil concentration is within the Qbt 4 concentration range of calcium at this AOC. Compared with the soil BV, the calcium Qbt 4 concentrations detected at locations 14-614622, 14-614623, and 14-614624 were below the soil BV. No further sampling to define the lateral and vertical extent for calcium is warranted.

Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in two samples at locations 14-614622 and 14-614623. Concentrations of chromium decreased laterally. Chromium was detected at concentrations of 7.7 mg/kg and 5.8 mg/kg below the soil BV (19.3 mg/kg) from 0–1 ft bgs at locations 14-614622 and 14-614623, respectively (Table D-1). Concentrations of chromium increased with depth at both locations, but both concentrations detected in Qbt 4 were below the maximum Qbt 2, 3, 4 background concentration (13 mg/kg). The lateral and vertical extent of chromium are defined.

Cobalt was detected above the Qbt 2, 3, 4 BV (3.14 mg/kg) in three samples at locations 14-614622, 14-614623, and 14-614642. Cobalt was detected at concentrations of 6.1 mg/kg and 4.3 mg/kg (below the soil BV of 8.64 mg/kg) from 0–1 ft bgs at locations 14-614622 and 14-614623, respectively (Table D-1). Concentrations of cobalt decreased laterally. The lateral extent of cobalt is defined. Concentrations of cobalt decreased with depth at locations 14-614622 and 14-614642 and remained essentially the same with depth at location 14-614623. The vertical extent of cobalt is defined.

Copper was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in four samples at locations 14-614622, 14-614623, 14-614624, and 14-614642. Concentrations detected below the soil BV (14.7 mg/kg) at locations 14-614622, 14-614623, and 14-614624 are presented in Table D-1. Concentrations of copper decreased laterally to the west, north, and east, but increased laterally to the south at location 14-614642. Figure G-7 is the scatter plot of Qbt 4 site data for copper that shows a linear trend with a positive slope for copper and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV. In addition, Table G-1 indicates Qbt 4 copper concentrations are not different from soil background across TA-14, and Table G-2 indicates the soil concentration is slightly above the Qbt 4 concentration range of copper at this AOC. Compared with the soil BV (14.7 mg/kg), the copper Qbt 4 concentration of 7.8 mg/kg detected from 0–1 ft bgs at location 14-614642 was below the soil BV. No further sampling to define the lateral extent of copper is warranted. Concentrations of copper decreased with depth at location 14-614642 and increased with depth at locations 14-614622, 14-614623, 14-614624, but the copper Qbt 4 concentrations detected at locations 14-614622, 14-614623, and 14-614624 were below or similar to the maximum Qbt 2, 3, 4 background concentration (6.2 mg/kg). The vertical extent of copper is defined.

Total cyanide was not detected but had DLs above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg). Because total cyanide was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Iron was detected above the Qbt 2, 3, 4 BV (14,500 mg/kg) in one sample (15,800 mg/kg) from 3–4 ft bgs at location 14-614622. Concentrations of iron decreased laterally. Iron was detected at a concentration of 12000 mg/kg below the soil BV (21500 mg/kg) from 0–1 ft bgs at this location (Table D-1). Concentrations of iron increased with depth, but the iron Qbt 4 concentration was below the maximum Qbt 2, 3, 4 background concentration (19,500 mg/kg). The lateral and vertical extent of iron are defined.

Lead was detected above the soil BV (22.3 mg/kg) in one sample (26.5 mg/kg) and above the Qbt 2, 3, 4 BV (11.2 mg/kg) in three samples at locations 14-614622, 14-614623, 14-614625, and 14-614642. Concentrations of lead decreased with depth at locations 14-614625 and 14-614642. Concentrations detected below the soil BV (22.3 mg/kg) at locations 14-614622 and 14-614623 are presented in Table D-1. Concentrations of lead decreased laterally to the east and north but increased laterally to the west at location 14-614625 and the south at location 14-614642. The concentration of 26.5 mg/kg detected in soil at location 14-614625 was below the maximum soil background concentration (28 mg/kg). Figure G-8 is the scatter plot of Qbt 4 site data for lead that shows a linear trend with a positive slope for lead and indicates most concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 lead concentrations are not different from soil background across TA-14, and Table G-2 indicates the soil concentration is within the Qbt 4 concentration range of lead at this AOC. Compared with the soil BV, the concentration of 17.6 mg/kg detected in Qbt 4 at location 14-614642 was below the soil BV. The lateral extent of lead is defined at locations 14-614624, 14-614525, and 14-614626, and no further sampling to define the lateral extent of lead at location 14-614642 is warranted. Concentrations of lead decreased with depth at locations 14-614622, 14-614625, and 14-614642 and increased with depth at location 14-614623, but the lead Qbt 4 concentration detected at location 14-614623 was similar to the maximum Qbt 2, 3, 4 background concentration (15.5 mg/kg). The vertical extent of lead is defined.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in three samples at locations 14-614622, 14-614623, and 14-614624. Concentrations detected below the soil BV (4610 mg/kg) at these three locations are presented in Table D-1. Concentrations of magnesium decreased laterally but increased with depth at all three locations. However, all magnesium Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in three samples at locations 14-614622, 14-614623, and 14-614624. Concentrations detected below the soil BV (15.4 mg/kg) at these three locations are presented in Table D-1. Concentrations of nickel decreased laterally but increased with depth at all three locations. However, two of the three nickel Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (7 mg/kg), and the other concentration (7.8 mg/kg) was not substantially above the maximum Qbt 2, 3, 4 background concentration. The lateral and vertical extent of nickel are defined.

Nitrate was detected in all 12 samples at six locations, with a maximum concentration of 3.9 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected at the site likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in three soil and four Qbt 4 samples at locations 14-614622, 14-614623, 14-614624, and 14-614642. Concentrations of perchlorate did not change substantially to the east at location 14-614624 and decreased laterally to the west, south, and north. The lateral extent of perchlorate is defined. Concentrations of perchlorate increased with depth at locations 14-614622, 14-614624, and 14-614642 and remained essentially the same with depth at location 14-614623. The concentration detected at location 14-614642 was below the EQL. The vertical extent of perchlorate is not defined at locations 14-614622 and 14-614624.

Selenium was detected above the Qbt 2, 3, 4 BV (0.3 mg/kg) in six samples at locations 14-614622 through 14-614625 and 14-614642. Concentrations detected below the soil BV (1.52 mg/kg) at locations 14-614622 through 14-614625 are presented in Table D-1. Concentrations of selenium decreased laterally to the north and did not change substantially to the west, south, and east. The lateral extent of selenium is defined. Concentrations of selenium remained essentially the same with depth at locations 14-614622 and 14-614625 and increased with depth at locations 14-614623, 14-614624, and 14-614642, Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows that the majority of the detected concentrations of selenium are consistent across the site. In addition, Table G-2 indicates the soil concentration is similar to the Qbt 4 concentration range of selenium at this AOC. Compared with the soil BV (1.52 mg/kg) and the maximum soil background concentration (1.8 mg/kg), the selenium Qbt 4 concentrations detected at the five locations were below the soil BV or the maximum soil background concentration. No further sampling to define the vertical extent for selenium is warranted.

Vanadium was detected above the Qbt 2, 3, 4 BV (17 mg/kg) in two samples at locations 14-614622 and 14-614623. Vanadium was detected at concentrations of 21.8 mg/kg and 15 mg/kg below the soil BV (39.6 mg/kg) from 0–1 ft bgs at locations 14-614622 and 14-614623, respectively (Table D-1). Concentrations of lead decreased laterally, decreased with depth at location 14-614622, and increased with depth at location 14-614623. Both vanadium Qbt 4 concentrations were below the maximum Qbt 2, 3, 4 background concentration (21 mg/kg). The lateral and vertical extent of vanadium are defined.

Organic Chemicals

Acetone was detected in three samples at locations 14-614622, 14-614623, and 14-614625. Surface samples were not analyzed for VOCs, but all three concentrations detected from 3–4 ft bgs were below EQLs. The lateral and vertical extent of acetone are defined.

HMX was detected in two samples at locations 14-614623 and 14-614642. Both concentrations were below EQLs and HMX was not detected from 3–4 ft bgs at both locations. The lateral and vertical extent of HMX are defined.

TATB was detected in 10 samples at locations 14-614622 through 14-614626 and 14-614642. Concentrations of TATB decreased laterally to the west, north, and east, but increased to the south at location 14-614642. The lateral extent of TATB is not defined at location 14-614642. Concentrations of TATB decreased with depth at locations 14-614622, 14-614623, 14-614626, and 14-614642. TATB was not detected in the sample from 3–4 ft bgs at locations 14-614624 and 14-614625. The vertical extent of TATB is defined.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-004.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, PCBs, SVOCs, and VOCs are defined at AOC C-14-004.

The lateral and vertical extent are defined or no further sampling to define extent is warranted for inorganic chemicals at AOC C-14-004.

The lateral extent of perchlorate is defined, but the vertical extent of perchlorate is not defined at locations 14-614622 and 14-614624.

The lateral and vertical extent of explosive compounds are defined, except the lateral extent of TATB is not defined at location 14-614642.

6.17.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC C-14-004 because extent is not defined for the site.

6.17.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC C-14-004 because extent is not defined for the site.

6.18 AOC C-14-005, Former Building

6.18.1 Site Description and Operation History

AOC C-14-005 is the location of a former storage building (structure 14-8) that was approximately 75 ft north of building 14-6 at TA-14 (Figure 6.18-1). Constructed in 1944, the wood-framed building measured 6 ft wide × 16 ft long × 9 ft high. The building was removed in 1952.

6.18.2 Relationship to Other SWMUs and AOCs

AOC C-14-005 is not associated with other SWMUs and AOCs at TA-14. The nearby sites under investigation include AOC C-14-003, the location of a former HE-preparation building, and

SWMU 14-007, the decommissioned septic system that served building 14-6. AOC C-14-003 is located approximately 100 ft southwest, and SWMU 14-007 is approximately 75 ft south-southeast.

6.18.3 Summary of Previous Investigations

During the 1995 RFI conducted at AOC C-14-005, samples were field screened for metals, gross radioactivity, and HE spot tests were performed. Based on field-screening results, two surface (0–0.5 ft bgs) samples were collected and submitted for off-site analysis of TAL metals, HE, and total uranium (LANL 1996, 054086, pp. 5-57–5-61). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed lead, thallium, and mercury detected above BVs.

6.18.4 Site Contamination

6.18.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC C-14-005:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Ten samples were collected from five locations within and around the structure footprint at 0–1 ft and 3–4 ft bgs. Samples were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, and VOCs (excluding surface samples).

The 2011 sampling locations at AOC C-14-005 are shown in Figure 6.18-1. Table 6.18-1 presents the 2011 samples collected and the analyses requested for AOC C-14-005. The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.18.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.18.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC C-14-005 consist of the results from 10 soil samples collected from five locations in 2011. The extent of contamination is not defined at AOC C-14-005. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 10 soil samples were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.18-2 presents the inorganic chemicals above BVs. Figure 6.18-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Three TAL metals (lead, mercury, and selenium) were detected above BVs. Total cyanide was not detected but had DLs above BV. Nitrate and perchlorate were detected.

Organic Chemicals

All 10 soil samples were analyzed for explosive compounds and SVOCs, two soil samples were analyzed for PCBs, and five soil samples were analyzed for VOCs. Table 6.18-3 presents the detected organic chemicals. Figure 6.18-3 shows the spatial distribution of detected organic chemicals.

One explosive compound (TATB), one SVOC (fluoranthene), and two VOCs (acetone and 4-isopropyltoluene) were detected. PCBs were not detected.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-005 based on site operation history (LANL 2011, 207481, p. 7).

6.18.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Total cyanide was not detected but had DLs above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg). Because total cyanide was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Lead was detected above the soil BV (22.3 mg/kg) in one sample (24 mg/kg) from 0–1 ft bgs at location 14-614628. Concentrations of lead increased laterally to the north at location 14-614628 and decreased with depth at this location, but the concentration detected was below the maximum soil background concentration (28 mg/kg). The lateral and vertical extent of lead are defined.

Mercury was detected above the soil BV (0.1 mg/kg) in five samples from 0–1 ft bgs at locations 14-614627 through 14-614631. Concentrations of mercury decreased to the east, did not change substantially to the west and south, but increased to the north at location 14-614628. The lateral extent of mercury is not defined. Concentrations of mercury decreased with depth at all five locations. The vertical extent of mercury is defined.

Nitrate was detected in 10 samples at five locations, with a maximum concentration of 3.6 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected at the site likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in four soil samples from 3–4 ft bgs at locations 14-614627, 14-614628, 14-614630, and 14-614631. Concentrations of perchlorate decreased laterally to the west, north, and east, increased to the south at location 14-614630, and increased with depth at all four locations. However, the concentrations of perchlorate detected at locations 14-614627, 14-614628, and 14-614631 were below EQLs. The lateral extent and vertical extent of perchlorate are not defined at location 14-614630.

Selenium was detected above the soil BV (1.52 mg/kg) in one sample (1.8 mg/kg) from 3–4 ft bgs at location 14-614628. Selenium was detected at a concentration of 1.2 mg/kg below the soil BV from 0–1 ft bgs at this location (Table D-1). Concentrations of selenium increased laterally to the north at location 14-614628 and increased with depth at this location, but the concentration detected from 3–4 ft bgs was similar to the maximum soil background concentration (1.7 mg/kg). The lateral and vertical extent of selenium are defined.

Organic Chemicals

Acetone was detected in one sample (0.076 mg/kg) from 3–4 ft bgs at location 14-614631. The lateral and vertical extent of acetone are not defined at location 14-614631.

Fluoranthene was detected in one sample (0.041 mg/kg) from 0–1 ft bgs at location 14-614631. The concentration was below the EQL, and fluoranthene was not detected from 3–4 ft bgs at this location. The lateral and vertical extent of fluoranthene are defined.

Isopropyltoluene[4-] was detected in one sample (0.019 mg/kg) from 3–4 ft bgs at location 14-614631. The lateral and vertical extent of 4-isopropyltoluene are not defined at location 14-614631.

TATB was detected in four samples from 0–1 ft bgs at locations 14-614627, 14-614629, 14-614630, and 14-614631. Concentrations of TATB decreased laterally in all four directions. The lateral extent of TATB is defined. TATB was not detected in the samples from 3–4 ft bgs at these four locations. The vertical extent of TATB is defined.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-005.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, explosive compounds, PCBs, and SVOCs are defined at AOC C-14-005.

The lateral and vertical extent of inorganic chemicals are defined, except the lateral extent of mercury is not defined at location 14-614628.

The lateral extent and vertical extent of perchlorate are not defined at location 14-614630.

The lateral and vertical extent of VOCs are defined, except the lateral and vertical extent of acetone and 4-isopropyltoluene are not defined at location 14-614631.

6.18.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC C-14-005 because extent is not defined for the site.

6.18.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC C-14-005 because extent is not defined for the site.

6.19 AOC C-14-007, Former Storage Building

6.19.1 Site Description and Operation History

AOC C-14-007 is the location of a former storage building (structure 14-10) that was located approximately 130 ft west of building 14-24 in the southeastern portion of TA-14 (Figure 6.19-1). Constructed in 1945, the wood-framed building measured 10 ft square × 8 ft high. The building was removed in 1952.

6.19.2 Relationship to Other SWMUs and AOCs

AOC C-14-007 is not associated with other SWMUs and AOCs at TA-14. The nearby sites under investigation include AOC 14-004(a), a storage area housed in a magazine, and AOC C-14-004, the location of a former electronics shop. AOC 14-004(a) is located approximately 150 ft northeast, and AOC C-14-004 is approximately 100 ft east.

6.19.3 Summary of Previous Investigations

During the 1995 RFI conducted at AOC C-14-007, samples were field screened for metals, gross radioactivity, and HE spot tests were performed. Based on field-screening results, two surface (0–0.5 ft bgs) samples were collected and submitted for off-site analysis of TAL metals, HE, SVOCs, and total uranium (LANL 1996, 054086, pp. 5-64–5-69). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed lead, thallium, and total uranium detected above BVs and TNT detected in one sample.

6.19.4 Site Contamination

6.19.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC C-14-007:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Ten samples were collected from five locations within and around the structure footprint at 0–1 ft and 3–4 ft bgs and were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, and VOCs (excluding surface samples).

The 2011 sampling locations at AOC C-14-007 are shown in Figure 6.19-1. Table 6.19-1 presents the 2011 samples collected and the analyses requested for AOC C-14-007. The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.19.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.19.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC C-14-007 consist of the results from 10 samples (four soil and six Qbt 4) collected from five locations in 2011. The extent of contamination is not defined at AOC C-14-007. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 10 samples (4 soil and 6 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.19-2 presents the inorganic chemicals above BVs. Figure 6.19-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Ten TAL metals (antimony, arsenic, barium, calcium, chromium, copper, lead, magnesium, nickel, and selenium) were detected above BVs. Total cyanide was not detected above BV but had DLs above BV. Nitrate and perchlorate were detected.

Organic Chemicals

All 10 samples (4 soil and 6 Qbt 4) were analyzed for explosive compounds and SVOCs, 2 samples (1 soil and 1 Qbt 4) were analyzed for PCBs, and 5 Qbt 4 samples were analyzed for VOCs. Table 6.19-3 presents the detected organic chemicals. Figure 6.19-3 shows the spatial distribution of detected organic chemicals.

One explosive compound (TATB), five SVOCs (benzene, benzo[b]fluoranthene, chrysene, fluoranthene, and pyrene), and three VOCs (2-butanone, 4-isopropyltoluene, and toluene) were detected. PCBs were not detected.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-007 based on site operation history (LANL 2011, 207481, p. 7).

6.19.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Antimony was detected above the soil BV (0.83 mg/kg) in one sample (4.9 mg/kg) from 0–1 ft bgs at location 14-614636. Concentrations of antimony decreased laterally and decreased with depth at location 14-614636. The lateral and vertical extent of antimony are defined.

Arsenic was detected above the Qbt 2, 3, 4 BV (2.79 mg/kg) in four samples from 3–4 ft bgs at locations 14-614632, 14-614634, 14-614635, and 14-614636. Concentrations detected below the soil BV (8.17 mg/kg) at locations 14-614634, 14-614635, and 14-614636 are presented in Table D-1. Concentrations of arsenic decreased laterally to the south, east, and north but increased to the west at location 14-614635. Concentrations of arsenic increased with depth at locations 14-614632, 14-614634, and 14-614635 and decreased with depth at location 14-614636. The arsenic Qbt 4 concentrations detected at locations 14-614632, 14-614634, and 14-614636 were either below or equivalent to the maximum Qbt 2, 3, 4 background concentration (5 mg/kg). Figure G-2 is the scatter plot of Qbt 4 site data for arsenic that shows a linear trend with a positive slope for arsenic and indicates concentrations across TA-14 were below the soil BV. In addition, Table G-1 indicates Qbt 4 arsenic concentrations are not different from soil background across TA-14, and Table G-2 indicates the arsenic Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this AOC). Compared with the soil BV, the arsenic Qbt 4 concentration of 6.3 mg/kg detected at location 14-614635 was below the soil BV. No further sampling to define the lateral and vertical extent for arsenic at location 14-614635 is warranted.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in two samples at location 14-614632. Concentrations of barium increased laterally to the north and increased with depth at this location. Figure G-3 is the scatter plot of Qbt 4 site data for barium that shows a linear trend with a positive slope for barium and indicates the concentrations across TA-14 were below or equal to the soil BV. In addition, Table G-1 indicates Qbt 4 barium concentrations are not different from soil background across TA-14. Compared with the soil BV (295 mg/kg), the barium Qbt 4 concentrations detected at location 14-614632 were below the soil BV. No further sampling to define the lateral and vertical extent for barium at location 14-614632 is warranted.

Calcium was detected above the Qbt 2, 3, 4 BV (2200 mg/kg) in one sample (4800 mg/kg) from 3–4 ft bgs at location 14-614632. Concentrations of calcium increased laterally to the north and increased with depth at this location. Figure G-4 is the scatter plot of Qbt 4 site data for calcium that shows a linear trend with a positive slope for calcium and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 calcium concentrations are not different from soil background across TA-14, and Table G-2 indicates the calcium Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this AOC). Compared with the soil BV (6120 mg/kg), the calcium Qbt 4 concentration of 4800 mg/kg detected at location 14-614632 was below the soil BV. No further sampling to define the lateral and vertical extent for calcium at location 14-614632 is warranted.

Chromium was detected above the Qbt 2, 3, 4 BV (7.14 mg/kg) in five samples from 3–4 ft bgs at locations 14-614632 through 14-614636. Concentrations detected below the soil BV (19.3 mg/kg) at locations 14-614633 through 14-614636 are presented in Table D-1. Concentrations of chromium decreased laterally to the south, increased laterally to the north at location 14-614632, to the east at location 14-614633, and to the west at location 14-614635. Concentrations of chromium increased with depth at all five locations. Figure G-5 is the scatter plot of Qbt 4 site data for chromium that shows a linear trend with a positive slope for chromium and indicates most concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 chromium concentrations are not different from soil background across TA-14. Compared with the soil BV (19.3 mg/kg) and the maximum soil background concentration (36.5 mg/kg), the chromium Qbt 4 concentrations detected at locations 14-614633 through 14-614636 were below either the soil BV or the maximum soil background concentration. No further sampling to define the lateral and/or vertical extent for chromium at these four locations is warranted. However, the lateral and vertical extent of chromium is not defined at location 14-614632 where the Qbt 4 concentration in the deeper sample exceeds the maximum soil background concentration.

Copper was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in three samples from 3–4 ft bgs at locations 14-614632, 14-614633, and 14-614635. Concentrations detected below the soil BV (14.7 mg/kg) at locations 14-614633 and 14-614635 are presented in Table D-1. Concentrations of copper decreased laterally to the south, increased laterally to the north at location 14-614632, to the east at location 14-614633, and to the west at location 14-614635. Concentrations of copper increased with depth at location 14-614632 and decreased with depth at locations 14-614633 and 14-614635. The concentrations detected in Qbt 4 at locations 14-614633 and 14-614635 were below the maximum Qbt 2, 3, 4 background concentration (6.2 mg/kg). Figure G-7 is the scatter plot of Qbt 4 site data for copper that shows a linear trend with a positive slope for copper and indicates concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV. In addition, Table G-1 indicates Qbt 4 copper concentrations are not different from soil background across TA-14, and Table G-2 indicates the copper Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this AOC). Compared with the soil BV, the copper Qbt 4 concentration of 9.7 mg/kg detected at location 14-614632 was below the soil BV. No further sampling to define the lateral and vertical extent for copper at location 14-614632 is warranted.

Total cyanide was not detected above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg) but had DLs above BV. Because total cyanide was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Lead was detected above the Qbt 2, 3, 4 BV (11.2 mg/kg) in two samples at locations 14-614632 and 14-614635. Lead was detected at a concentration of 21.9 mg/kg (below the soil BV of 22.3 mg/kg) from 0–1 ft bgs at location 14-614635 (Table D-1). Concentrations of lead increased laterally to the north and west, but the lead Qbt 4 concentration detected at location 14-614632 was similar to the maximum Qbt 2, 3, 4 background concentration (15.5 mg/kg). Figure G-8 is the scatter plot of Qbt 4 site data for lead that shows a linear trend with a positive slope for lead and indicates most concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 lead concentrations are not different from soil background across TA-14, and Table G-2 indicates the lead Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this AOC). Compared with the soil BV, the lead Qbt 4 concentration (17.7 mg/kg) detected at location 14-614635 was below the soil BV. No further sampling to define the lateral extent for lead is warranted. Concentrations of lead decreased with depth at locations 14-614632 and 14-614635. The vertical extent of lead is defined.

Magnesium was detected above the Qbt 2, 3, 4 BV (1690 mg/kg) in one sample (1770 mg/kg) from 3–4 ft bgs at location 14-614632. Concentrations of magnesium increased laterally to the north and increased with depth at this location, but the concentration detected was below the maximum Qbt 2, 3, 4 background concentration (2820 mg/kg). The lateral and vertical extent of magnesium are defined.

Nickel was detected above the Qbt 2, 3, 4 BV (6.58 mg/kg) in three samples from 3–4 ft bgs at locations 14-614632, 14-614635, and 14-614636. Concentrations detected below the soil BV (15.4 mg/kg) at locations 14-614635 and 14-614636 are presented in Table D-1. Concentrations of nickel increased laterally to the north at location 14-614532, to the west at location 14-614535, and with depth at locations 14-614632, 14-614635, and 14-614636. Figure G-10 is the scatter plot of Qbt 4 site data for nickel that shows a linear trend with a positive slope for nickel and indicates the concentrations across TA-14 (except one concentration at SWMU 14-009) were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 nickel concentrations are not different from soil background across TA-14. Compared with the soil BV (15.4 mg/kg), the nickel Qbt 4 concentrations detected at locations 14-614632, 14-614635, and 14-614636 were either below the soil BV and/or the maximum soil background concentration (29 mg/kg). No further sampling to define the lateral and vertical extent for nickel is warranted.

Nitrate was detected in four soil and five Qbt 4 samples at five locations, with a maximum concentration of 4.7 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in one Qbt 4 sample (0.0052 mg/kg) from 3–4 ft bgs at location 14-614632. Concentrations of perchlorate increased laterally to the north and increased with depth at location 14-614632, but the concentration detected was equivalent to the EQL The lateral and vertical extent of perchlorate are defined.

Selenium was detected above the Qbt 2, 3, 4 BV (0.3 mg/kg) in six samples at locations 14-614632 through 14-614636. Concentrations detected below the soil BV (1.52 mg/kg) at locations 14-614533 through 14-614536 are presented in Table D-1. Concentrations of selenium decreased laterally to the west at location 14-614633, to the south at location 14-614634, and to the west at location 14-614635 but increased laterally to the north at location 14-614632. The lateral extent of selenium is not defined at location 14-614632. Concentrations of selenium increased with depth at all five locations. The vertical extent of selenium is not defined.

Organic Chemicals

Benzene and 2-butanone were each detected in one sample (0.0003 mg/kg and 0.0058 mg/kg, respectively) from 3–4 ft bgs at location 14-614635. Surface samples were not analyzed for VOCs, but the concentrations detected from 3–4 ft bgs were below EQLs. The lateral and vertical extent of benzene and 2-butanone are defined.

Benzo(b)fluoranthene, chrysene, fluoranthene, and pyrene were each detected in one sample (0.074 mg/kg, 0.048 mg/kg, 0.055 mg/kg, and 0.048 mg/kg, respectively) from 0–1 ft bgs at location 14-614635. Concentrations detected were below EQLs and benzo(b)fluoranthene, chrysene, fluoranthene, and pyrene were not detected from 3–4 ft bgs at this location. The lateral and vertical extent of benzo(b)fluoranthene, chrysene, fluoranthene, and pyrene are defined.

Isopropyltoluene(4-) was detected in two samples at locations 14-614632 and 14-614635. Surface samples were not analyzed for VOCs, but the concentrations detected from 3–4 ft bgs were below EQLs. The lateral and vertical extent of 4-isopropyltoluene are defined.

TATB was detected in four samples from 0–1 ft bgs at locations 14-614633 through 14-614636. Concentrations of TATB decreased laterally to the north and east but increased laterally to the west and south. The lateral extent of TATB is not defined to the west and south of locations 14-614635 and 14-614534, respectively. TATB was not detected in the deeper samples at these four locations. The vertical extent of TATB is defined.

Toluene was detected in one sample (0.0015 mg/kg) from 3–4 ft bgs at location 14-614633. The surface sample was not analyzed for VOCs, but the concentration detected from 3–4 ft bgs was below the EQL. The lateral and vertical extent of toluene are defined.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-007.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, perchlorate, PCBs, SVOCs, and VOCs are defined at AOC C-14-007.

The lateral and vertical extent are defined or no further sampling to define extent is warranted for inorganic chemicals, except for

- the lateral and vertical extent of chromium at location 14-614632, and
- the lateral and vertical extent of selenium at location 14-614632 and the vertical extent of selenium at locations 14-614633 through 14-614636.

The lateral and vertical extent of explosive compounds are defined, except for the lateral extent of TATB to the west and south at locations 14-614635 and 14-614534, respectively.

6.19.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC C-14-007 because extent is not defined for the site.

6.19.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC C-14-007 because extent is not defined for the site.

6.20 AOC C-14-009, Former Magazine

6.20.1 Site Description and Operation History

AOC C-14-009 is a former magazine (structure 14-13) located approximately 125 ft northeast of building 14-5 (which was partly destroyed by the Cerro Grande fire in 2000) (Figure 6.20-1). Constructed in 1945, the wood-framed magazine measured 3 ft wide × 4 ft long × 3 ft high and was covered with an earthen berm on three sides and the top. The magazine was destroyed by burning in 1960.

6.20.2 Relationship to Other SWMUs and AOCs

AOC C-14-009 is not associated with other SWMUs and AOCs at TA-14. AOC C-14-009 is located approximately 125 ft northeast of Consolidated Unit 14-002(c)-99, a decommissioned firing site, and approximately 150 ft southwest of SWMU 14-003, a former burning area.

6.20.3 Summary of Previous Investigations

During the 1995 RFI conducted at AOC C-14-009, samples were field screened for metals, gross radioactivity, and HE spot tests were performed. Based on field-screening results, two near-surface (0.5–1.2 ft bgs) samples were collected and submitted for off-site analysis of TAL metals and HE (LANL 1996, 054086, pp. 5-97–5-100). Data from the Phase I RFI are screening-level data and are presented in Appendix B of the HIR (LANL 2006, 091697). Screening-level data showed lead detected above BVs.

6.20.4 Site Contamination

6.20.4.1 Soil and Rock Sampling

As part of the 2011 investigation, the following activities were conducted at AOC C-14-009:

- All samples were field screened for organic vapors and gross-alpha, -beta, and -gamma radioactivity. Field-screening results were recorded on the SCLs/COC forms (Appendix D) and are presented in Table 3.2-2.
- Ten samples were collected from five locations within and around the structure footprint at 0–1 ft and 3–4 ft bgs and were analyzed for TAL metals, total cyanide, nitrate, perchlorate, explosive compounds, PCBs (20% of samples), SVOCs, and VOCs (excluding surface samples).

The 2011 sampling locations at AOC C-14-009 are shown in Figure 6.20-1. Table 6.20-1 presents the 2011 samples collected and the analyses requested for AOC C-14-009. The geodetic coordinates of the 2011 sampling locations are presented in Table 3.2-1.

6.20.4.2 Soil and Rock Sample Field-Screening Results

No organic vapors were detected at more than 5 ppm above ambient-air levels during PID screening of the samples during the 2011 investigation. No radiological-screening results exceeded twice the daily site background levels. All HE spot test results were negative. Field-screening results for the 2011 samples are presented in Table 3.2-2. No changes to sampling or other activities occurred because of the results of field screening.

6.20.4.3 Soil and Rock Sample Analytical Results

Decision-level data at AOC C-14-009 consist of the results from 10 samples (2 soil and 8 Qbt 4) collected from five locations in 2011. The extent of contamination is not defined at AOC C-14-009. Therefore, COPCs for the site have not been identified.

Inorganic Chemicals

All 10 samples (2 soil and 8 Qbt 4) were analyzed for TAL metals, total cyanide, nitrate, and perchlorate. Table 6.20-2 presents the inorganic chemicals above BVs. Figure 6.20-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Eight TAL metals (aluminum, antimony, barium, cobalt, copper, lead, manganese, selenium) were detected above BVs or not detected but had DLs above BV. Total cyanide was not detected but had DLs above BV. Nitrate was detected and perchlorate was not detected.

Organic Chemicals

All 10 samples (2 soil and 8 Qbt 4) were analyzed for explosive compounds and SVOCs, 2 Qbt 4 samples were analyzed for PCBs, and 5 Qbt 4 samples were analyzed for VOCs. Table 6.20-3 presents the detected organic chemicals. Figure 6.20-3 shows the spatial distribution of detected organic chemicals.

One explosive compound (TATB) and three VOCs (acetone, chloroform, and methylene chloride) were detected. PCBs and SVOCs were not detected.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-009 based on operation history (LANL 2011, 207481, p. 7).

6.20.4.4 Nature and Extent of Soil and Rock Contamination

Inorganic Chemicals

Section 5.3 discusses the comparisons of weathered Qbt 4 concentrations with soil and soil background concentrations at TA-14. Appendix G presents the scatter plots, box plots, statistical test results, and other data supporting the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14. Based at least in part on these comparisons, it was determined whether additional sampling was warranted at a particular site to further characterize the extent of contamination for specific inorganic chemicals.

Aluminum was detected above the Qbt 2, 3, 4 BV (7340 mg/kg) in one sample (7550 mg/kg) from 0–1 ft bgs at location 14-614619. Concentrations of aluminum increased laterally to the south and decreased with depth at this location, but the concentration detected at location 14-614619 was below the maximum Qbt 2, 3, 4 background concentration (8370 mg/kg), The lateral and vertical extent of aluminum are defined.

Antimony was not detected above BV but had DLs above BV. Because antimony was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of antimony are defined.

Barium was detected above the Qbt 2, 3, 4 BV (46 mg/kg) in six samples at locations 14-614615, 14-614616, 14-614617, and 14-614619. Barium was detected at a concentration of 135 mg/kg (below the soil BV of 295 mg/kg) from 0–1 ft bgs at location 14-614615 located at the center of the footprint (Table D-1). Concentrations of barium decreased laterally, decreased with depth at locations 14-614615, 14-614617, and 14-614619 and remained essentially the same with depth at location 14-614616. The lateral and vertical extent of barium are defined.

Cobalt was detected above the Qbt 2, 3, 4 BV (3.14 mg/kg) in one sample (3.8 mg/kg) from 0–1 ft bgs at location 14-614619. Concentrations of cobalt increased to the south at this location. Figure G-6 is the scatter plot of Qbt 4 site data for cobalt that shows a linear trend with a positive slope for cobalt and indicates concentrations across TA-14 were below the soil BV and/or the maximum soil background concentration. In addition, Table G-1 indicates Qbt 4 cobalt concentrations are not different from soil background across TA-14. Compared with the soil BV (8.64 mg/kg), the cobalt Qbt 4 concentration detected was below the soil BV. No further sampling to define the lateral extent for cobalt is warranted. Concentrations of cobalt decreased with depth at this location. The vertical extent of cobalt is defined.

Copper was detected above the Qbt 2, 3, 4 BV (4.66 mg/kg) in one sample (5.5 mg/kg) from 0–1 ft bgs at location 14-614616. Concentrations of copper increased laterally to the north and decreased with depth at this location, but the concentration detected was below the maximum Qbt 2, 3, 4 background concentration (6.2 mg/kg). The lateral and vertical extent of copper are defined.

Total cyanide was not detected but had DLs above the soil or Qbt 2, 3, 4 BV (both 0.5 mg/kg). Because total cyanide was not detected above BV and all results reported between the BV and the individual sample's respective DL were nondetects, the lateral and vertical extent of total cyanide are defined.

Lead was detected above the soil BV (22.3 mg/kg) in one sample (30.1 mg/kg) at location 14-614615 and above the Qbt 2, 3, 4 BV (11.2 mg/kg) in three samples at locations 14-614616 and 14-614619. Concentrations of lead decreased laterally to the west, south, and east but increased to the north at location 14-614619. Concentrations of lead decreased with depth at locations 14-614615 and 14-614619 but increased with depth at location 14-614616. The lateral and vertical extent of lead are not defined at location 14-614616.

Manganese was detected above the Qbt 2, 3, 4 BV (482 mg/kg) in one sample (598 mg/kg) from 3–4 ft bgs at location 14-614616. The Gehan and quantile tests indicated site concentrations are not different from background (Figure F-4.0-1 and Table F-4). The lateral and vertical extent of manganese are defined.

Nitrate was detected in all 10 samples at five locations, with a maximum concentration of 3.8 mg/kg. No background data are available for nitrate. Nitrate is naturally occurring, and the concentrations detected at the site likely reflect naturally occurring levels. The lateral and vertical extent of nitrate are defined.

Selenium was detected above the Qbt 2, 3, 4 BV (0.3 mg/kg) in eight samples at locations 14-614615 through 14-614619. Selenium was detected at a concentration of 0.66 mg/kg from 0–1 ft bgs at location 14-614615 (Table D-1). Concentrations of selenium remained essentially the same laterally and increased with depth at all five locations. Figure G-11 is the scatter plot of Qbt 4 site data for selenium that shows the majority of the detected concentrations of selenium are consistent across the site. In addition, Table G-2 indicates the selenium Qbt 4 concentration range is similar to the soil concentration ranges at other sites (no soil samples were collected at depth at this AOC). Compared with the soil BV (1.52 mg/kg), the selenium Qbt 4 concentrations detected at all five locations were below the soil BV. No further sampling to define the lateral and vertical extent for selenium is warranted.

Organic Chemicals

Acetone was detected in one sample (0.0088 mg/kg) from 3–4 ft bgs at location 14-614615. Acetone was not detected at the four lateral locations 14-614616 through 14-614619. The surface sample was not analyzed for VOCs at location 14-614615, but the concentration detected from 3–4 ft bgs was below the EQL. The lateral and vertical extent of acetone are defined.

Chloroform was detected in one sample (0.00045 mg/kg) from 3–4 ft bgs at location 14-614617. The surface sample was not analyzed for VOCs, but the concentration detected from 3–4 ft bgs was below the EQL. The lateral and vertical extent of chloroform are defined.

Methylene chloride was detected in four samples from 3–4 ft bgs at locations 14-614616 through 14-614619. Surface samples were not analyzed for VOCs, but all concentrations detected from 3–4 ft bgs were below EQLs. The lateral and vertical extent of methylene chloride are defined.

TATB was detected in one sample (0.57 mg/kg) from 0–1 ft bgs at location 14-614616. TATB was detected on the north side of the building footprint, but the concentration of 0.57 mg/kg was not substantially above the EQL (0.45 mg/kg). No further sampling to define the lateral extent of TATB at location 14-614616 is warranted. TATB was not detected in the sample from 3–4 ft bgs at this location. The vertical extent of TATB is defined.

Radionuclides

Samples were not analyzed for radionuclides at AOC C-14-009.

Summary of Nature and Extent

The lateral and vertical extent of total cyanide, nitrate, perchlorate, PCBs, SVOCs, and VOCs are defined at AOC C-14-009.

The lateral and vertical extent of inorganic chemicals are defined, except the lateral and vertical extent of lead are not defined at location 14-614616.

The lateral and vertical extent are defined or no further sampling to define extent is warranted for explosive compounds,

6.20.5 Summary of Human Health Risk Screening

A human health risk assessment has not been performed for AOC C-14-009 because extent is not defined for the site.

6.20.6 Summary of Ecological Risk Screening

An ecological risk assessment has not been performed for AOC C-14-009 because extent is not defined for the site.

7.0 CONCLUSIONS

7.1 Nature and Extent of Contamination

Of the 27 sites addressed during the 2011 investigation of TA-14 sites located in the Cañon de Valle Aggregate Area, 5 sites are deferred from investigation pursuant to Table IV-2 of the Consent Order and 4 sites located next to active firing sites are proposed for delayed investigation. The nature and extent of contamination have not been determined for the 10 sites investigated. A complete investigation was not conducted at one of the sites because of ongoing firing activities; sampling was conducted at this site only to determine if contaminants are migrating off-site.

Summaries of the nature and extent of contamination and remaining characterization and/or remediation requirements for the sites at TA-14 are presented below.

The following five sites at TA-14 are deferred per Table IV-2 of the Consent Order:

- AOC 14-001(f)
- SWMU 14-002(a)
- SWMU 14-002(b)
- SWMU 14-002(d) of Consolidated Unit 14-002(c)-99
- SWMU 14-002(e)

The following four sites at TA-14 are proposed for delayed investigation because they are located within an active structure or next to active firing sites:

- SWMU 14-002(f)
- AOC 14-004(a)

- AOC C-14-002
- AOC C-14-003

AOC 14-001(g), an active firing site, is proposed for delayed investigation; samples were collected from downgradient drainages to determine if contaminants are migrating off-site. Concentrations of detected inorganic and organic chemicals decreased in the drainage downgradient of AOC 14-001(g) and were not detected or not detected above BVs in samples collected from the bottom of the drainage. Concentrations of cesium-134 and strontium-90 decreased in the drainages downgradient of AOC 14-001(g) and are therefore not migrating off-site. Cesium-137 was detected above the sediment FV in samples from the bottom of the drainages below AOC 14-001(g) but at concentrations below the maximum sediment FV. Therefore, cesium-137 is not migrating off-site.

The Qbt 4 samples collected from the TA-14 sites were from weathered tuff. As noted in section 5.3, illustrated in Appendix G, and reiterated in discussions of one or more inorganic chemicals at several sites, the Qbt 4 inorganic chemical concentrations detected at sites investigated within TA-14 are not different from soil background concentrations, except for selenium and silver. Because of the similarity between the weathered Qbt 4 inorganic chemical concentrations and soil background concentrations at TA-14, it was concluded that additional sampling for extent was not warranted for one or more inorganic chemicals at a given site. As a result, it was concluded that the nature and extent of contamination have been defined or further sampling to define extent is not warranted for seven sites:

- AOC 14-001(a)
- AOC 14-001(b)
- AOC 14-001(c)
- AOC 14-001(d)
- AOC 14-001(e)
- SWMU 14-003
- AOC C-14-001

Ten sites at TA-14 were investigated to determine the nature and extent of contamination. Additional sampling is needed to define the extent of contamination for one or more inorganic chemical, organic chemical, or radionuclide at the following 10 sites:

- SWMU 14-009—vertical extent of antimony, chromium, nickel, lead, selenium, HMX, RDX, strontium-90, and isotopic uranium. Uranium-238 was detected at a concentration of 162 pCi/g, exceeding the construction worker SAL of 160 pCi/g, from 0–1 ft bgs at location 14-614528.
- SWMU 14-010—vertical extent of lead, selenium, and zinc
- AOC C-14-008—vertical extent of selenium
- SWMU 14-002(c)—lateral and vertical extent of lead, selenium, and zinc; vertical extent of nitrate and perchlorate
- SWMU 14-006—lateral extent of HMX; vertical extent of selenium, perchlorate, HMX, TATB, TNT, bis(2-ethylhexyl)phthalate, and strontium-90. Benzo(a)pyrene was detected at a concentration of 9.2 mg/kg, exceeding the industrial SSL of 2.34 mg/kg, from 0–1 ft bgs at location 14-614536.
- SWMU 14-007—vertical extent of selenium

- AOC C-14-004—lateral extent of TATB; vertical extent of perchlorate
- AOC C-14-005—lateral extent of mercury; lateral and vertical extent of perchlorate, acetone, and 4-isopropyltoluene
- AOC C-14-007—lateral extent of TATB; lateral and vertical extent of chromium and selenium
- AOC C-14-009—lateral and vertical extent of lead

7.2 Summary of Risk-Screening Assessments

The seven sites for which the nature and extent of contamination are defined or no further sampling to define extent is warranted were evaluated for potential human health risks under the industrial (if applicable), construction worker, and residential scenarios, as well as evaluated for the ecological risk.

7.2.1 Human Health Risk Screening Assessments

The human health risk-screening assessments are presented in section H-4.0 in Appendix H.

Because the AOCs 14-001(a,b,c,d,e) pull boxes are belowground, no samples were collected between 0–1 ft bgs. No potential exposure pathways exist. Therefore, a risk-screening assessment was not performed for the industrial scenario. No potential unacceptable risk or dose exists for the construction worker and residential scenarios at AOCs 14-001(a,b,c,d,e) because no COPCs were identified at the site.

The human health risk-screening assessments indicated no potential unacceptable risks or doses exist for the industrial and residential scenarios at SWMU 14-003. SWMU 14-003 does not pose a potential unacceptable carcinogenic risk or dose under the construction worker scenario. However, the construction worker HI is above 1 primarily from manganese. The single detected concentration of manganese above Qbt 2, 3, 4 BV is within the range of Qbt 2, 3, 4 background concentrations and is similar to the Qbt 2, 3, 4 BV. In addition, the construction worker SSL (463 mg/kg) is less than the Qbt 2, 3, 4 BV and the maximum Qbt 2, 3, 4 background concentration. Therefore, the HQ for manganese does not reflect a potential risk to the construction worker above that which would result from exposure to naturally occurring levels, and the construction worker HI is overestimated. Without manganese, the construction worker HI is 0.9, which is below the NMED target HI of 1. Furthermore, Qbt 4 at TA-14 is weathered tuff to approximately 10 ft bgs and more closely resembles soil. Comparing the Qbt 4 concentration (486 mg/kg) with the soil BV (671 mg/kg) indicates the concentration is not above the soil BV. This analysis further supports the overestimation of potential risk to the construction worker.

Because no carcinogens were retained as COPCs at AOC C-14-001, no carcinogenic risk exists at AOC C-14-001. The human health risk-screening assessments indicated no potential unacceptable noncarcinogenic risks exist for the industrial, construction worker, and residential scenarios at AOC C-14-001. Radionuclides were not analyzed for at AOC C-14-001.

7.2.2 Ecological Risk Screening Assessments

The ecological risk-screening assessments are presented in section H-5.0 in Appendix H.

No potential ecological risk exists at AOCs 14-001(a,b,c,d,e) because no COPCs were identified at these sites.

No potential ecological risks exist for ecological receptors at SWMU 14-003 and AOC C-14-001 based on minimum ESL comparisons, HI analyses, comparisons to background concentrations, potential effects to populations (individuals for T&E species), and LOAEL analysis.

8.0 RECOMMENDATIONS

The determination of site status is based on the results of the risk-screening assessments and the nature and extent evaluation. Depending on the decision scenario used, the sites are recommended as corrective activities 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—results in corrective action complete with controls; that is, some type of institutional controls must be in place to ensure the land use remains consistent with site cleanup levels.

8.1 Recommendations for Deferred/Delayed Characterization

Nine sites are recommended for deferred/delayed characterization and investigation; five of the sites are deferred per Table IV-2 of the Consent Order, and four sites located within an active structure or next to active firing sites are proposed for delayed investigation.

Complete investigation of another site, AOC 14-001(g), is proposed for delayed investigation because of its active firing site operations.

8.2 Recommendations for Corrective Actions Complete

The extent of contamination has been defined for five sites and further sampling for extent is not warranted for two sites at TA-14 within the Cañon de Valle Aggregate Area (Table 8.1-1). Therefore, no further investigation or remediation activities are warranted for these sites.

AOCs 14-001(a,b,c,d,e) do not have COPCs. SWMU 14-003 and AOC C-14-001 do not pose potential unacceptable risks or doses under the industrial, construction worker, and residential scenarios and do not pose potential ecological risks to any receptor at the site. The Laboratory recommends corrective actions complete without controls for AOCs 14-001(a,b,c,d,e), SWMU 14-003, and AOC C-14-001.

8.3 Additional Field Characterization and Remediation Activities

8.3.1 Additional Field Characterization Activities

The extent of contamination has not been defined for 10 sites investigated at TA-14 (Table 8.1-1). 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 14-002(c), 14-006, 14-007, 14-009, and 14-010, and AOCs C-14-004, C-14-005, C-14-007, C-14-008, and C-14-009

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 these sites. After the proposed Phase II sampling is completed, the data collected will be used to confirm the extent of contamination has been defined and to complete human health and ecological risk-screening assessments for these sites.

The results will be presented in a Phase II investigation report for the TA-14 sites in the Cañon de Valle Aggregate Area.

8.3.2 Additional Remediation Activities

Two sites require remediation and characterization/confirmation sampling at TA-14 in the Cañon de Valle Aggregate Area:

- SWMU 14-006—The concentration of benzo(a)pyrene exceeded the industrial SSL (2.34 mg/kg) from 0–1 ft bgs at location 14-614536. The removal of the top 3 ft of soil from a 5-ft × 5-ft area around location 14-614536 is recommended, along with collecting four confirmation samples around the excavated area.
- SWMU 14-009—The concentration of uranium-238 exceeded the construction worker SAL (160 pCi/g) from 0–1 ft bgs at location 14-614528. The removal of the top 3.5 ft of soil from a 5-ft × 5-ft area around location 14-614528 is recommended, along with collecting four confirmation samples around the excavated area.

After the proposed remediation and confirmation sampling at both sites are completed, the data collected will be used to confirm the extent of contamination has been defined and to complete human health and ecological risk-screening assessments for these sites. The results will be presented in a Phase II investigation report for the TA-14 sites in the Cañon de Valle Aggregate Area.

8.4 Schedule for Recommended Activities

A Phase II investigation work plan will be developed and submitted to NMED 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.

9.0 REFERENCES AND MAP DATA SOURCES

9.1 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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9.2 Map Data Sources

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

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

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

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

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

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

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

Contours: lanl_contour1991_; Hypsography, 2, 10, 20, 100 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

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

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

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

Industrial waste: wfm_indstrl_waste_arc; Primary Industrial Waste Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 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.

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

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

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

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

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

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

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

Outfalls: er_outfalls_pnt: Outfalls; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; Unknown publication date.

Monitoring wells: Environmental Surveillance at Los Alamos During 2006, Groundwater monitoring; LANL Report LA-14341-ENV, September 2007.

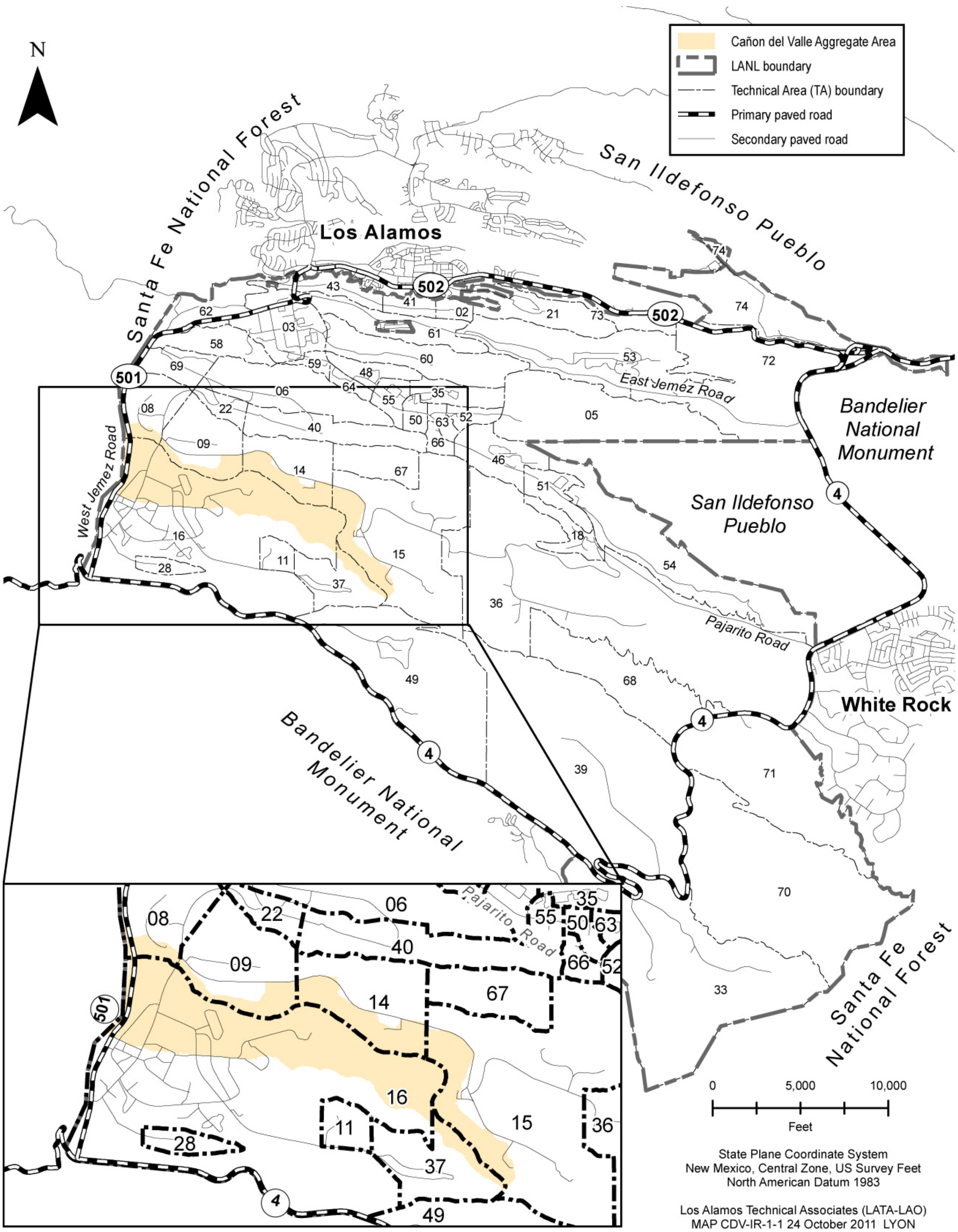
Supply Wells: Locations of Monitoring and Supply Wells at Los Alamos National Laboratory, Table A-2, 2009 General Facility Information; LANL Report LA-UR-09-1341; March 2009.

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.



State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983

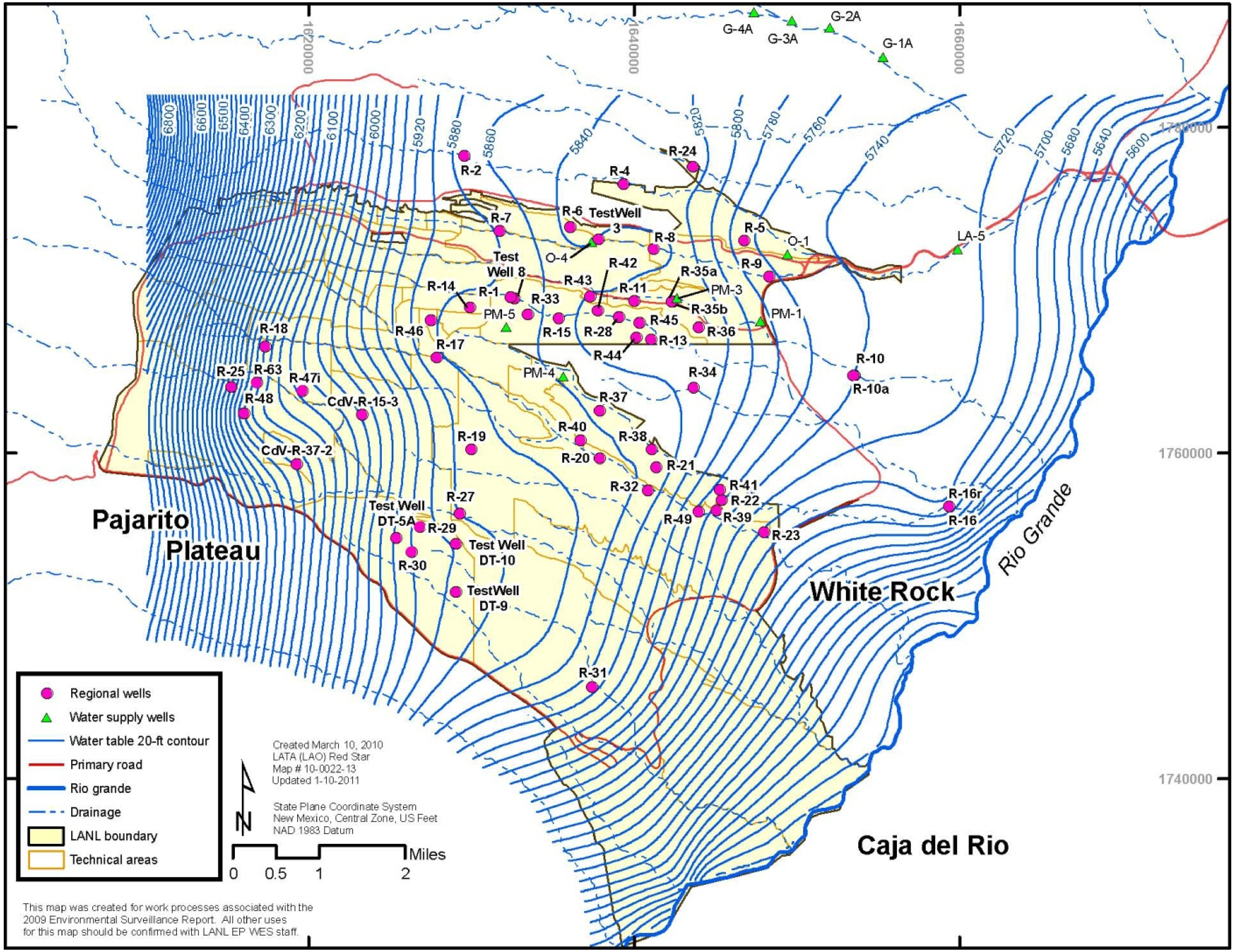
Los Alamos Technical Associates (LATA-LAO)
MAP CDV-IR-1-1 24 October 2011 LYON

Figure 1.0-1 **Location of Cañon de Valle Aggregate Area with respect to Laboratory technical areas**

Bandelier Tuff	Tshirege Member	Qbt 4	Ash-flow units
		Qbt 3	
		Qbt 2	
		Qbt 1v	
		Qbt 1g	
		Tsankawi Pumice Bed	
Cerro Toledo interval		Volcaniclastic sediments and ash-falls	
Bandelier Tuff	Otowi Member	Ash-flow units	
		Guaje Pumice Bed	
Puye Formation and intercalated volcanic rocks	Fanglomerate	Fanglomerate facies includes sand, gravel, conglomerate, and tuffaceous sediments	
	Volcanic rocks	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 (called the ”Chaquehui Formation” by Purtymun 1995, 45344)	
	Basalt		
	Coarse sediments		
	Basalt		
	Coarse sediments		
	Basalt		
	Coarse sediments		
	Basalt		
	Coarse sediments		
	Arkosic clastic sedimentary deposits	Undivided Santa Fe Group (includes Chamita[?] and Tesuque Formations)	

Source: Baltz et al. 1963, 8402; Purtymun 1995, 45344; LANL 1998, 59599; Broxton and Reneau 1995, 49726.

Figure 2.2-1 Generalized stratigraphy of bedrock geologic units of the Pajarito Plateau



Created March 10, 2010
LATA (LAO) Red Star
Map # 10-0022-13
Updated 1-10-2011

State Plane Coordinate System
New Mexico, Central Zone, US Feet
NAD 1983 Datum

This map was created for work processes associated with the 2009 Environmental Surveillance Report. All other uses for this map should be confirmed with LANL EP WES staff.

Figure 2.2-2 Depths to top of regional aquifer across the Laboratory

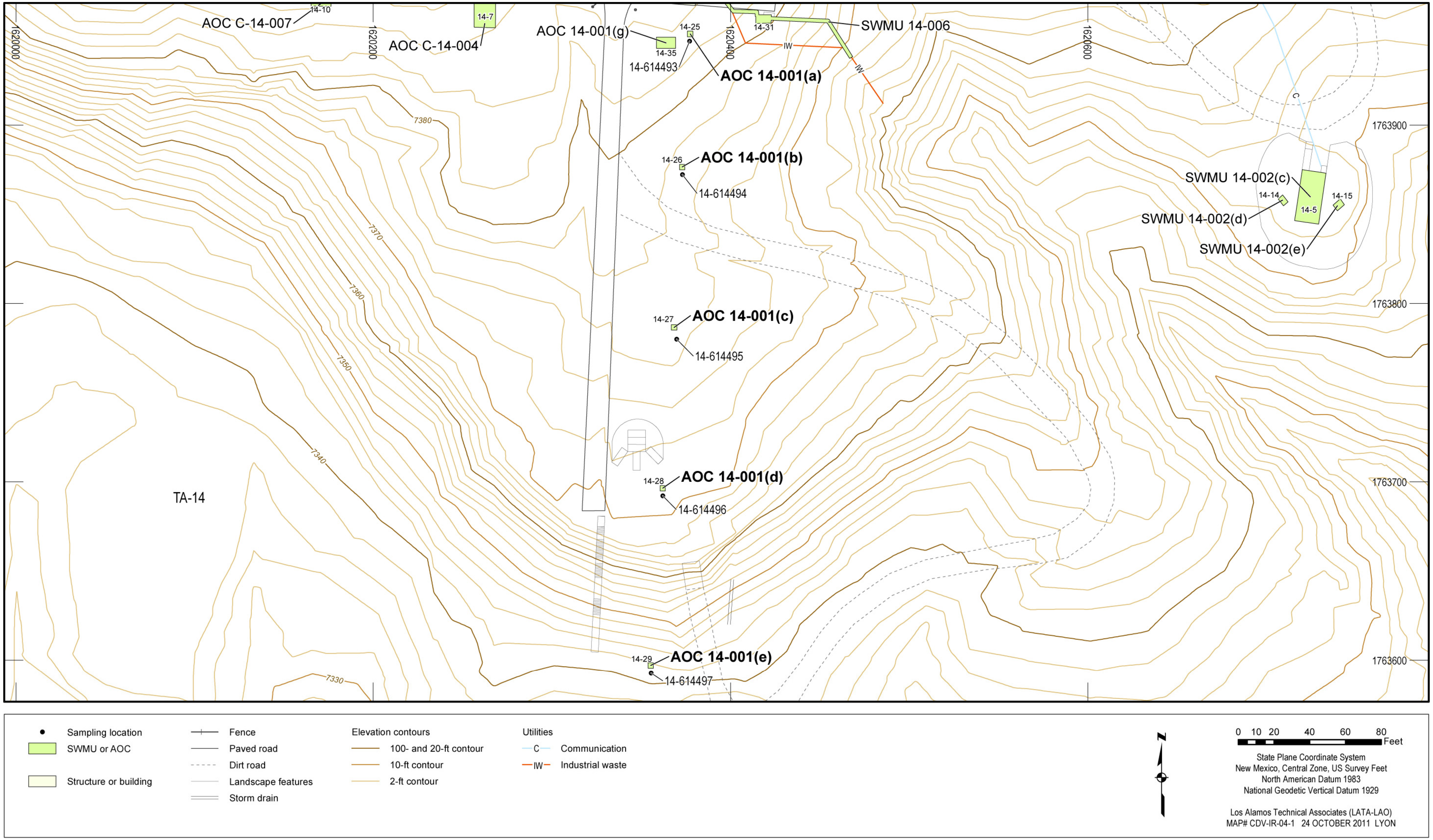


Figure 6.2-1 AOCs 14-001(a,b,c,d,e) site map and sampling locations

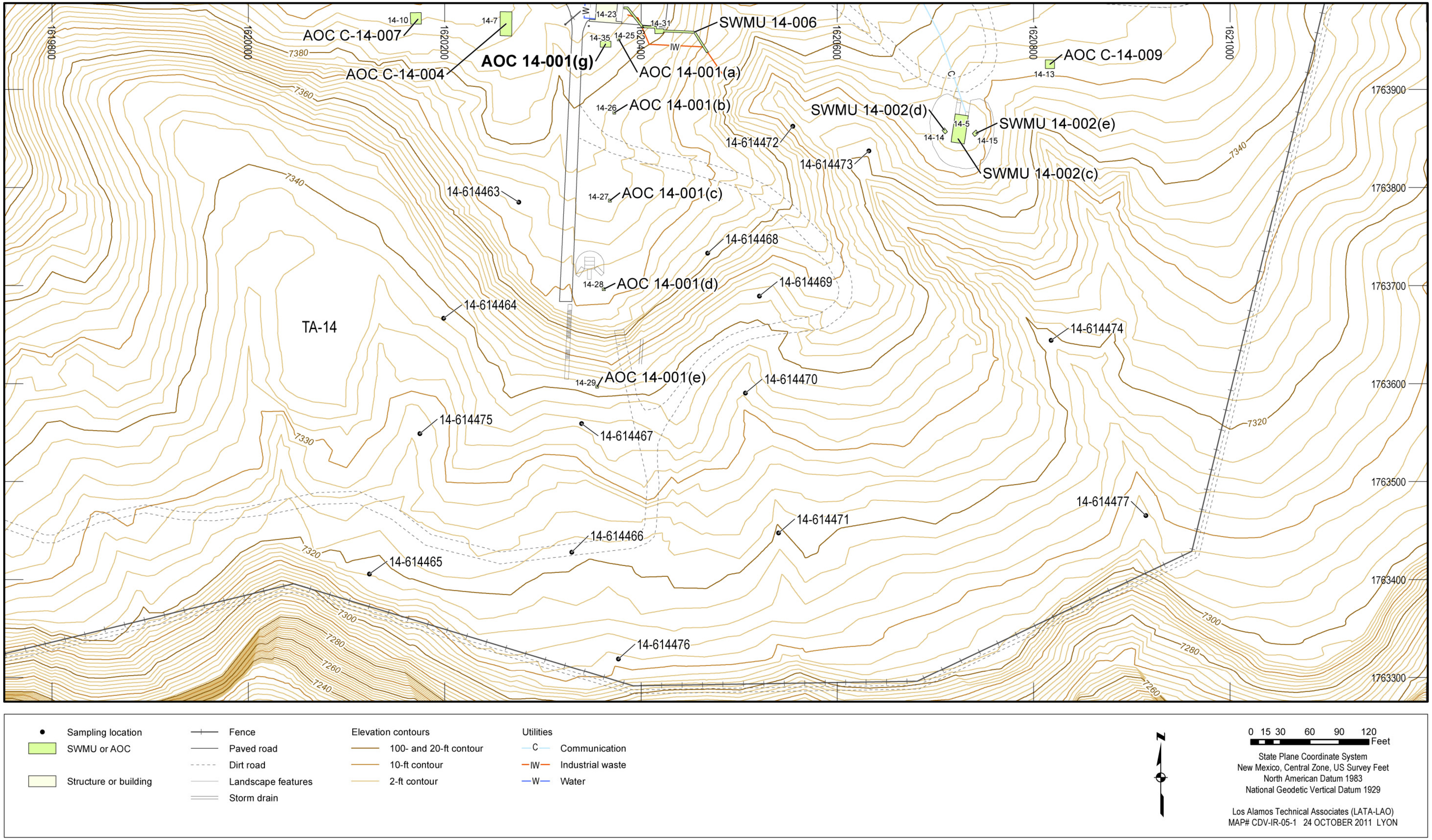


Figure 6.7-1 **AOC 14-001(g) site map and sampling locations**

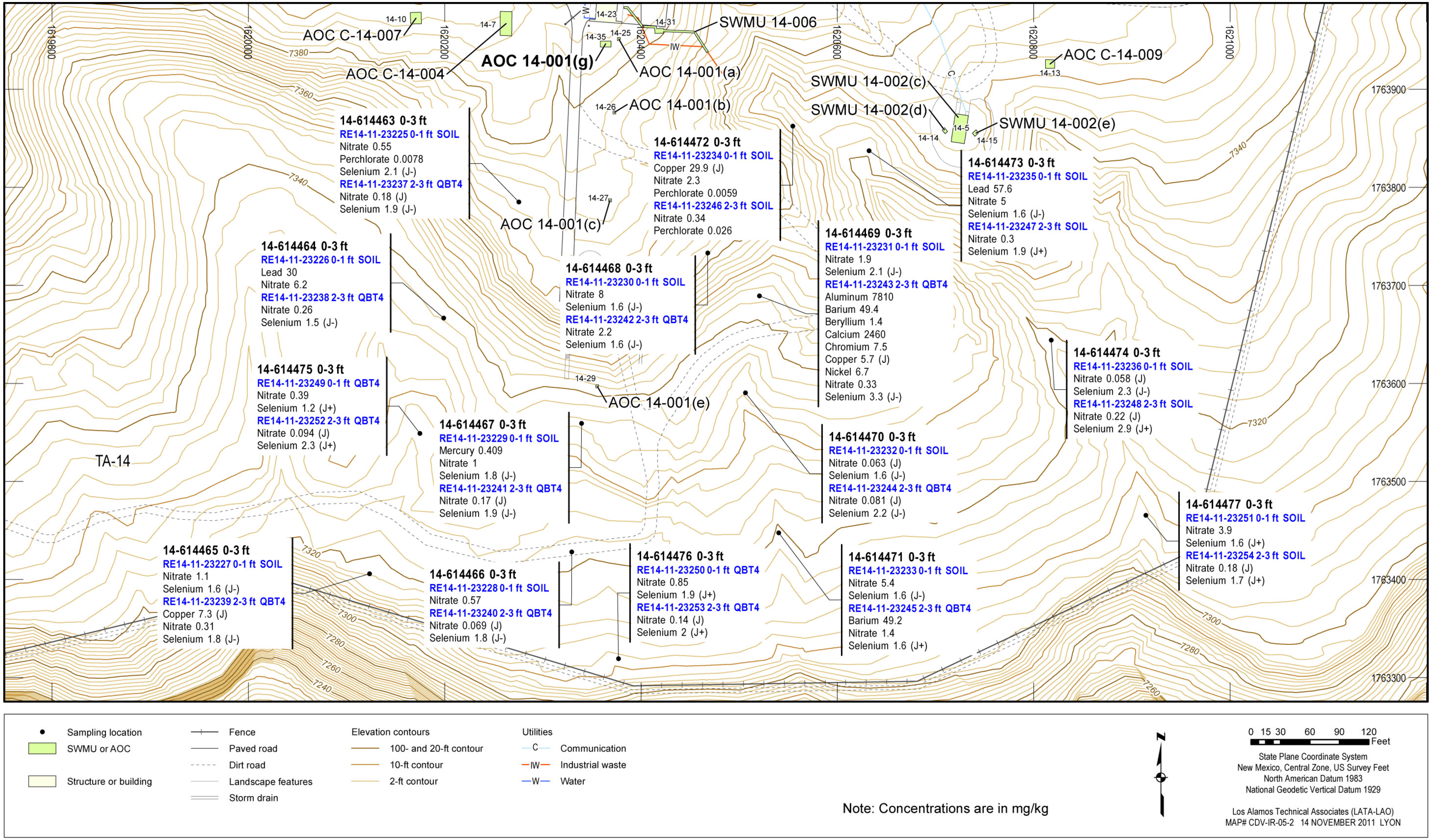


Figure 6.7-2 Inorganic chemicals detected or detected above BVs at AOC 14-001(g)

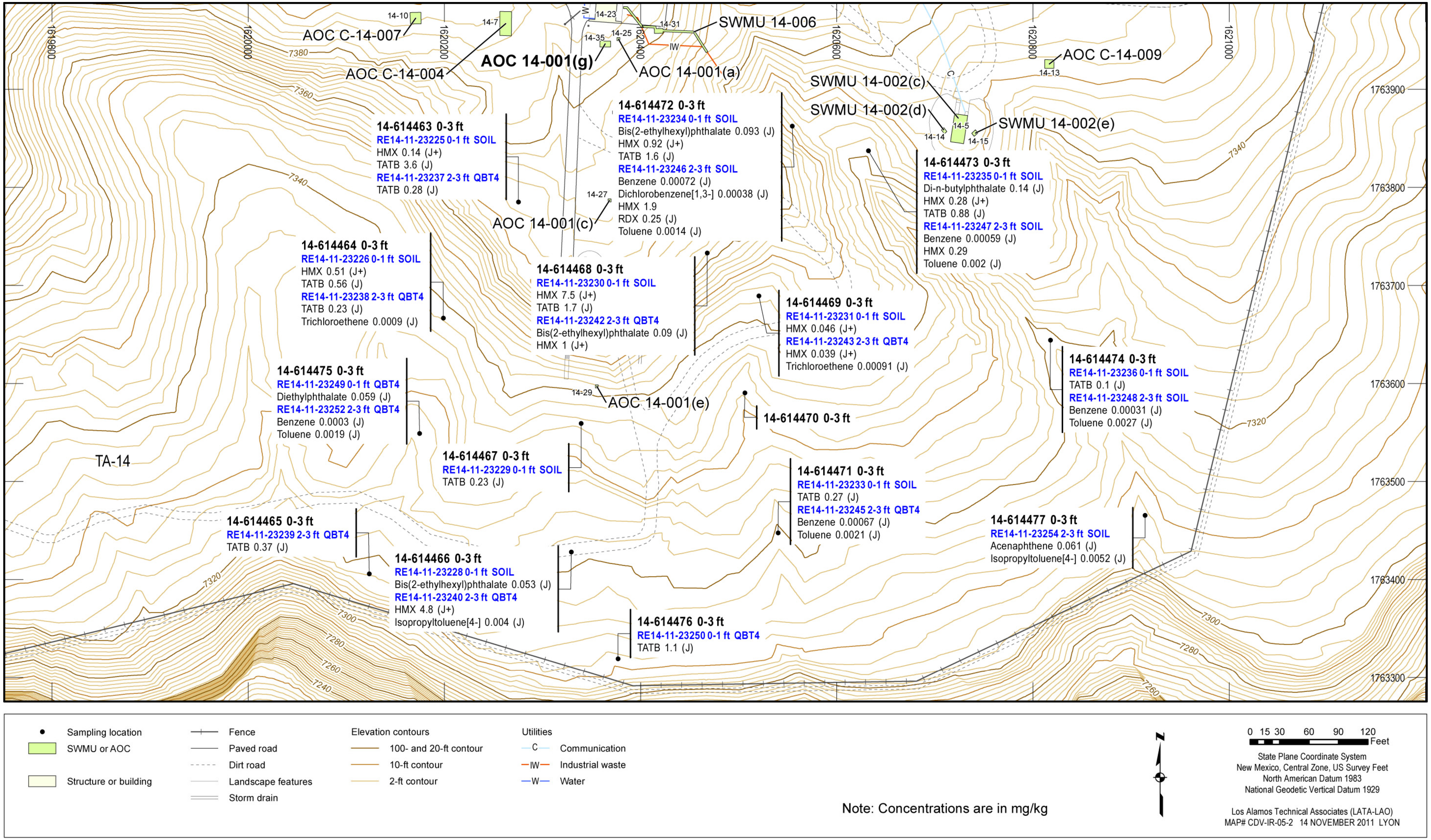


Figure 6.7-3 Organic chemicals detected at AOC 14-001(g)

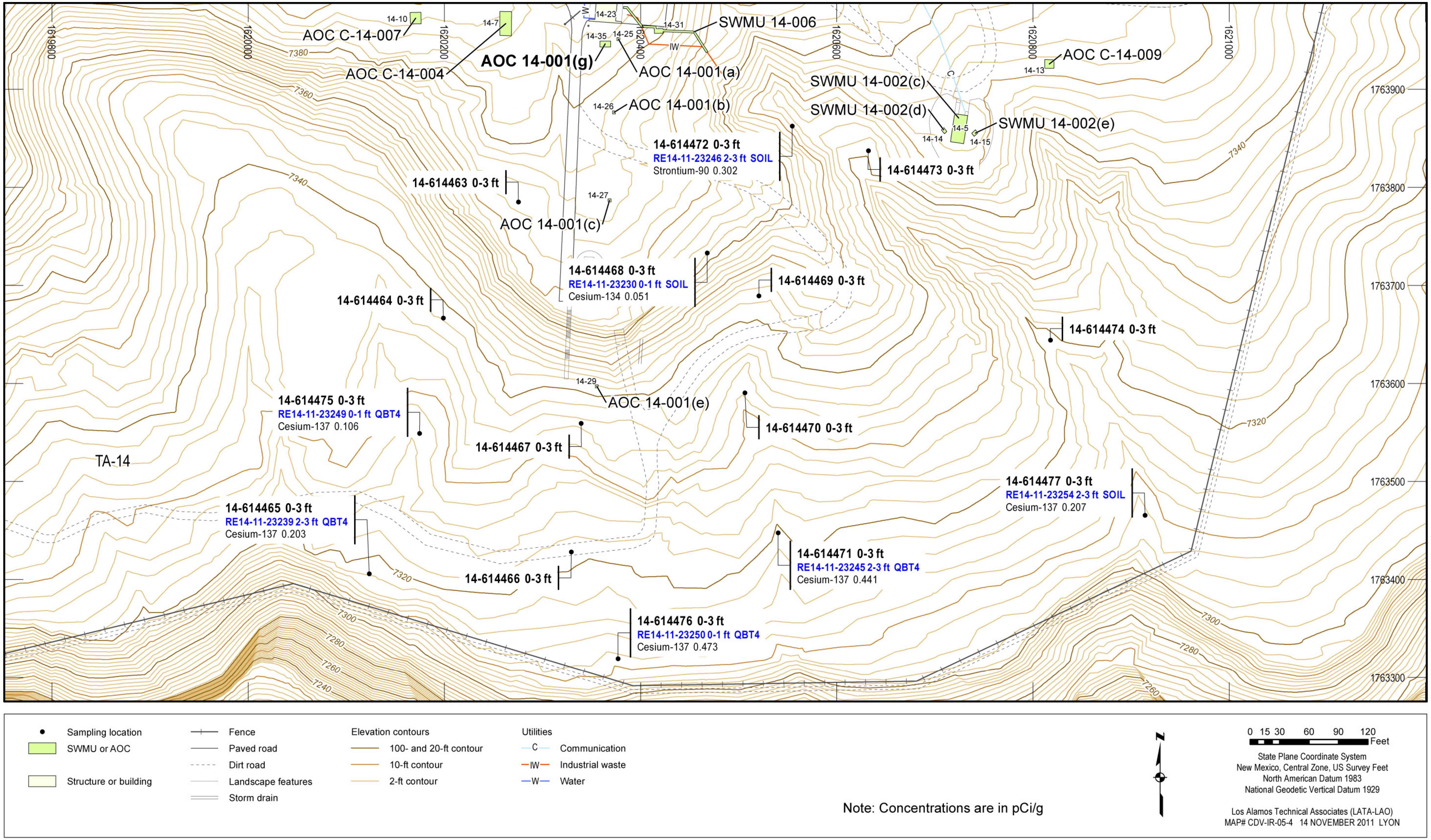


Figure 6.7-4 Radionuclides detected or detected above BVs/FVs at AOC 14-001(g)

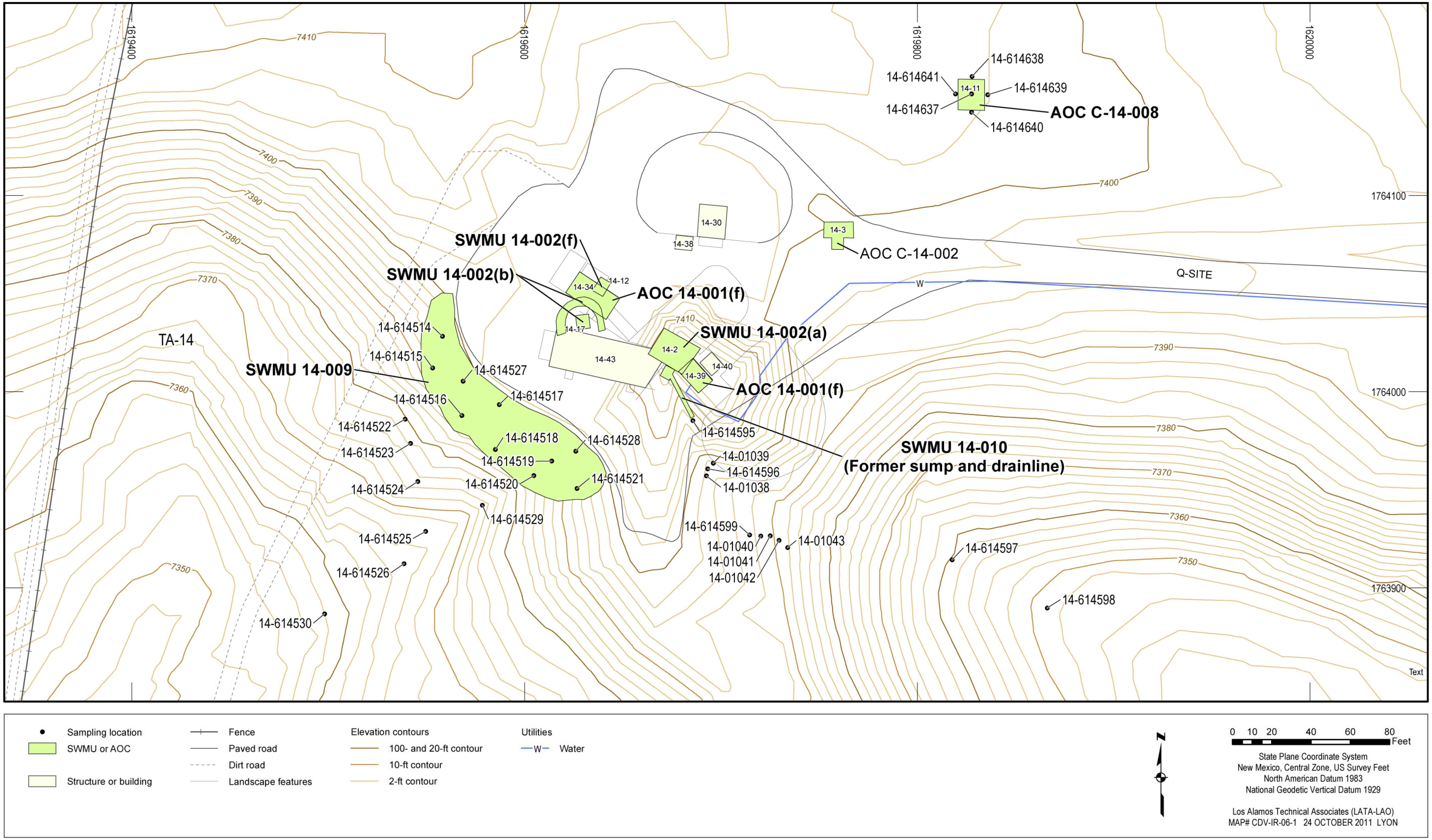


Figure 6.8-1 Consolidated Unit 14-002(a)-99 [AOC 14-001(f), SWMUs 14-002(a,b,f), 14-009, 14-010, and AOC C-14-008] site map and sampling locations

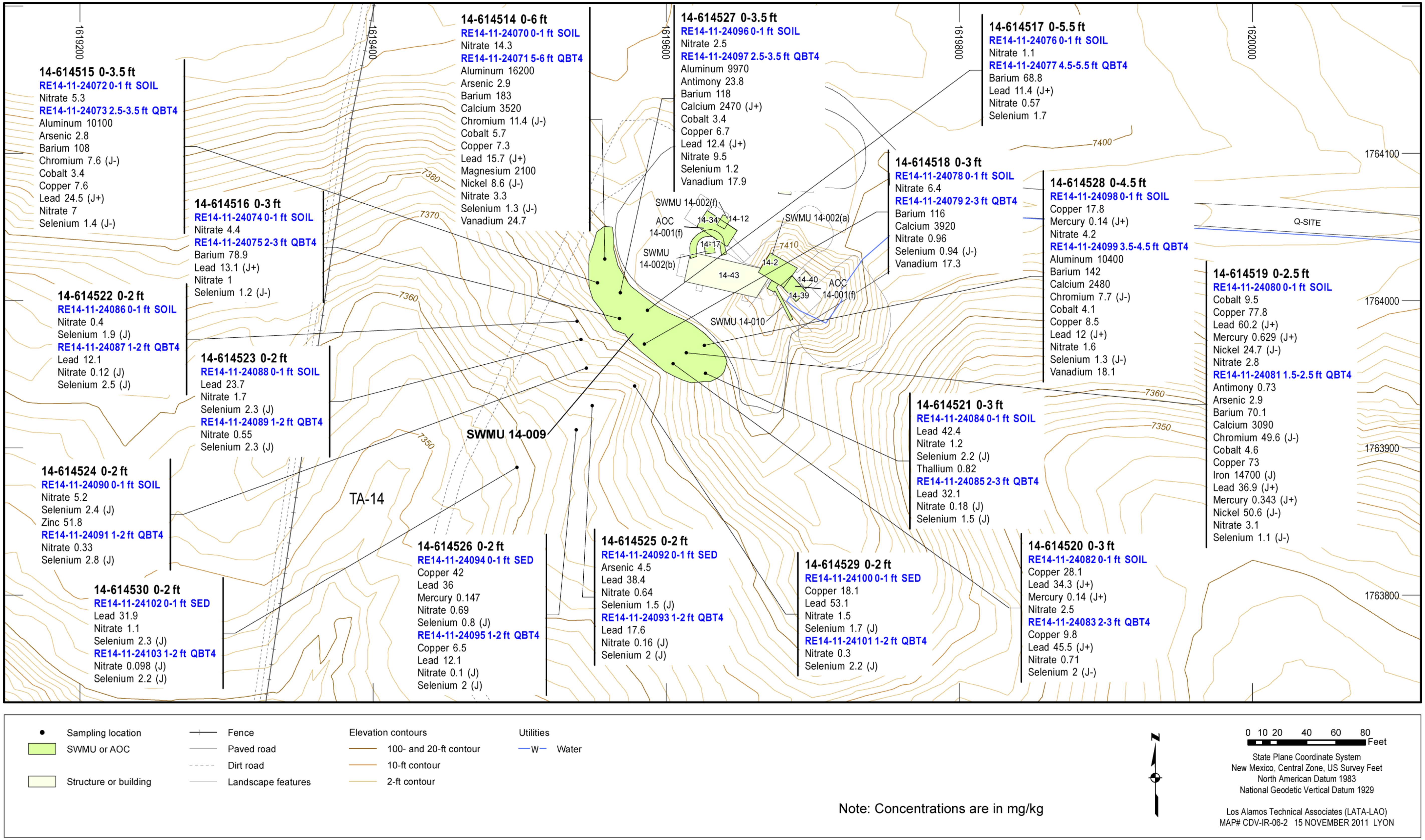


Figure 6.8-2 Inorganic chemicals detected or detected above BVs at SWMU 14-009 [Consolidated Unit 14-002(a)-99]

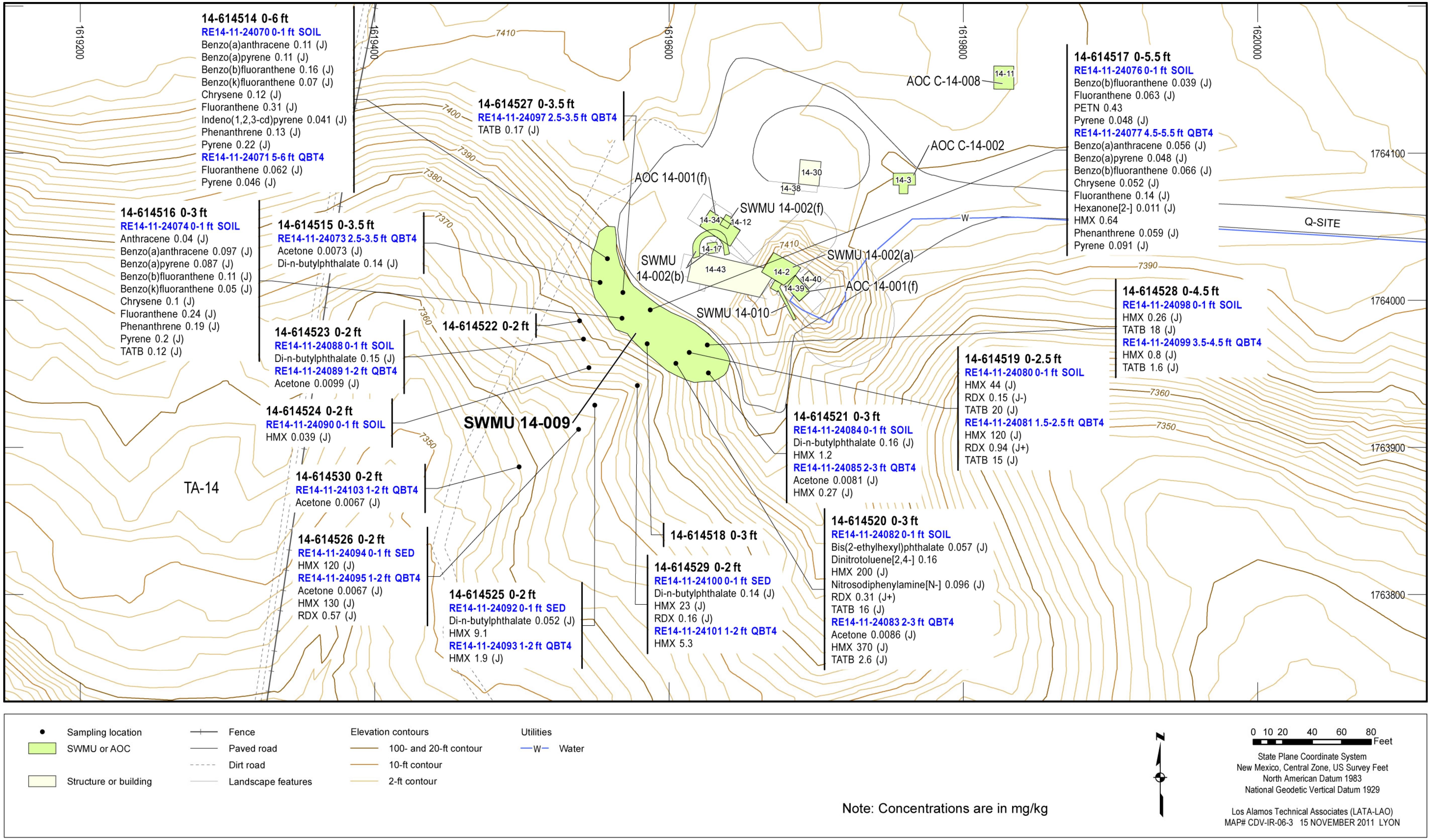


Figure 6.8-3 Organic chemicals detected at SWMU 14-009 [Consolidated Unit 14-002(a)-99]

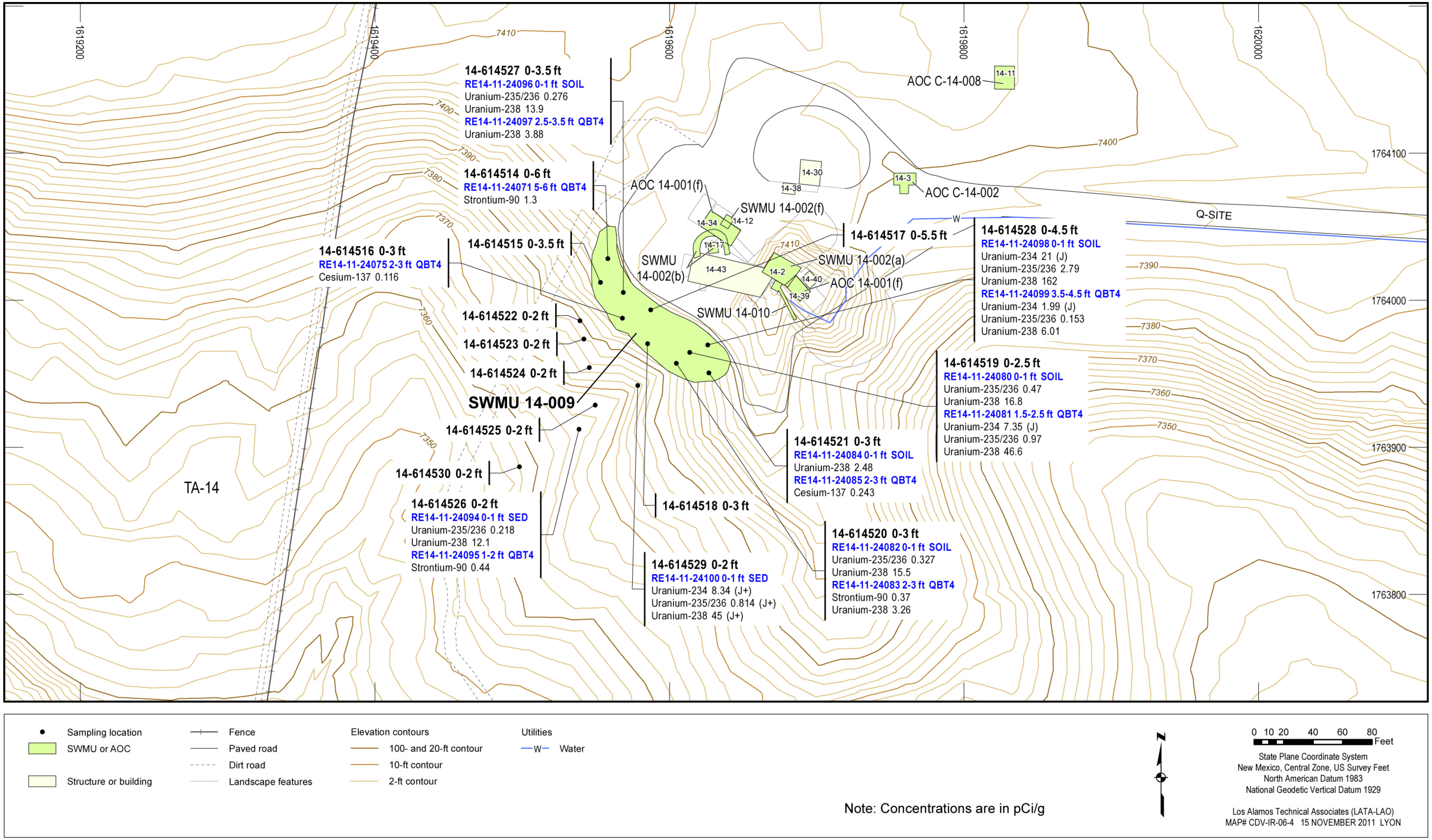


Figure 6.8-4 Radionuclides detected or detected above BVs at SWMU 14-009 [Consolidated Unit 14-002(a)-99]

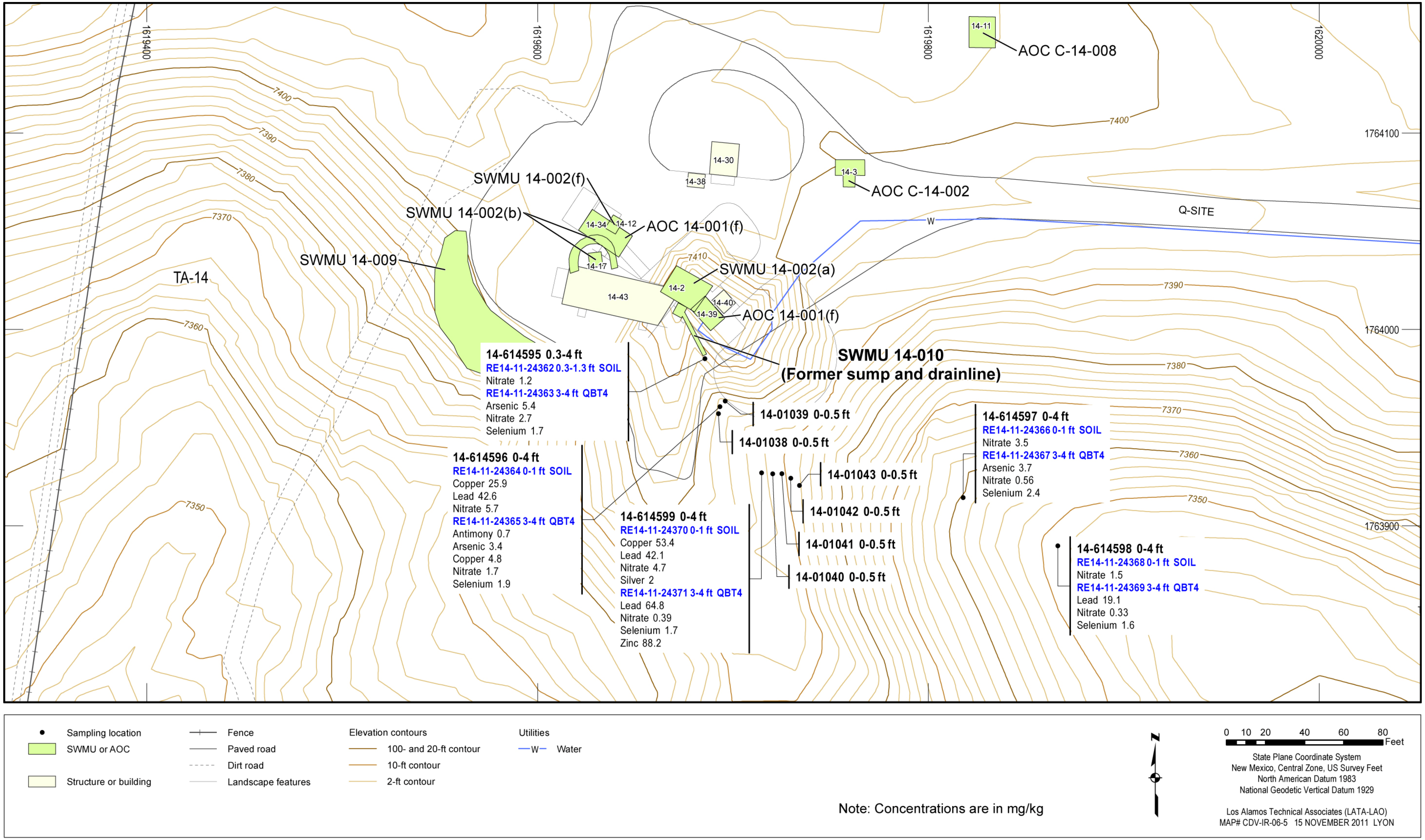


Figure 6.8-5 Inorganic chemicals detected or detected above BVs at SWMU 14-010 [Consolidated Unit 14-002(a)-99]

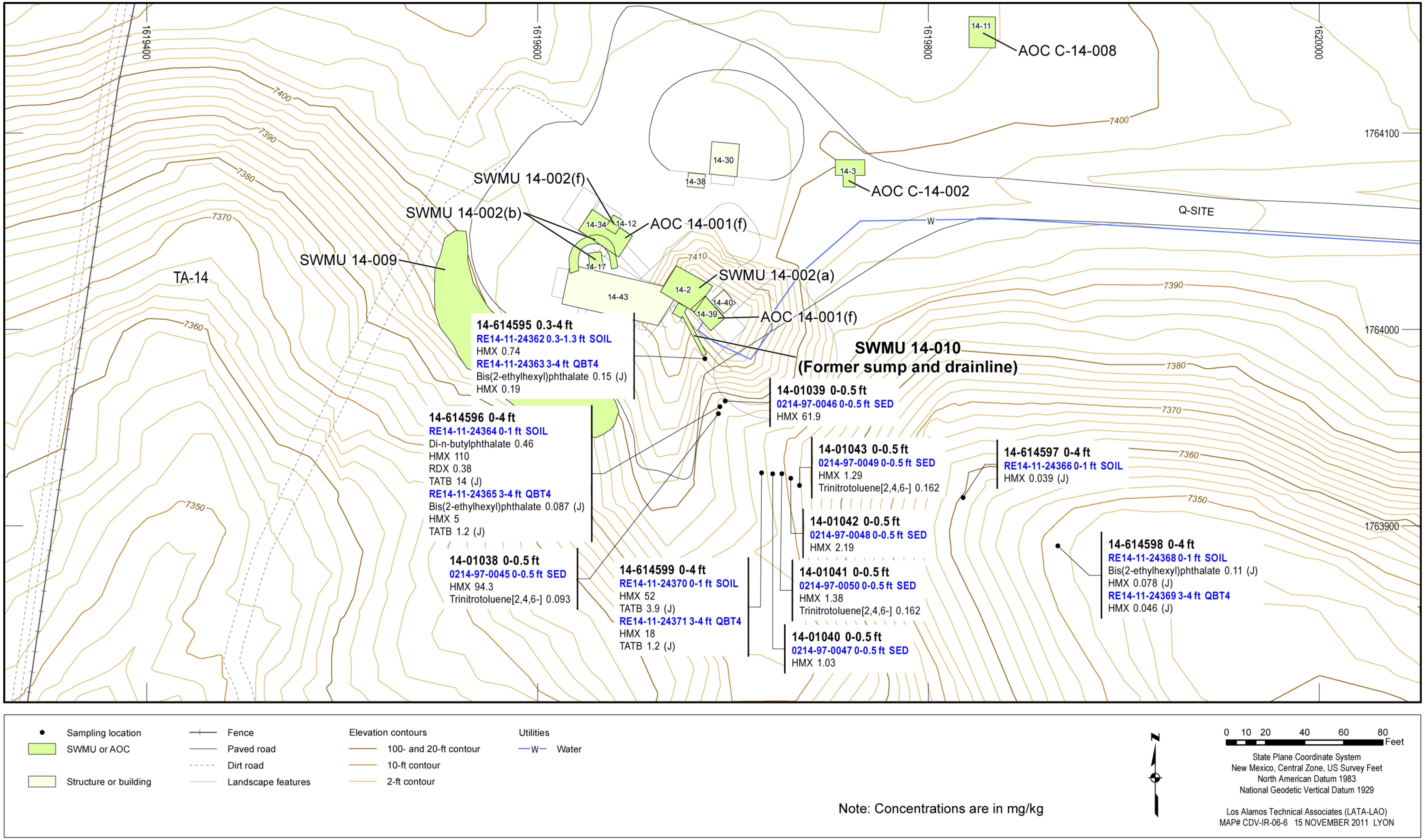


Figure 6.8-6 **Organic chemicals detected at SWMU 14-010 [Consolidated Unit 14-002(a)-99]**

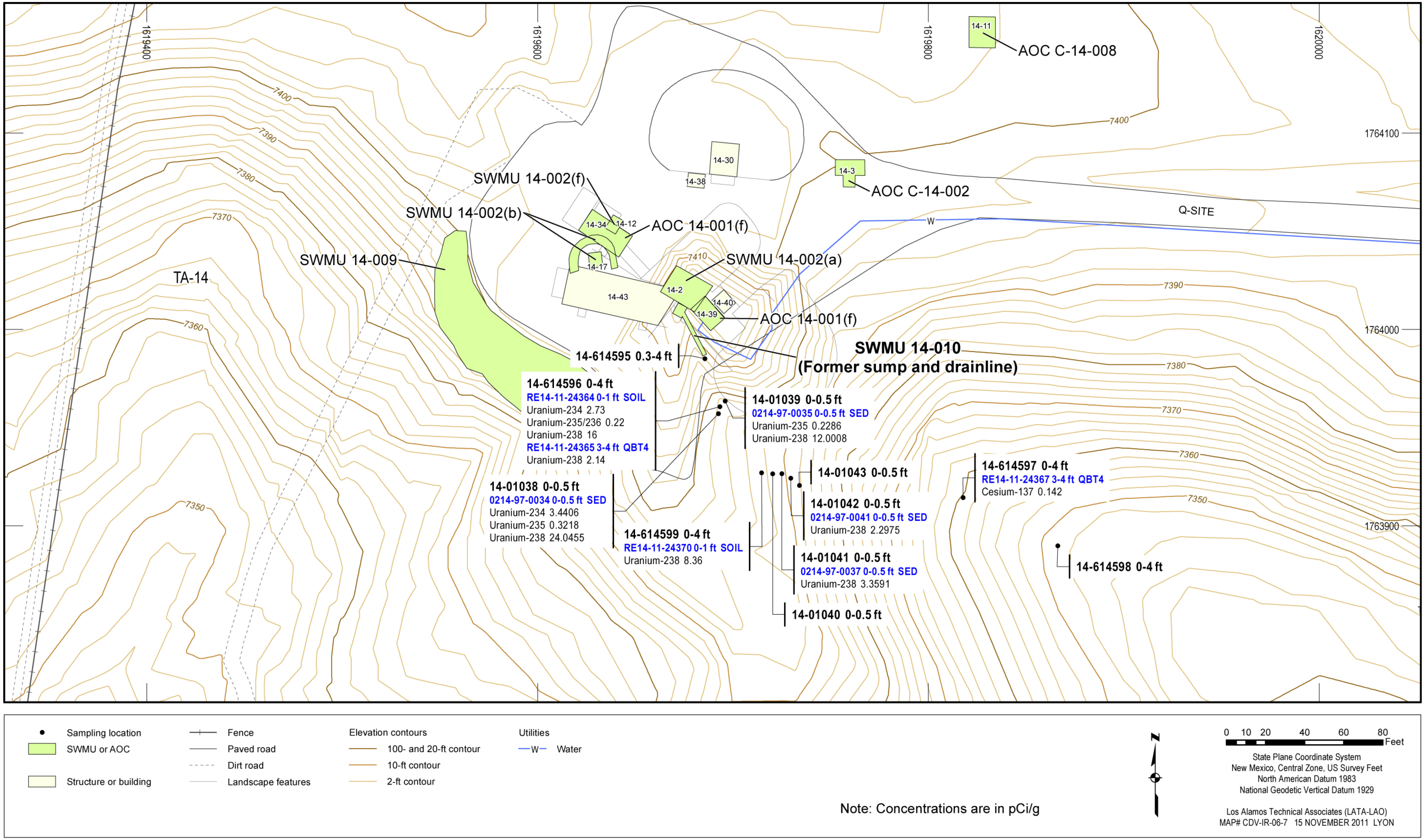


Figure 6.8-7 Radionuclides detected or detected above BVs at SWMU 14-010 [Consolidated Unit 14-002(a)-99]

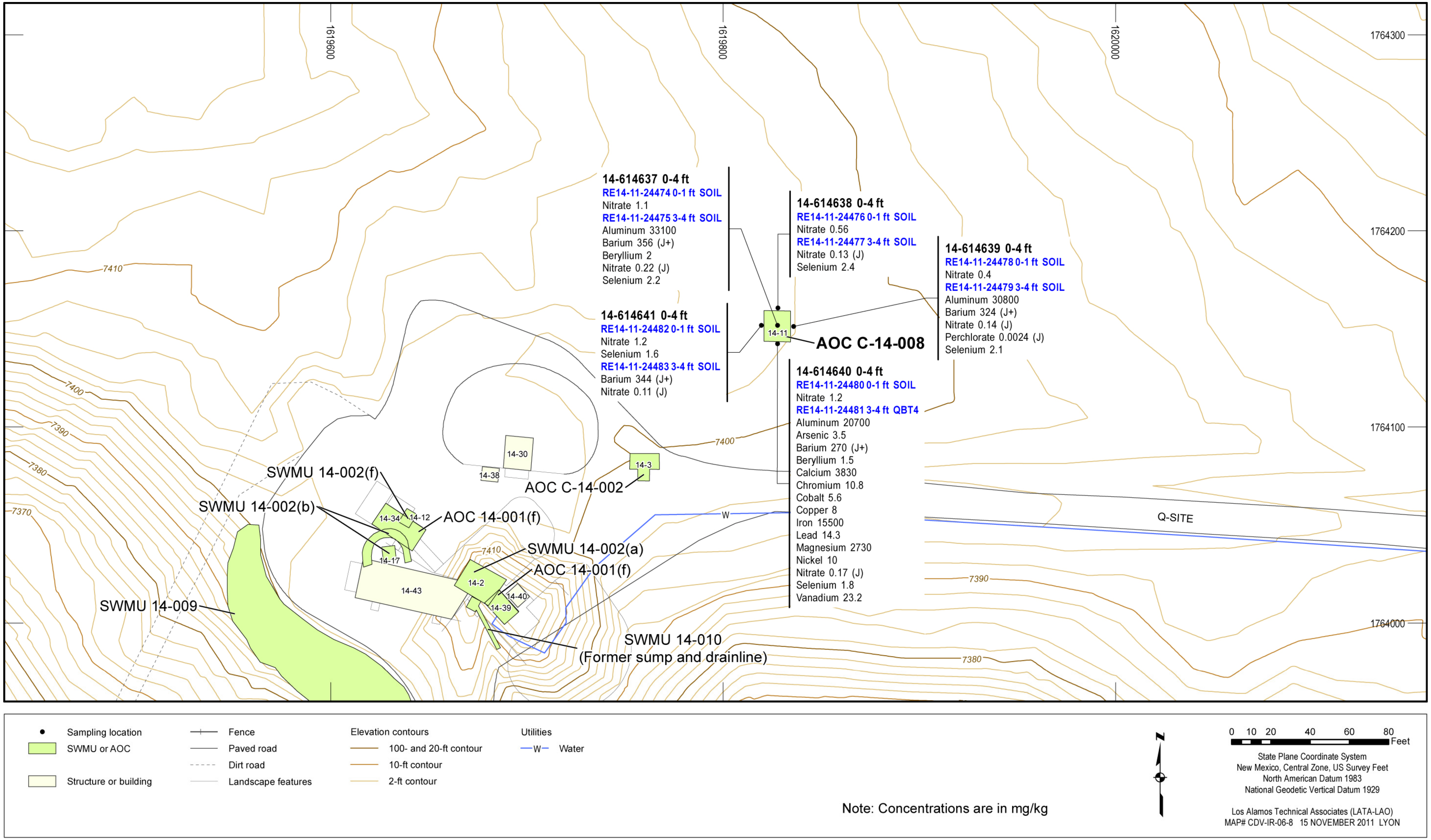


Figure 6.8-8 Inorganic chemicals detected or detected above BVs at AOC C-14-008 [Consolidated Unit 14-002(a)-99]

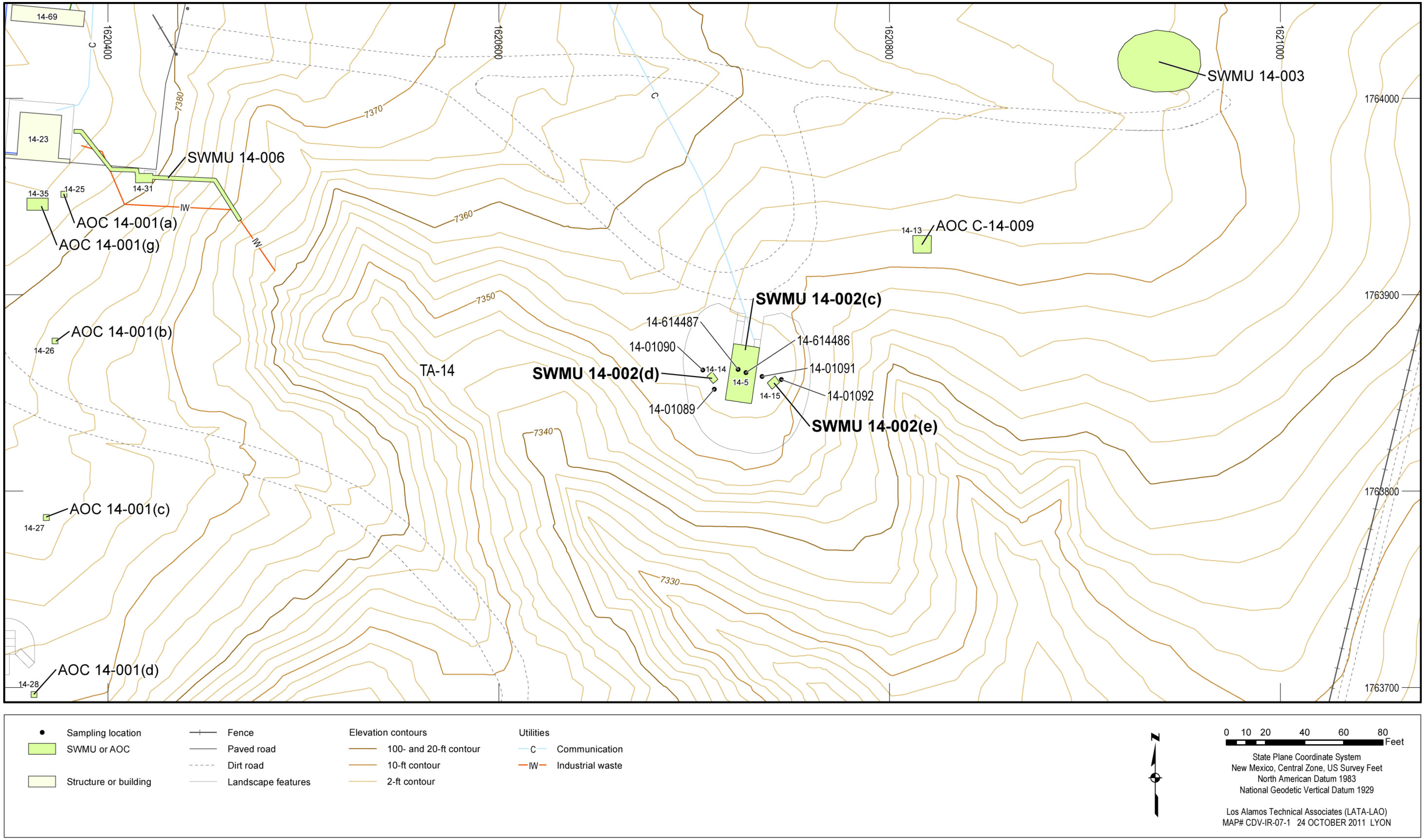


Figure 6.9-1 Consolidated Unit 14-002(c)-99 [SWMUs 14-002(c,d,e)] site map and sampling locations

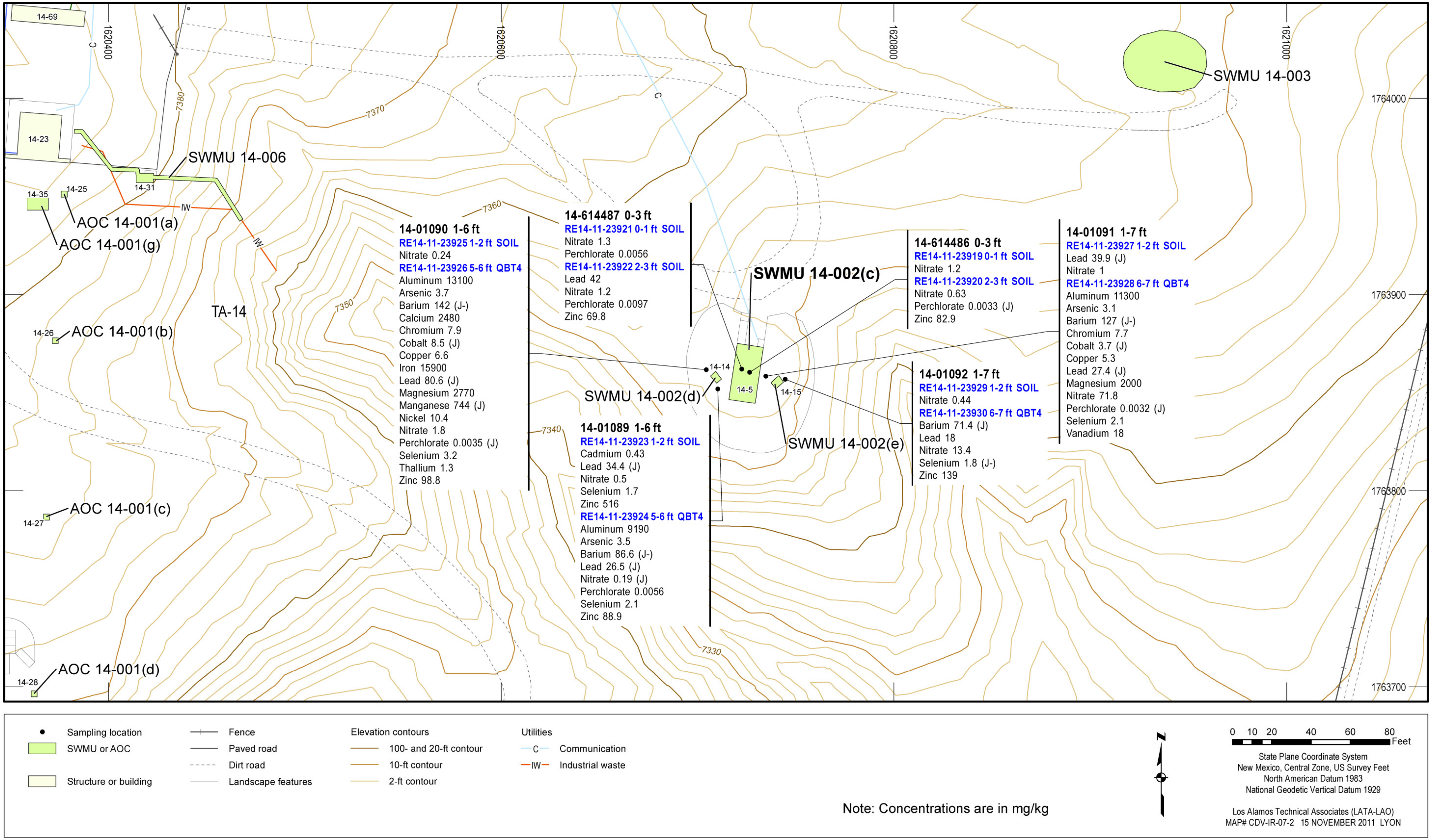
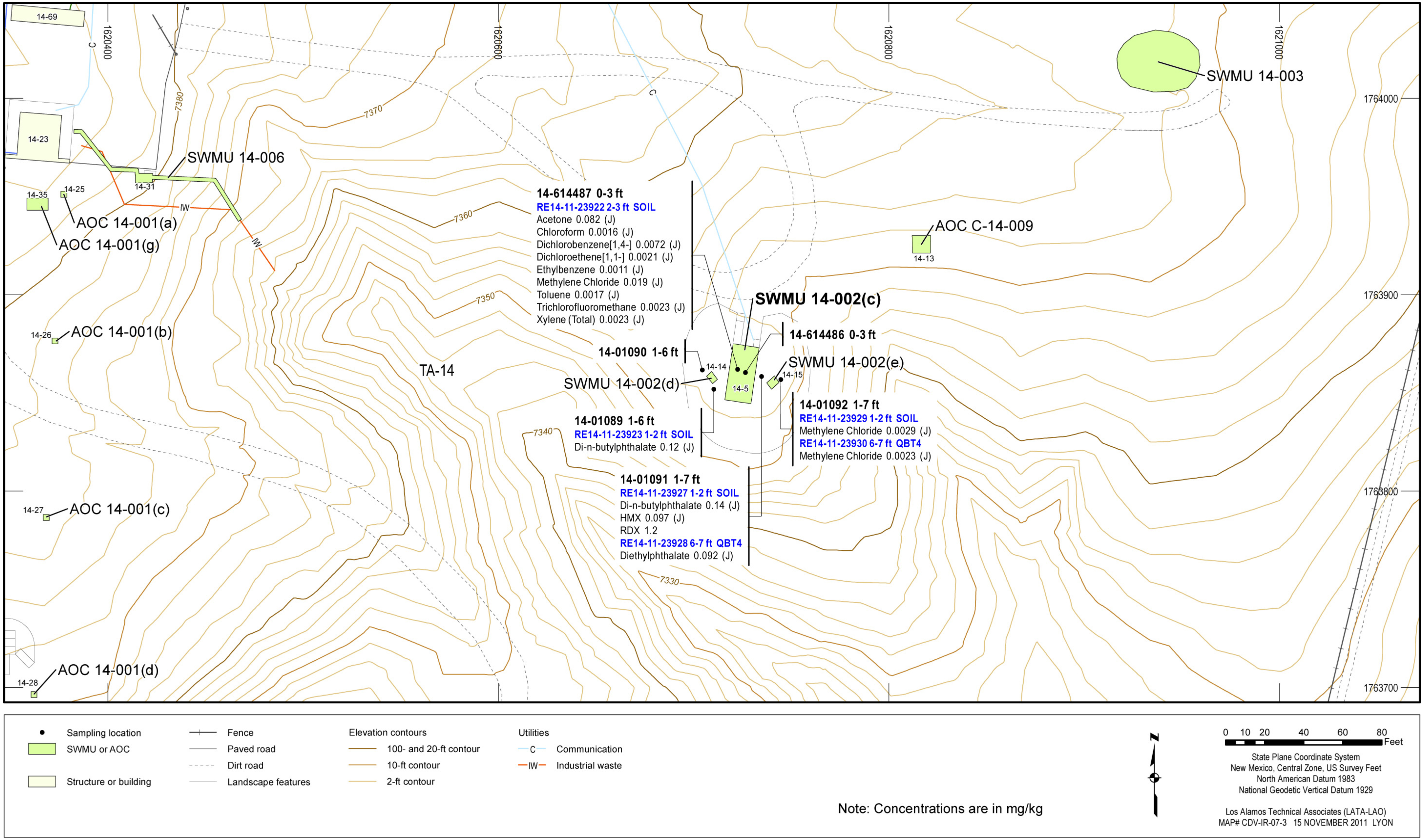


Figure 6.9-2 Inorganic chemicals detected or detected above BVs at SWMU 14-002(c)



14-614487 0-3 ft
RE14-11-23922 2-3 ft SOIL
Acetone 0.082 (J)
Chloroform 0.0016 (J)
Dichlorobenzene[1,4-] 0.0072 (J)
Dichloroethene[1,1-] 0.0021 (J)
Ethylbenzene 0.0011 (J)
Methylene Chloride 0.019 (J)
Toluene 0.0017 (J)
Trichlorofluoromethane 0.0023 (J)
Xylene (Total) 0.0023 (J)

14-614486 0-3 ft

14-01090 1-6 ft

14-01089 1-6 ft
RE14-11-23923 1-2 ft SOIL
Di-n-butylphthalate 0.12 (J)

14-01092 1-7 ft
RE14-11-23929 1-2 ft SOIL
Methylene Chloride 0.0029 (J)
RE14-11-23930 6-7 ft QBT4
Methylene Chloride 0.0023 (J)

14-01091 1-7 ft
RE14-11-23927 1-2 ft SOIL
Di-n-butylphthalate 0.14 (J)
HMX 0.097 (J)
RDX 1.2
RE14-11-23928 6-7 ft QBT4
Diethylphthalate 0.092 (J)

Note: Concentrations are in mg/kg

Figure 6.9-3 Organic chemicals detected at SWMU 14-002(c)

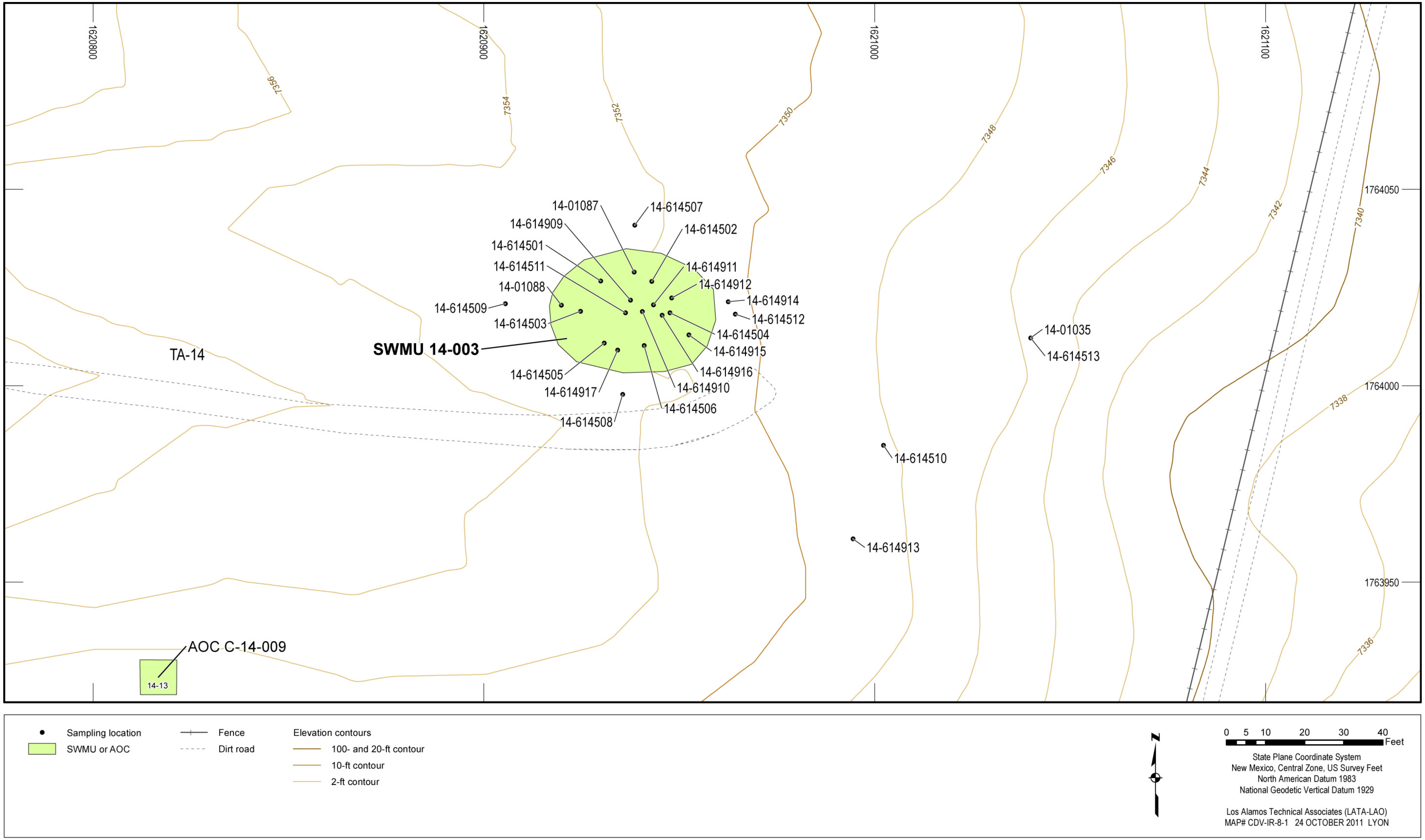


Figure 6.10-1 SWMU 14-003 site map and sampling locations

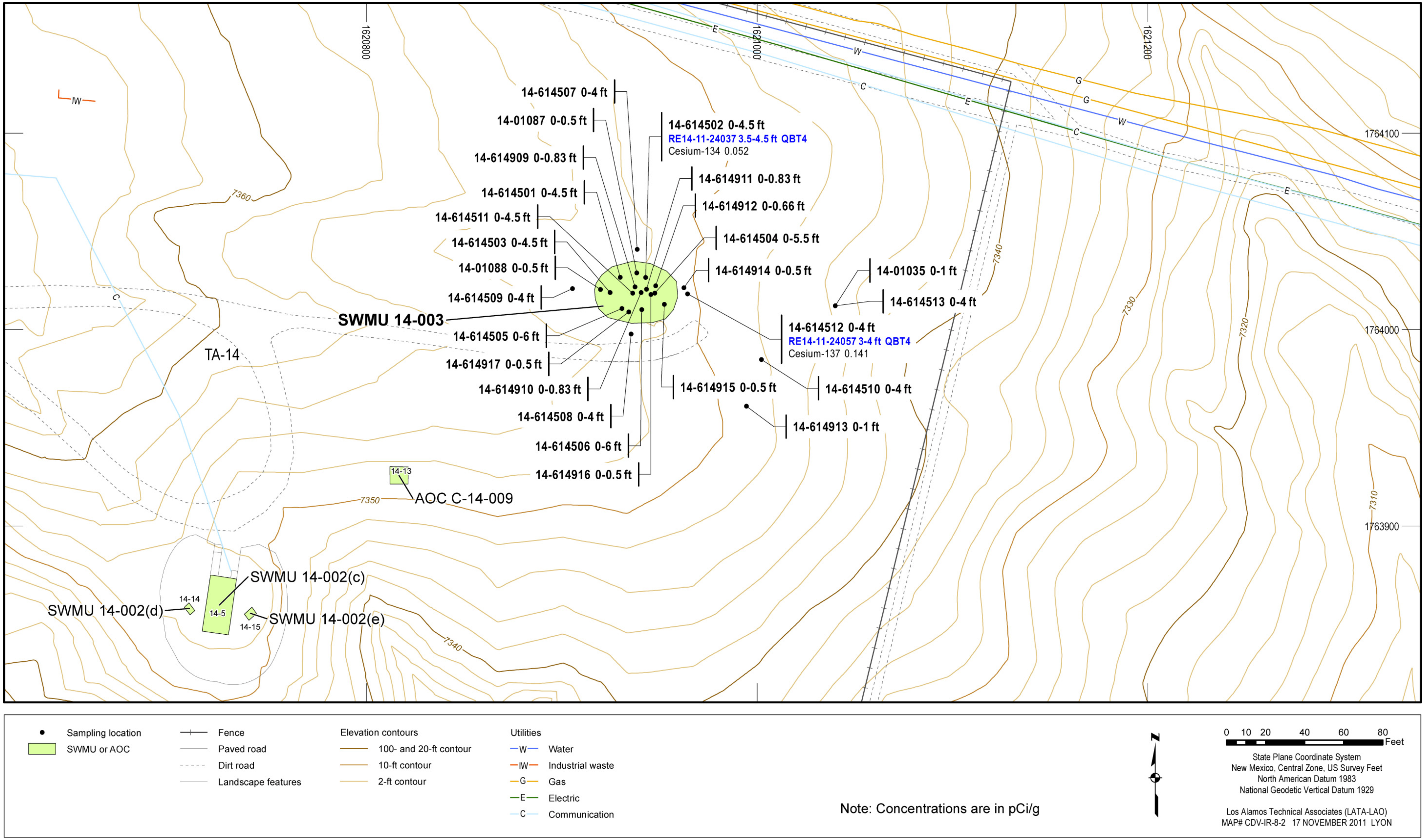


Figure 6.10-2 Radionuclides detected or detected above BVs/FVs at SWMU 14-003

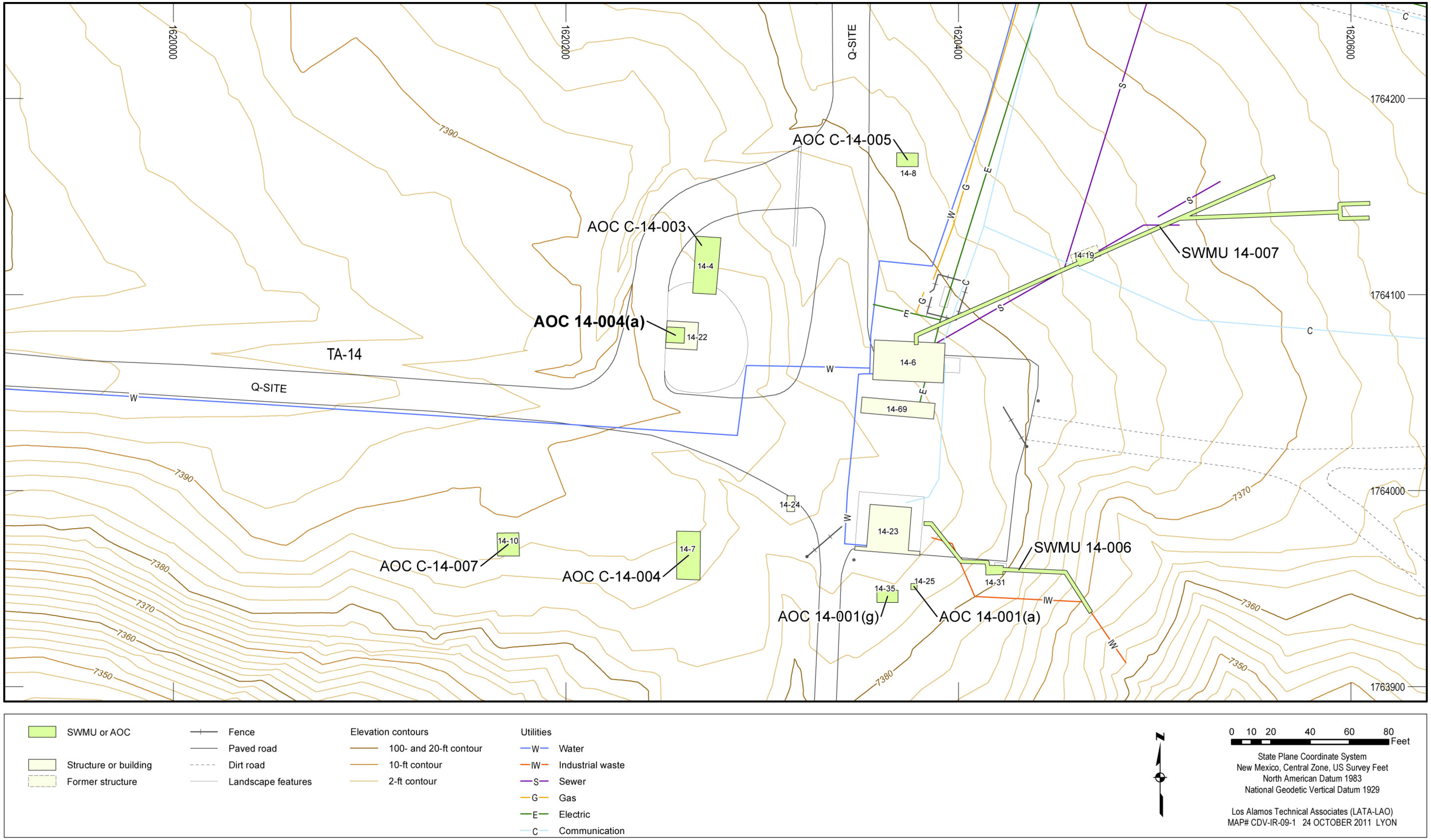


Figure 6.11-1 AOC 14-004(a) site map

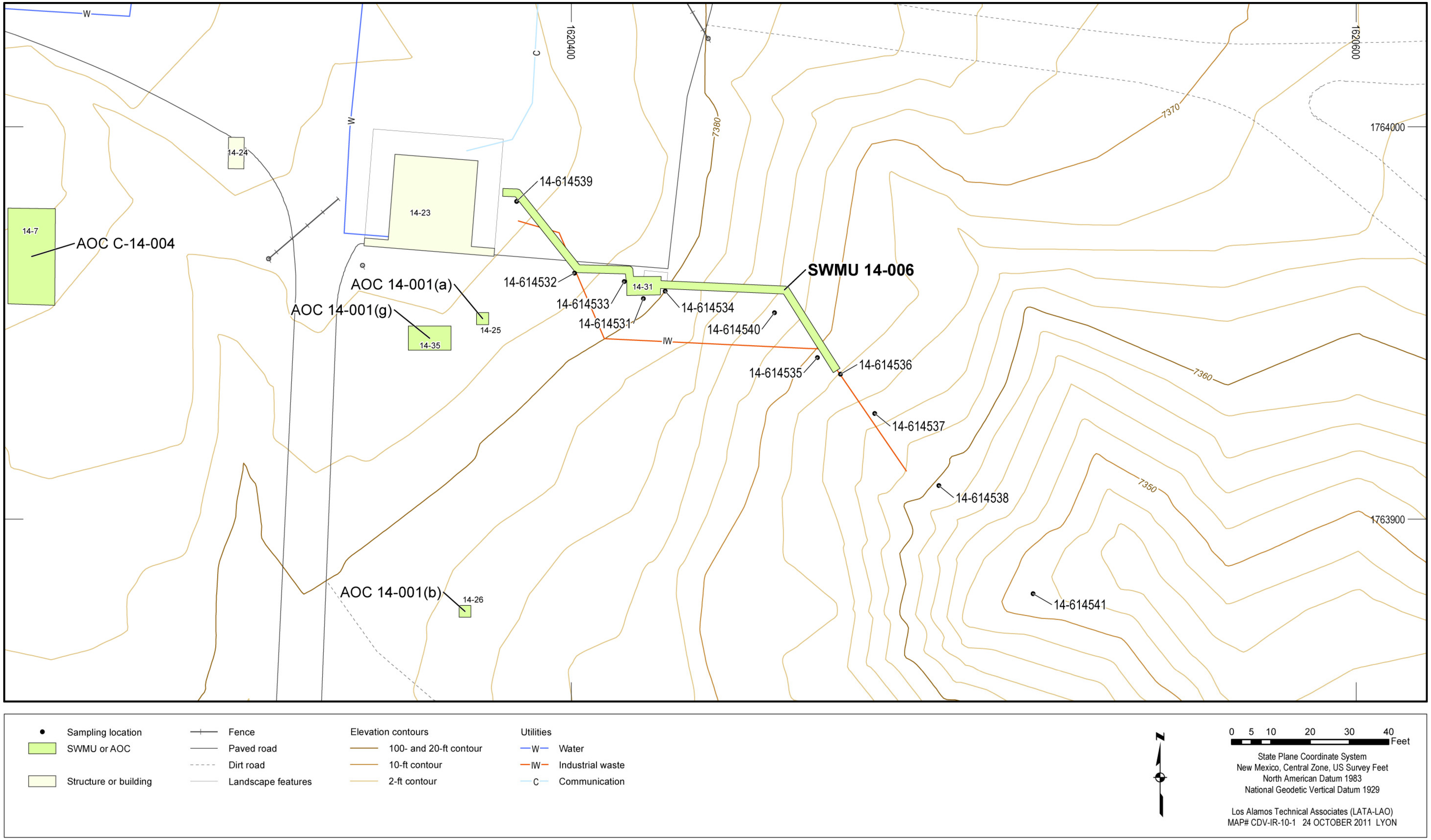
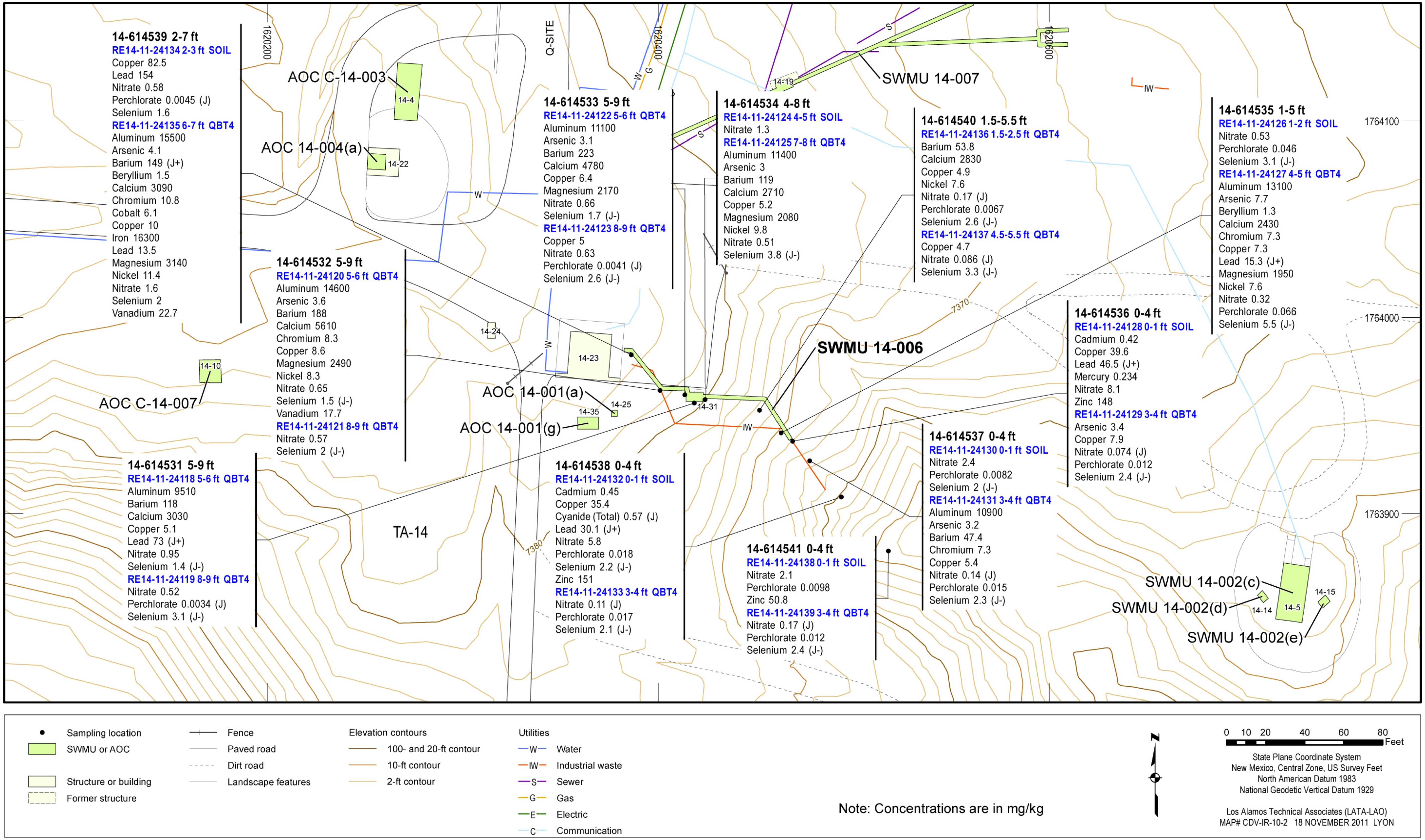


Figure 6.12-1 SWMU 14-006 site map and sampling locations



14-614539 2-7 ft
RE14-11-24134 2-3 ft SOIL
Copper 82.5
Lead 154
Nitrate 0.58
Perchlorate 0.0045 (J)
Selenium 1.6
RE14-11-24135 6-7 ft QBT4
Aluminum 15500
Arsenic 4.1
Barium 149 (J+)
Beryllium 1.5
Calcium 3090
Chromium 10.8
Cobalt 6.1
Copper 10
Iron 16300
Lead 13.5
Magnesium 3140
Nickel 11.4
Nitrate 1.6
Selenium 2
Vanadium 22.7

14-614533 5-9 ft
RE14-11-24122 5-6 ft QBT4
Aluminum 11100
Arsenic 3.1
Barium 223
Calcium 4780
Copper 6.4
Magnesium 2170
Nitrate 0.66
Selenium 1.7 (J-)
RE14-11-24123 8-9 ft QBT4
Copper 5
Nitrate 0.63
Perchlorate 0.0041 (J)
Selenium 2.6 (J-)

14-614534 4-8 ft
RE14-11-24124 4-5 ft SOIL
Nitrate 1.3
RE14-11-24125 7-8 ft QBT4
Aluminum 11400
Arsenic 3
Barium 119
Calcium 2710
Copper 5.2
Magnesium 2080
Nickel 9.8
Nitrate 0.51
Selenium 3.8 (J-)

14-614540 1.5-5.5 ft
RE14-11-24136 1.5-2.5 ft QBT4
Barium 53.8
Calcium 2830
Copper 4.9
Nickel 7.6
Nitrate 0.17 (J)
Perchlorate 0.0067
Selenium 2.6 (J-)
RE14-11-24137 4.5-5.5 ft QBT4
Copper 4.7
Nitrate 0.086 (J)
Selenium 3.3 (J-)

14-614535 1-5 ft
RE14-11-24126 1-2 ft SOIL
Nitrate 0.53
Perchlorate 0.046
Selenium 3.1 (J-)
RE14-11-24127 4-5 ft QBT4
Aluminum 13100
Arsenic 7.7
Beryllium 1.3
Calcium 2430
Chromium 7.3
Copper 7.3
Lead 15.3 (J+)
Magnesium 1950
Nickel 7.6
Nitrate 0.32
Perchlorate 0.066
Selenium 5.5 (J-)

14-614532 5-9 ft
RE14-11-24120 5-6 ft QBT4
Aluminum 14600
Arsenic 3.6
Barium 188
Calcium 5610
Chromium 8.3
Copper 8.6
Magnesium 2490
Nickel 8.3
Nitrate 0.65
Selenium 1.5 (J-)
Vanadium 17.7
RE14-11-24121 8-9 ft QBT4
Nitrate 0.57
Selenium 2 (J-)

14-614536 0-4 ft
RE14-11-24128 0-1 ft SOIL
Cadmium 0.42
Copper 39.6
Lead 46.5 (J+)
Mercury 0.234
Nitrate 8.1
Zinc 148
RE14-11-24129 3-4 ft QBT4
Arsenic 3.4
Copper 7.9
Nitrate 0.074 (J)
Perchlorate 0.012
Selenium 2.4 (J-)

14-614537 0-4 ft
RE14-11-24130 0-1 ft SOIL
Nitrate 2.4
Perchlorate 0.0082
Selenium 2 (J-)
RE14-11-24131 3-4 ft QBT4
Aluminum 10900
Arsenic 3.2
Barium 47.4
Chromium 7.3
Copper 5.4
Nitrate 0.14 (J)
Perchlorate 0.015
Selenium 2.3 (J-)

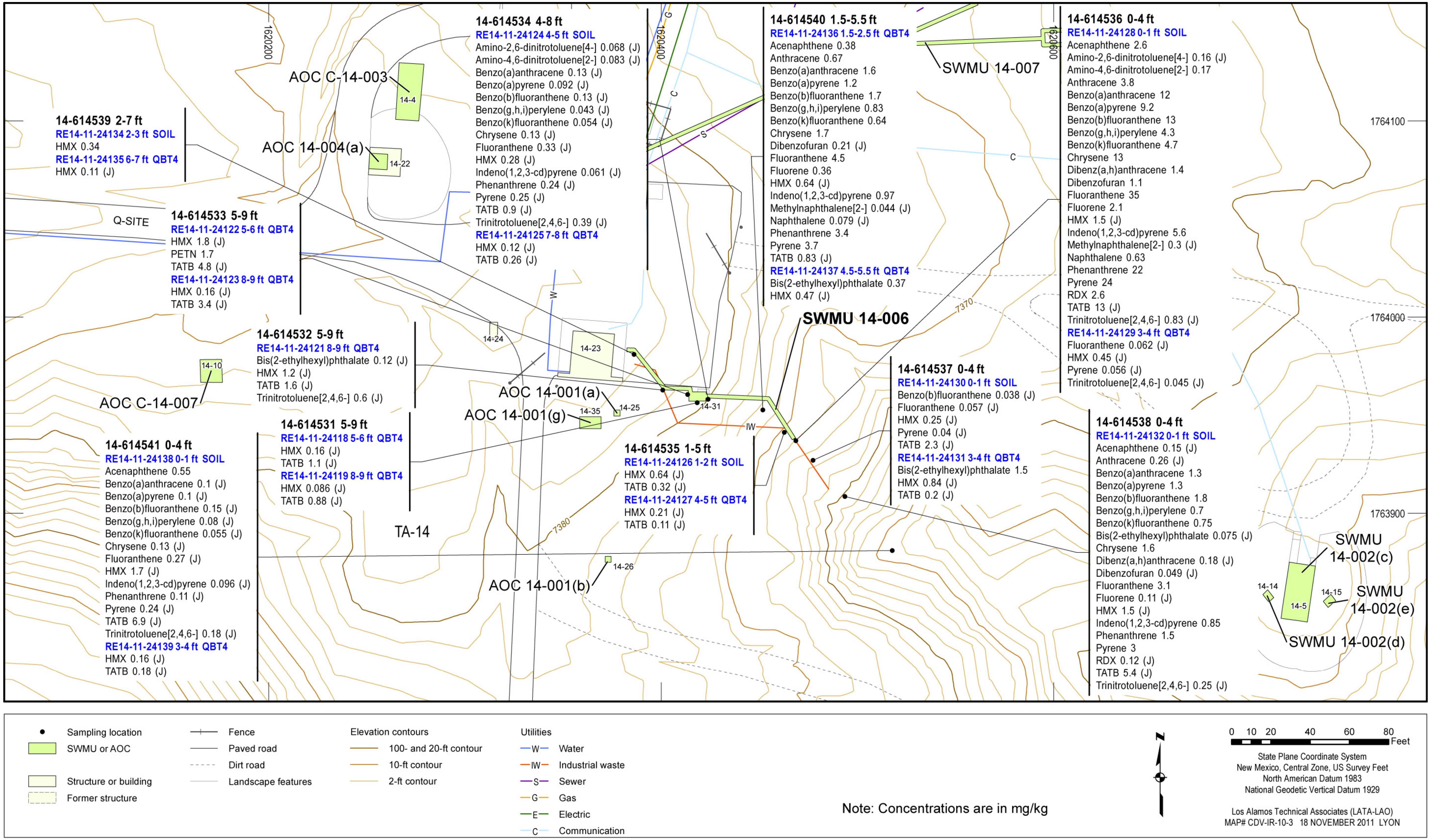
14-614531 5-9 ft
RE14-11-24118 5-6 ft QBT4
Aluminum 9510
Barium 118
Calcium 3030
Copper 5.1
Lead 73 (J+)
Nitrate 0.95
Selenium 1.4 (J-)
RE14-11-24119 8-9 ft QBT4
Nitrate 0.52
Perchlorate 0.0034 (J)
Selenium 3.1 (J-)

14-614538 0-4 ft
RE14-11-24132 0-1 ft SOIL
Cadmium 0.45
Copper 35.4
Cyanide (Total) 0.57 (J)
Lead 30.1 (J+)
Nitrate 5.8
Perchlorate 0.018
Selenium 2.2 (J-)
Zinc 151
RE14-11-24133 3-4 ft QBT4
Nitrate 0.11 (J)
Perchlorate 0.017
Selenium 2.1 (J-)

14-614541 0-4 ft
RE14-11-24138 0-1 ft SOIL
Nitrate 2.1
Perchlorate 0.0098
Zinc 50.8
RE14-11-24139 3-4 ft QBT4
Nitrate 0.17 (J)
Perchlorate 0.012
Selenium 2.4 (J-)

Note: Concentrations are in mg/kg

Figure 6.12-2 Inorganic chemicals detected or detected above BVs at SWMU 14-006



14-614539 2-7 ft
RE14-11-24134 2-3 ft SOIL
HMX 0.34
RE14-11-24135 6-7 ft QBT4
HMX 0.11 (J)

14-614533 5-9 ft
RE14-11-24122 5-6 ft QBT4
HMX 1.8 (J)
PETN 1.7
TATB 4.8 (J)
RE14-11-24123 8-9 ft QBT4
HMX 0.16 (J)
TATB 3.4 (J)

14-614534 4-8 ft
RE14-11-24124 4-5 ft SOIL
Amino-2,6-dinitrotoluene[4-] 0.068 (J)
Amino-4,6-dinitrotoluene[2-] 0.083 (J)
Benzo(a)anthracene 0.13 (J)
Benzo(a)pyrene 0.092 (J)
Benzo(b)fluoranthene 0.13 (J)
Benzo(g,h,i)perylene 0.043 (J)
Benzo(k)fluoranthene 0.054 (J)
Chrysene 0.13 (J)
Fluoranthene 0.33 (J)
HMX 0.28 (J)
Indeno(1,2,3-cd)pyrene 0.061 (J)
Phenanthrene 0.24 (J)
Pyrene 0.25 (J)
TATB 0.9 (J)
Trinitrotoluene[2,4,6-] 0.39 (J)
RE14-11-24125 7-8 ft QBT4
HMX 0.12 (J)
TATB 0.26 (J)

14-614540 1.5-5.5 ft
RE14-11-24136 1.5-2.5 ft QBT4
Acenaphthene 0.38
Anthracene 0.67
Benzo(a)anthracene 1.6
Benzo(a)pyrene 1.2
Benzo(b)fluoranthene 1.7
Benzo(g,h,i)perylene 0.83
Benzo(k)fluoranthene 0.64
Chrysene 1.7
Dibenzofuran 0.21 (J)
Fluoranthene 4.5
Fluorene 0.36
HMX 0.64 (J)
Indeno(1,2,3-cd)pyrene 0.97
Methylnaphthalene[2-] 0.044 (J)
Naphthalene 0.079 (J)
Phenanthrene 3.4
Pyrene 3.7
TATB 0.83 (J)
RE14-11-24137 4.5-5.5 ft QBT4
Bis(2-ethylhexyl)phthalate 0.37
HMX 0.47 (J)

14-614536 0-4 ft
RE14-11-24128 0-1 ft SOIL
Acenaphthene 2.6
Amino-2,6-dinitrotoluene[4-] 0.16 (J)
Amino-4,6-dinitrotoluene[2-] 0.17
Anthracene 3.8
Benzo(a)anthracene 12
Benzo(a)pyrene 9.2
Benzo(b)fluoranthene 13
Benzo(g,h,i)perylene 4.3
Benzo(k)fluoranthene 4.7
Chrysene 13
Dibenz(a,h)anthracene 1.4
Dibenzofuran 1.1
Fluoranthene 35
Fluorene 2.1
HMX 1.5 (J)
Indeno(1,2,3-cd)pyrene 5.6
Methylnaphthalene[2-] 0.3 (J)
Naphthalene 0.63
Phenanthrene 22
Pyrene 24
RDX 2.6
TATB 13 (J)
Trinitrotoluene[2,4,6-] 0.83 (J)
RE14-11-24129 3-4 ft QBT4
Fluoranthene 0.062 (J)
HMX 0.45 (J)
Pyrene 0.056 (J)
Trinitrotoluene[2,4,6-] 0.045 (J)

14-614532 5-9 ft
RE14-11-24121 8-9 ft QBT4
Bis(2-ethylhexyl)phthalate 0.12 (J)
HMX 1.2 (J)
TATB 1.6 (J)
Trinitrotoluene[2,4,6-] 0.6 (J)

14-614537 0-4 ft
RE14-11-24130 0-1 ft SOIL
Benzo(b)fluoranthene 0.038 (J)
Fluoranthene 0.057 (J)
HMX 0.25 (J)
Pyrene 0.04 (J)
TATB 2.3 (J)
RE14-11-24131 3-4 ft QBT4
Bis(2-ethylhexyl)phthalate 1.5
HMX 0.84 (J)
TATB 0.2 (J)

14-614531 5-9 ft
RE14-11-24118 5-6 ft QBT4
HMX 0.16 (J)
TATB 1.1 (J)
RE14-11-24119 8-9 ft QBT4
HMX 0.086 (J)
TATB 0.88 (J)

14-614541 0-4 ft
RE14-11-24138 0-1 ft SOIL
Acenaphthene 0.55
Benzo(a)anthracene 0.1 (J)
Benzo(a)pyrene 0.1 (J)
Benzo(b)fluoranthene 0.15 (J)
Benzo(g,h,i)perylene 0.08 (J)
Benzo(k)fluoranthene 0.055 (J)
Chrysene 0.13 (J)
Fluoranthene 0.27 (J)
HMX 1.7 (J)
Indeno(1,2,3-cd)pyrene 0.096 (J)
Phenanthrene 0.11 (J)
Pyrene 0.24 (J)
TATB 6.9 (J)
Trinitrotoluene[2,4,6-] 0.18 (J)
RE14-11-24139 3-4 ft QBT4
HMX 0.16 (J)
TATB 0.18 (J)

14-614535 1-5 ft
RE14-11-24126 1-2 ft SOIL
HMX 0.64 (J)
TATB 0.32 (J)
RE14-11-24127 4-5 ft QBT4
HMX 0.21 (J)
TATB 0.11 (J)

14-614538 0-4 ft
RE14-11-24132 0-1 ft SOIL
Acenaphthene 0.15 (J)
Anthracene 0.26 (J)
Benzo(a)anthracene 1.3
Benzo(a)pyrene 1.3
Benzo(b)fluoranthene 1.8
Benzo(g,h,i)perylene 0.7
Benzo(k)fluoranthene 0.75
Bis(2-ethylhexyl)phthalate 0.075 (J)
Chrysene 1.6
Dibenz(a,h)anthracene 0.18 (J)
Dibenzofuran 0.049 (J)
Fluoranthene 3.1
Fluorene 0.11 (J)
HMX 1.5 (J)
Indeno(1,2,3-cd)pyrene 0.85
Phenanthrene 1.5
Pyrene 3
RDX 0.12 (J)
TATB 5.4 (J)
Trinitrotoluene[2,4,6-] 0.25 (J)

Note: Concentrations are in mg/kg

Figure 6.12-3 Organic chemicals detected at SWMU 14-006

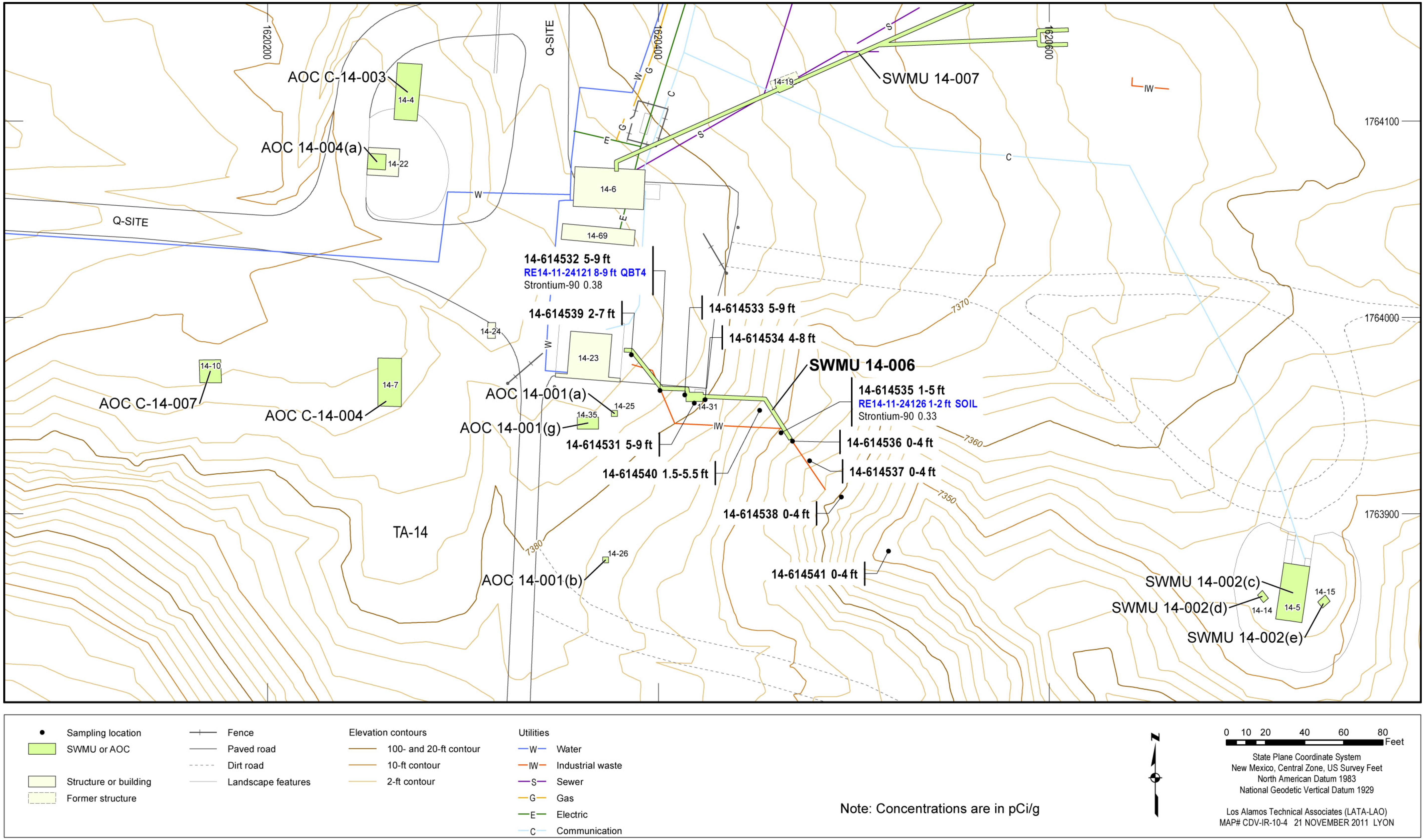


Figure 6.12-4 Radionuclides detected or detected above BVs/FVs at SWMU 14-006

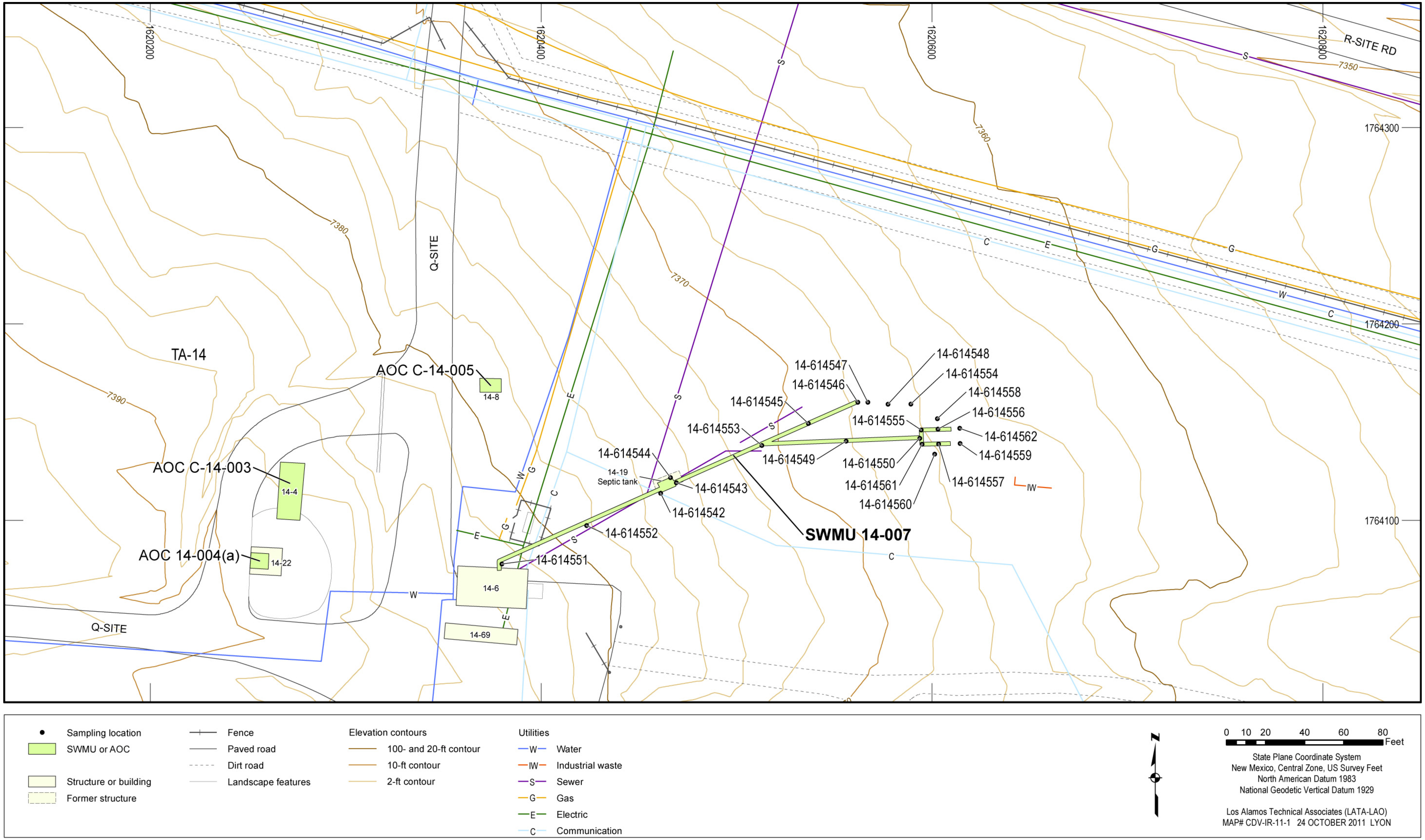


Figure 6.13-1 SWMU 14-007 site map and sampling locations

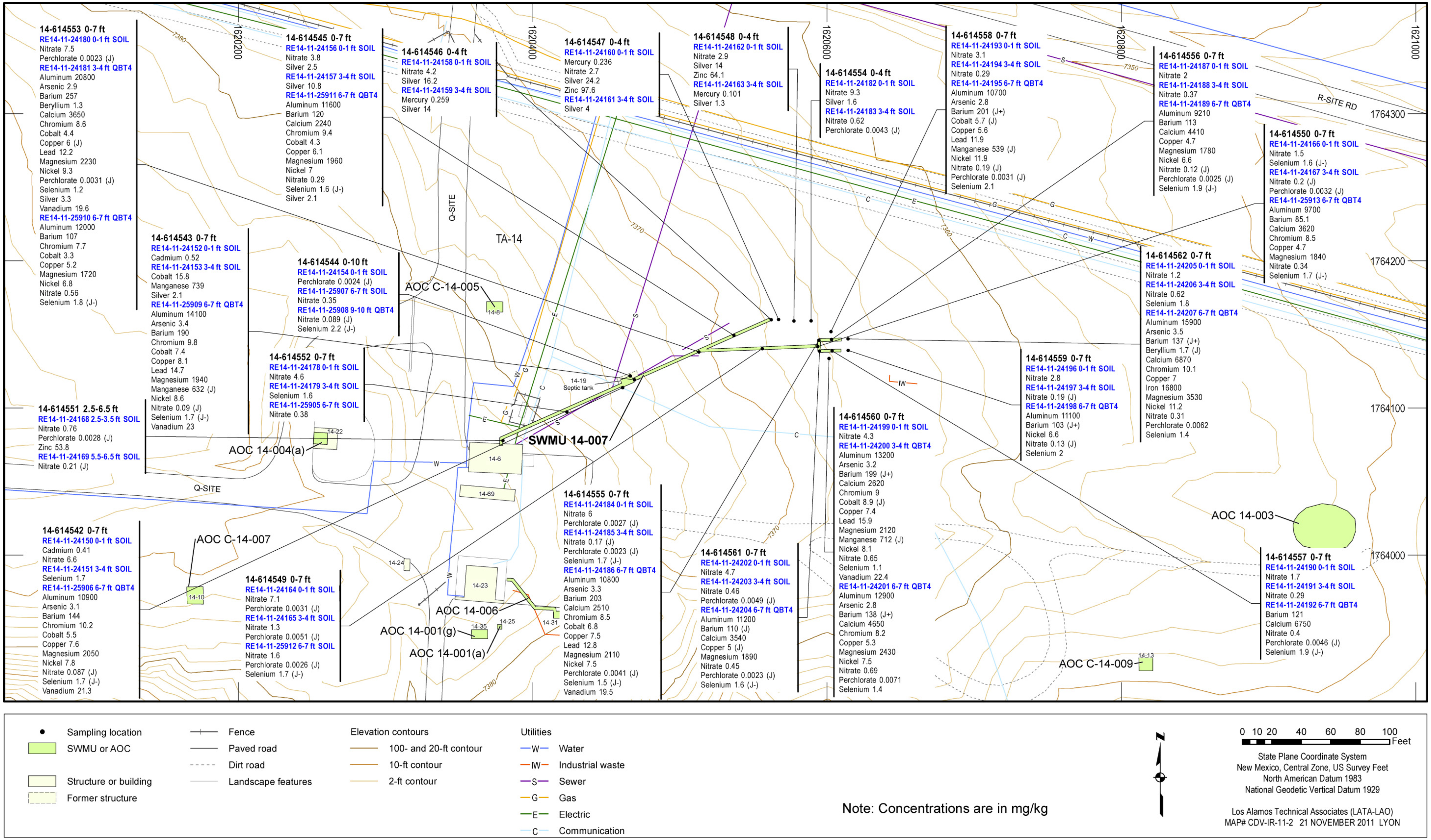


Figure 6.13-2 Inorganic chemicals detected or detected above BVs at SWMU 14-007

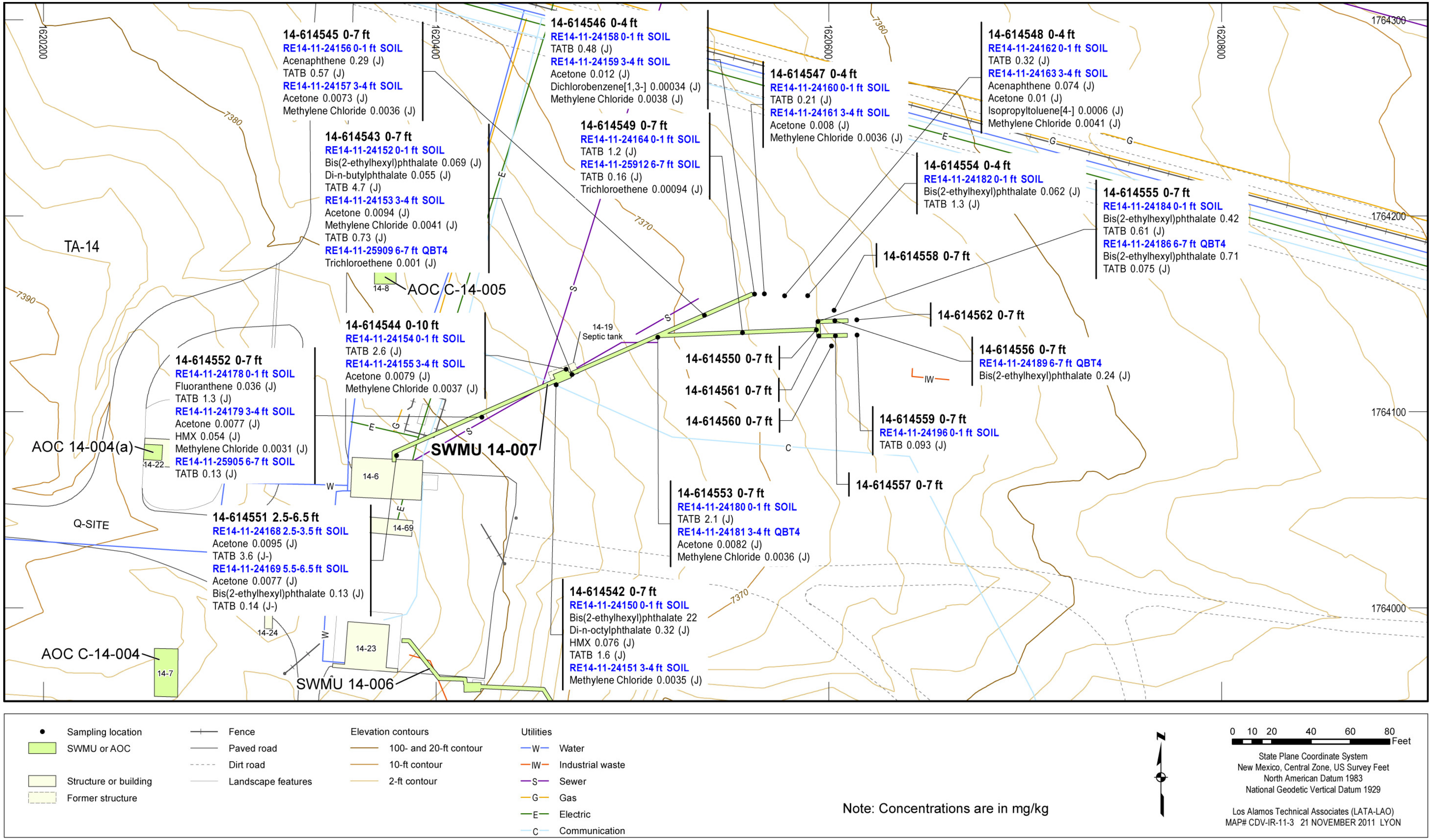


Figure 6.13-3 Organic chemicals detected at SWMU 14-007

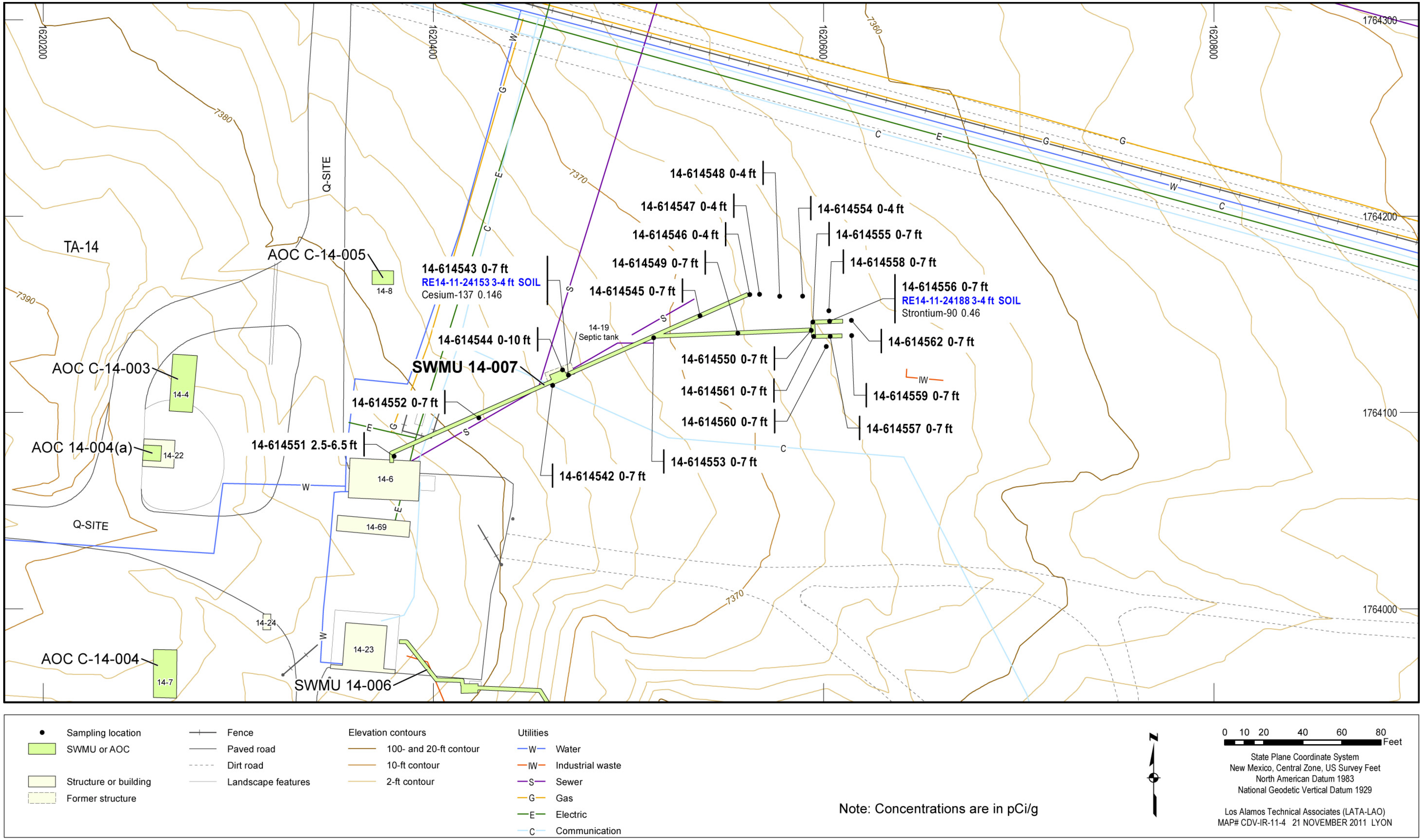
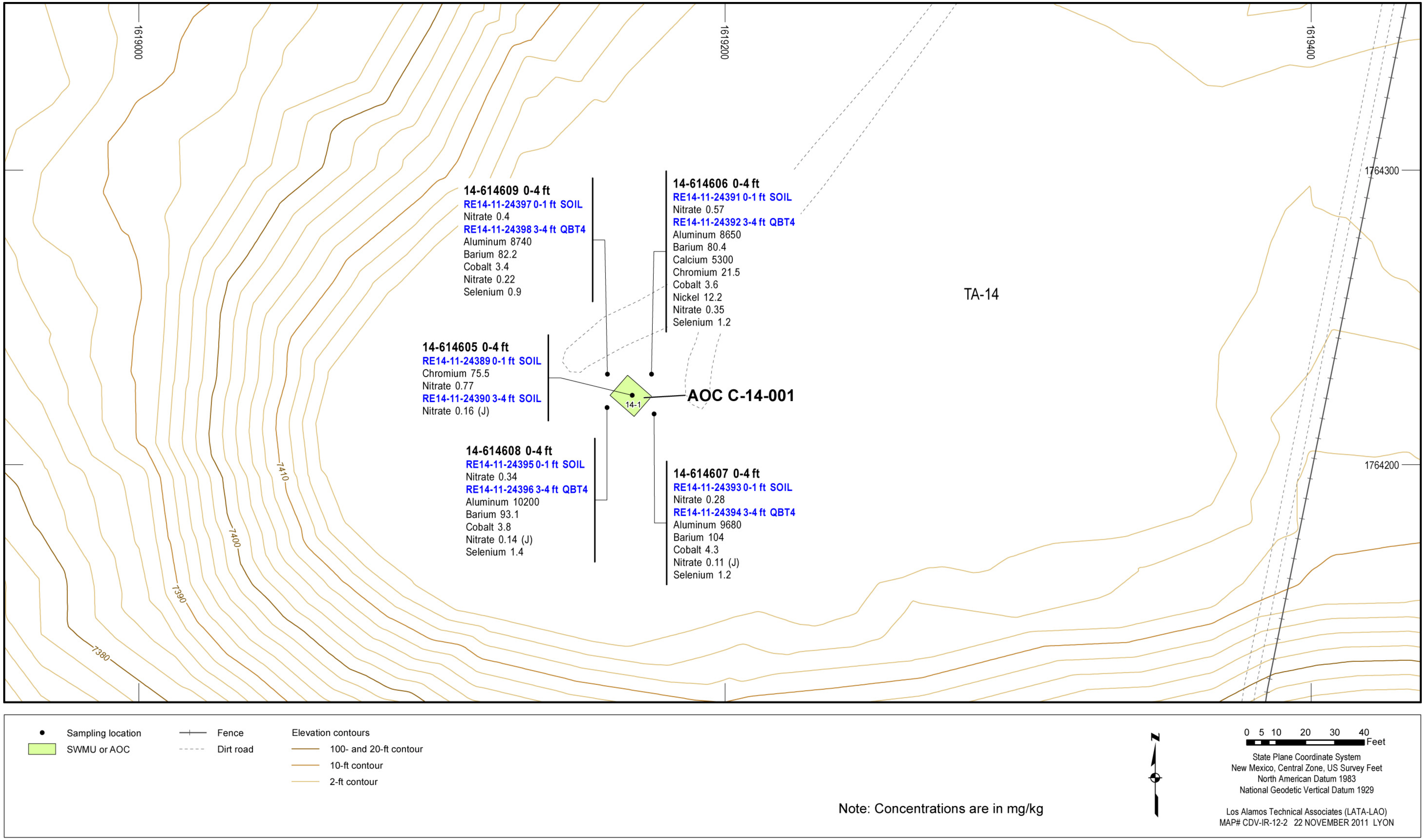


Figure 6.13-4 Radionuclides detected or detected above BVs/FVs at SWMU 14-007

Figure 6.14-1 AOC C-14-001 site map and sampling locations



14-614609 0-4 ft
RE14-11-24397 0-1 ft SOIL
Nitrate 0.4
RE14-11-24398 3-4 ft QBT4
Aluminum 8740
Barium 82.2
Cobalt 3.4
Nitrate 0.22
Selenium 0.9

14-614606 0-4 ft
RE14-11-24391 0-1 ft SOIL
Nitrate 0.57
RE14-11-24392 3-4 ft QBT4
Aluminum 8650
Barium 80.4
Calcium 5300
Chromium 21.5
Cobalt 3.6
Nickel 12.2
Nitrate 0.35
Selenium 1.2

14-614605 0-4 ft
RE14-11-24389 0-1 ft SOIL
Chromium 75.5
Nitrate 0.77
RE14-11-24390 3-4 ft SOIL
Nitrate 0.16 (J)

14-614608 0-4 ft
RE14-11-24395 0-1 ft SOIL
Nitrate 0.34
RE14-11-24396 3-4 ft QBT4
Aluminum 10200
Barium 93.1
Cobalt 3.8
Nitrate 0.14 (J)
Selenium 1.4

14-614607 0-4 ft
RE14-11-24393 0-1 ft SOIL
Nitrate 0.28
RE14-11-24394 3-4 ft QBT4
Aluminum 9680
Barium 104
Cobalt 4.3
Nitrate 0.11 (J)
Selenium 1.2

Note: Concentrations are in mg/kg

State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

Los Alamos Technical Associates (LATA-LAO)
MAP# CDV-IR-12-2 22 NOVEMBER 2011 LYON

Figure 6.14-2 Inorganic chemicals detected or detected above BVs at AOC C-14-001

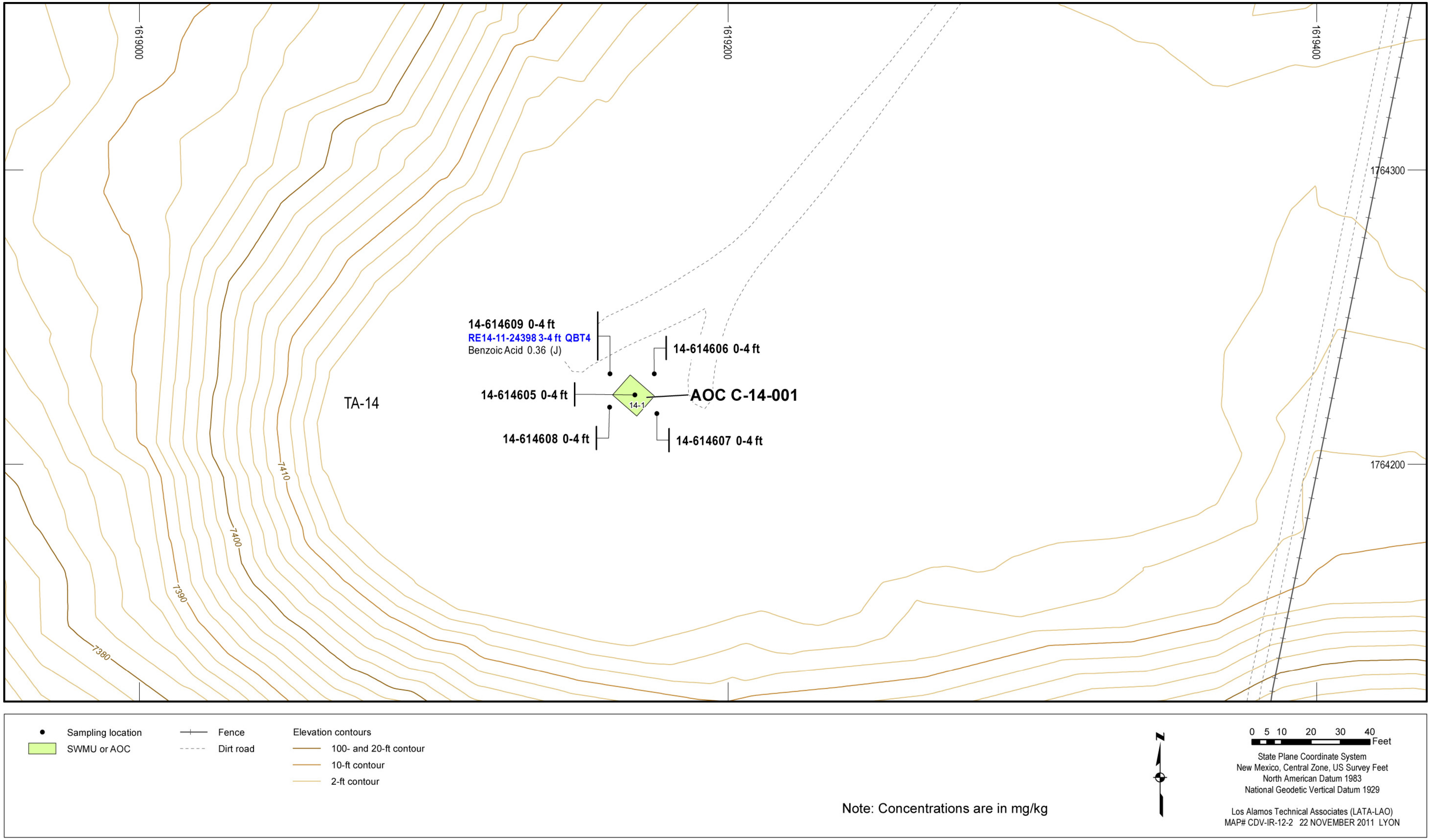


Figure 6.14-3 Organic chemicals detected at AOC C-14-001

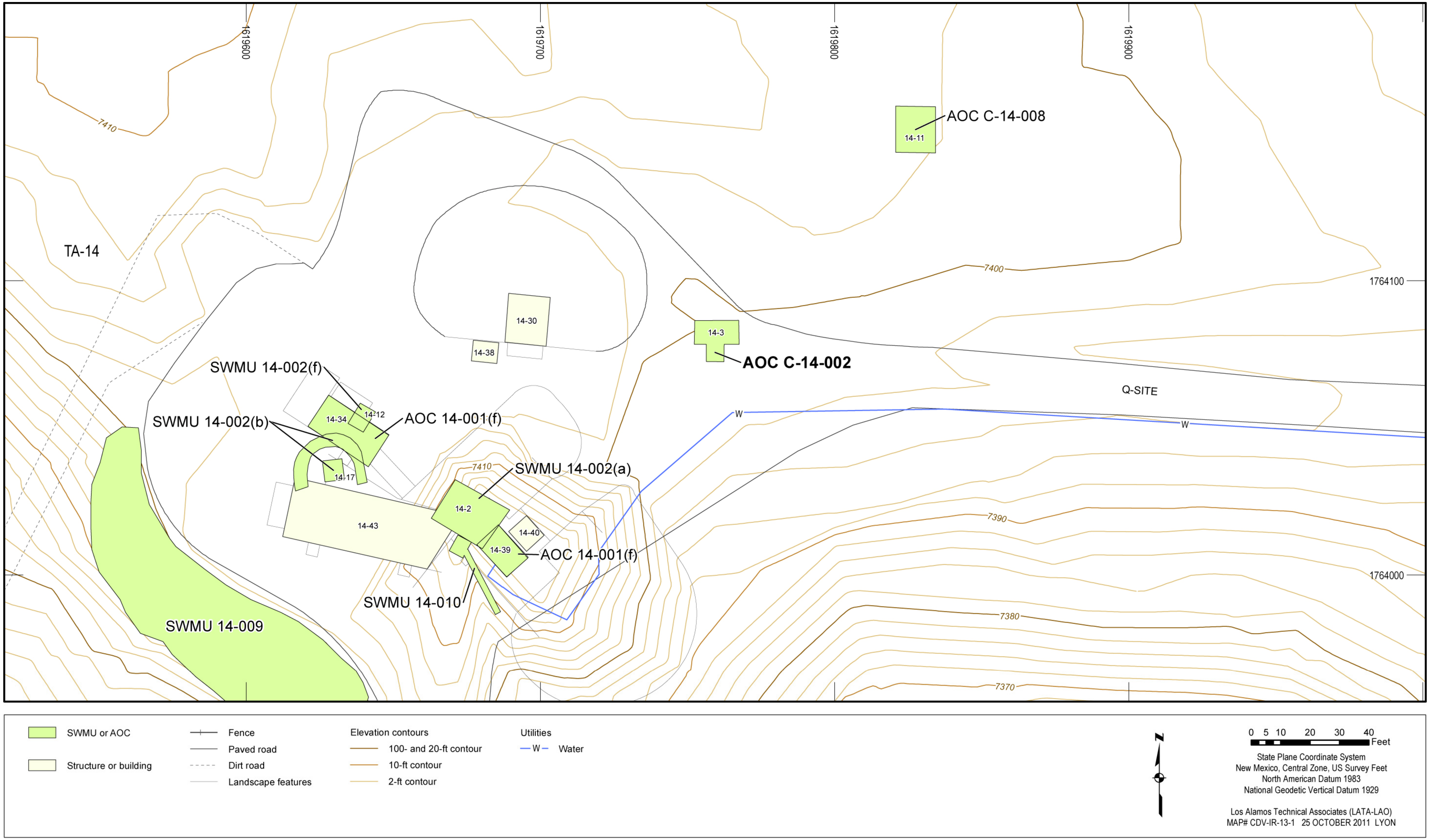


Figure 6.15-1 AOC C-14-002 site map

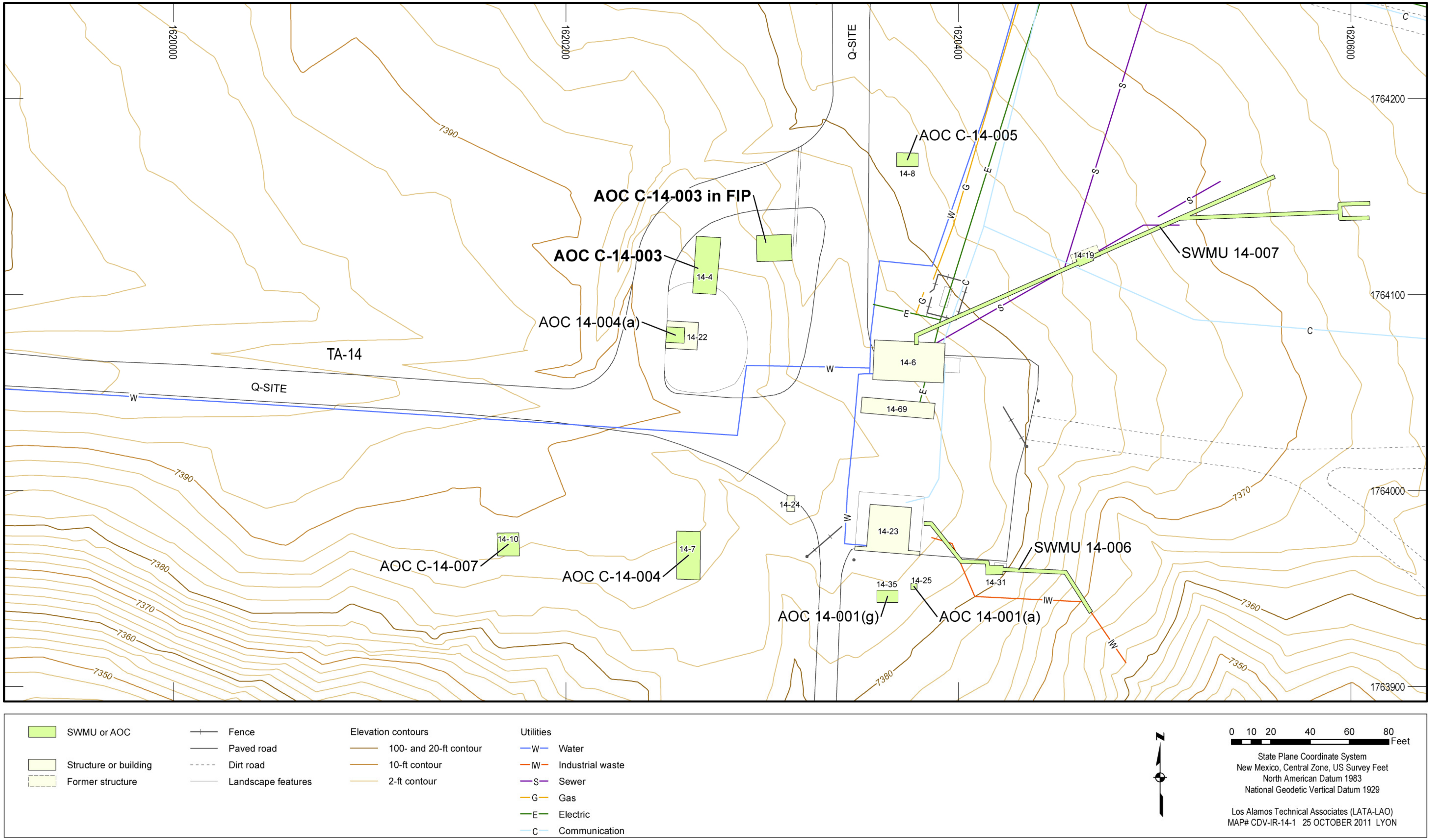


Figure 6.16-1 AOC C-14-003 site map

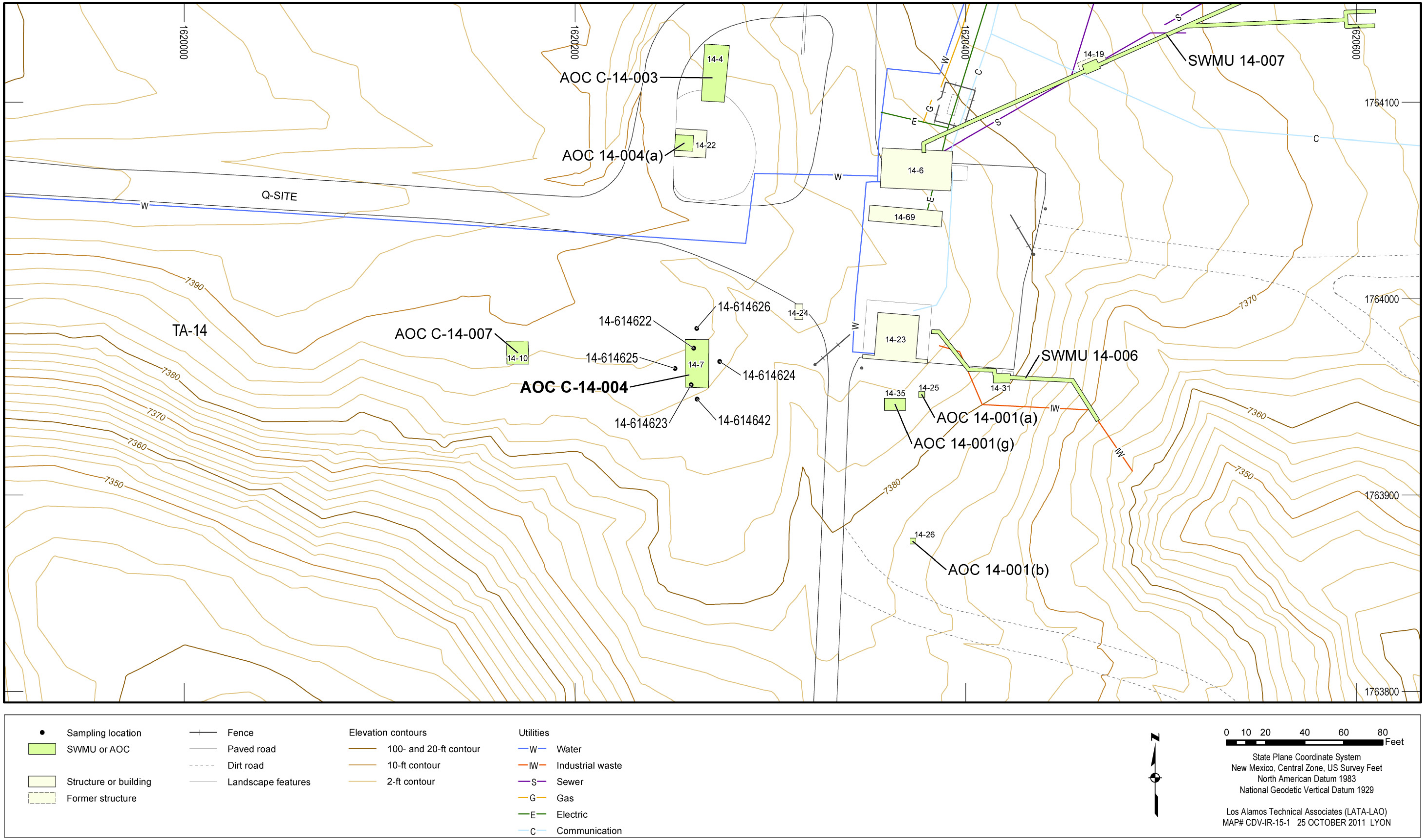


Figure 6.17-1 AOC C-14-004 site map and sampling locations

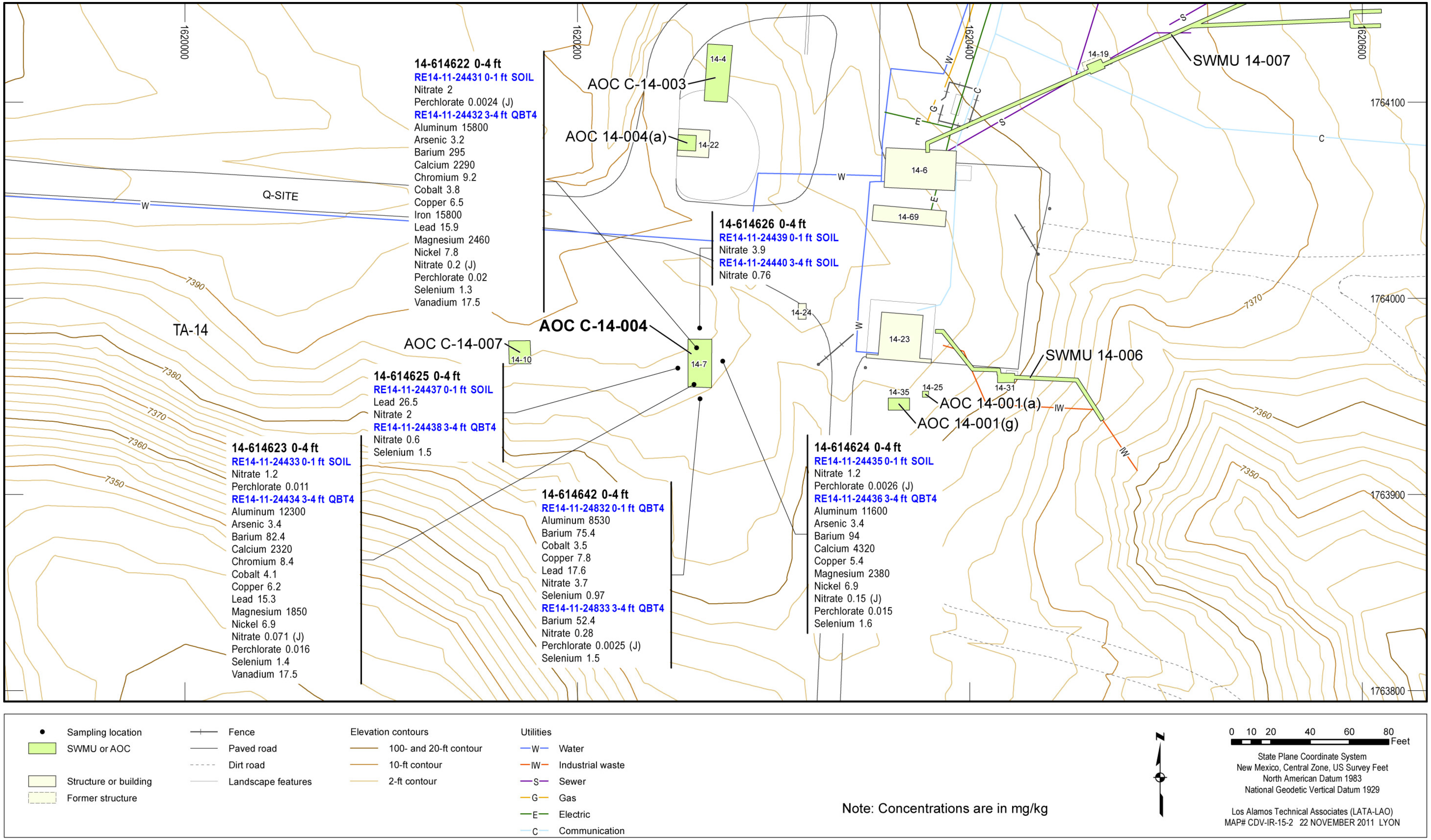


Figure 6.17-2 Inorganic chemicals detected or detected above BVs at AOC C-14-004

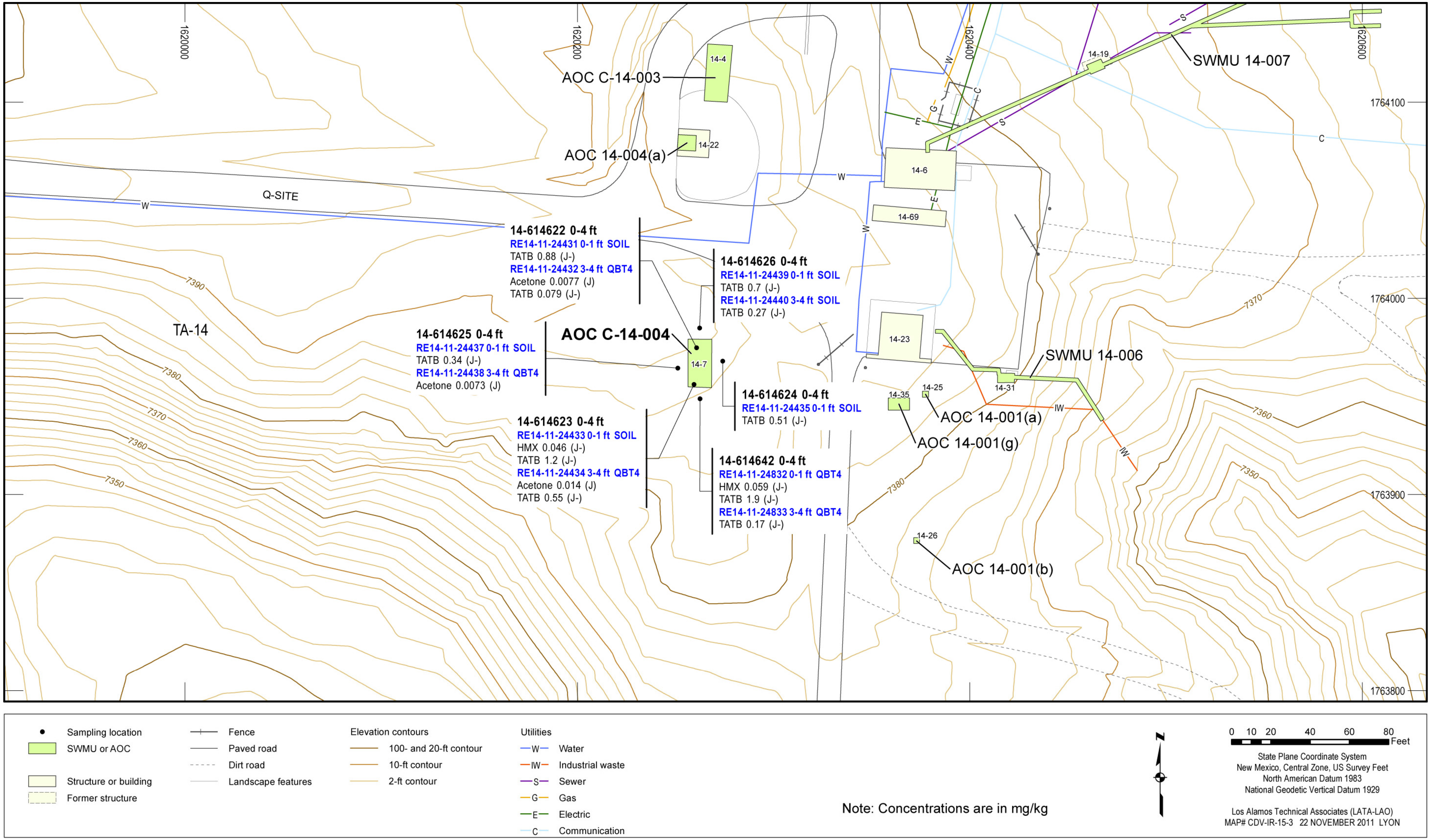


Figure 6.17-3 Organic chemicals detected at AOC C-14-004

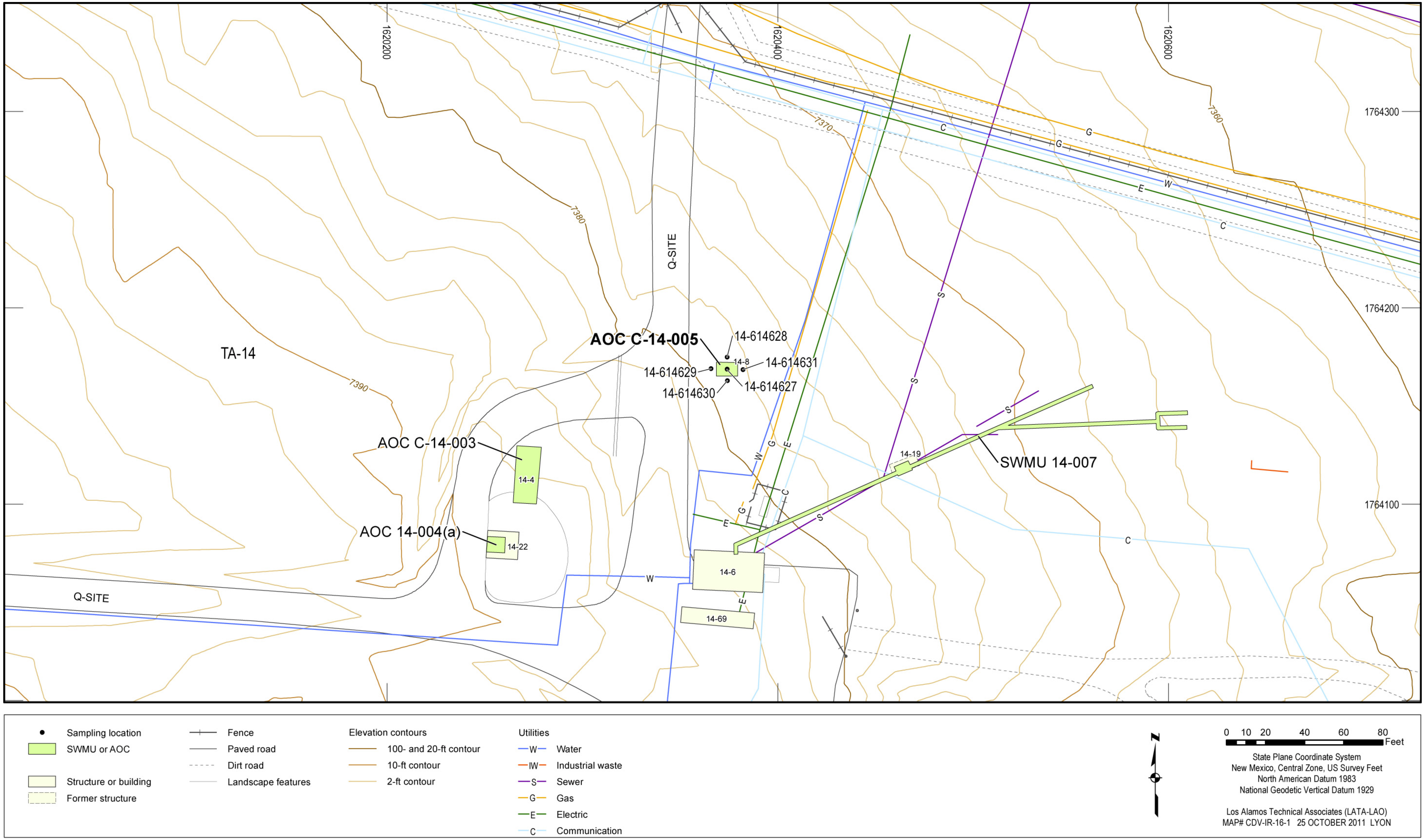
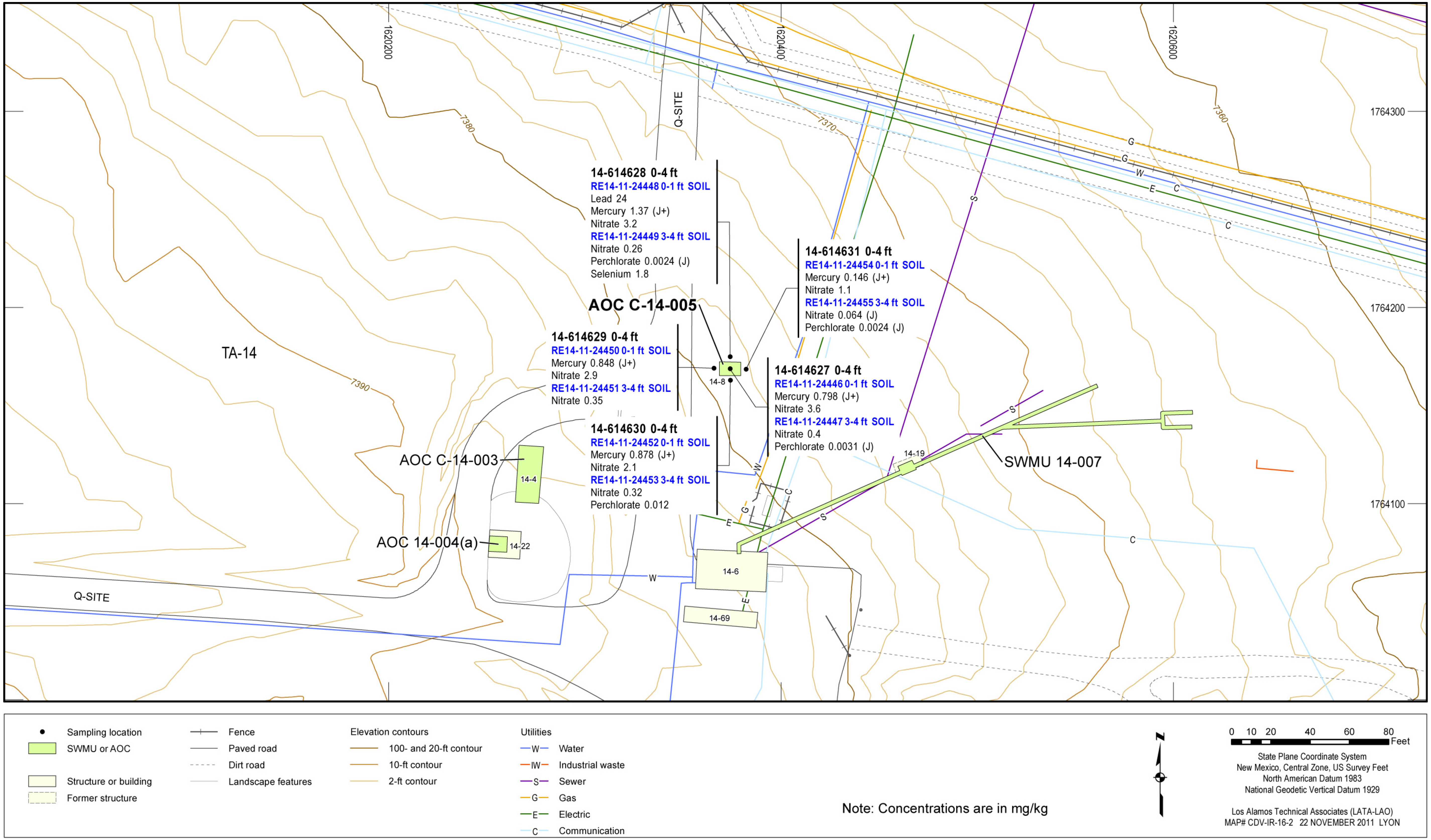


Figure 6.18-1 AOC C-14-005 site map and sampling locations



Note: Concentrations are in mg/kg

Figure 6.18-2 Inorganic chemicals detected or detected above BVs at AOC C-14-005

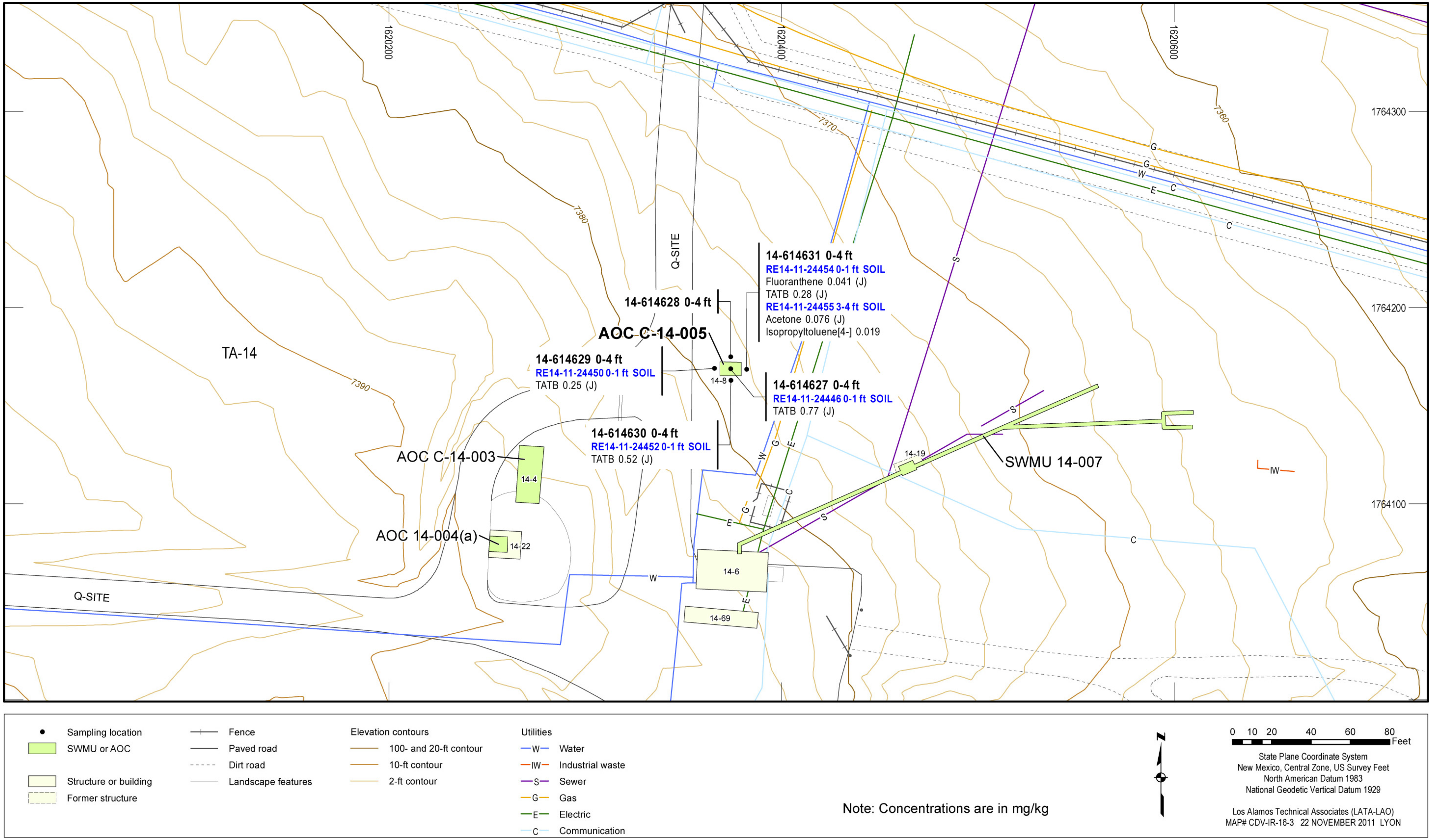


Figure 6.18-3 Organic chemicals detected at AOC C-14-005

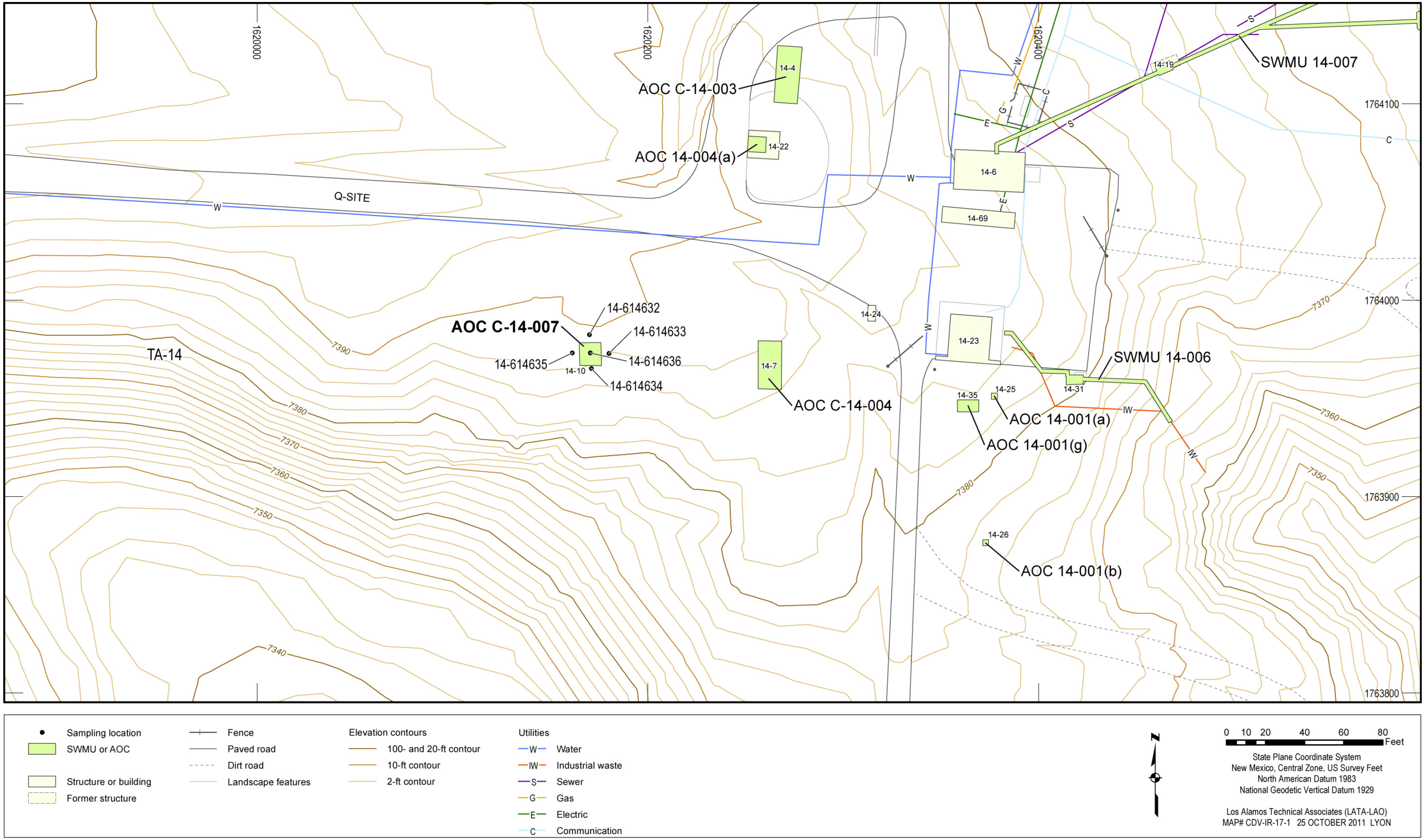


Figure 6.19-1 AOC C-14-007 site map and sampling locations

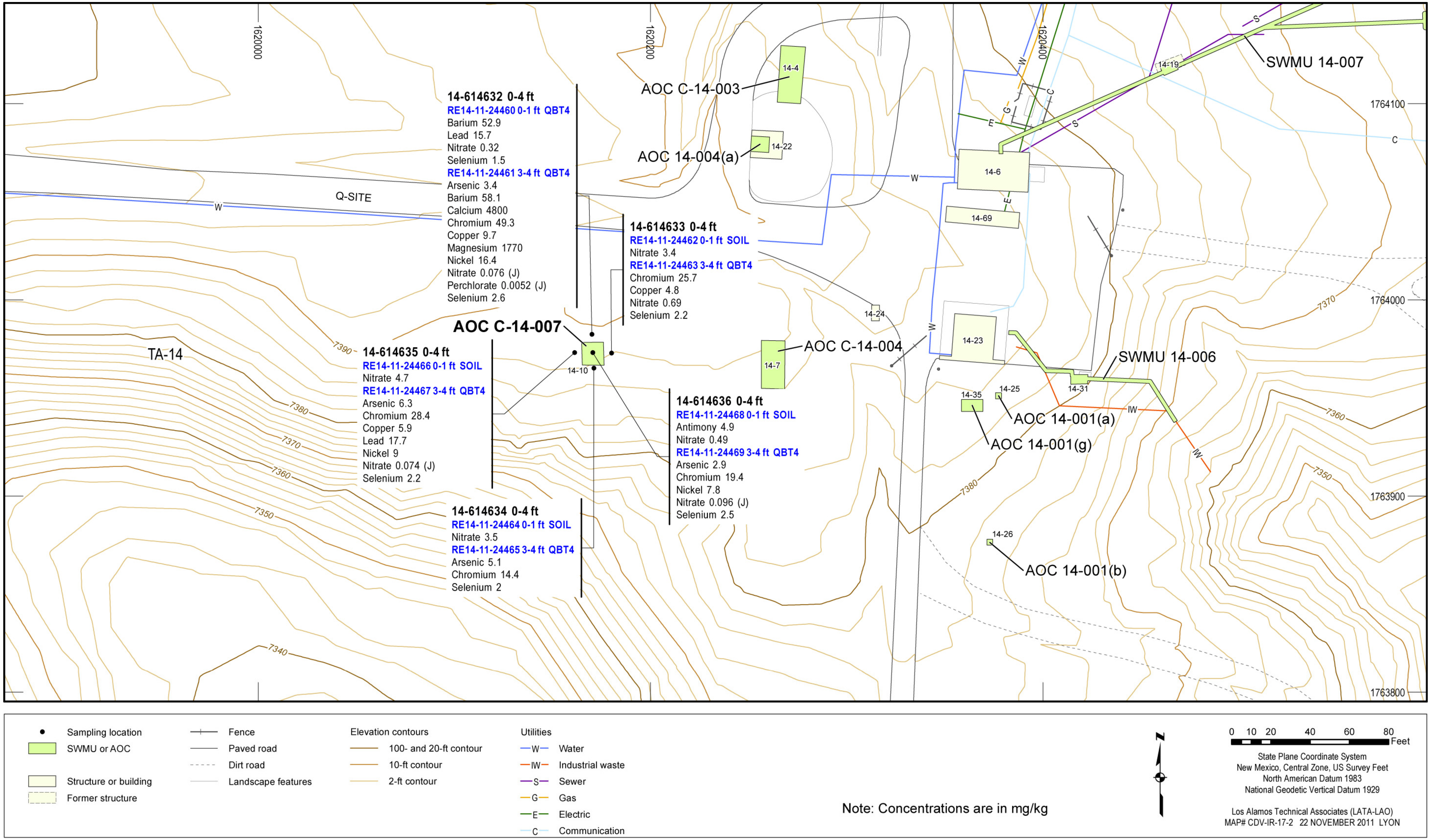
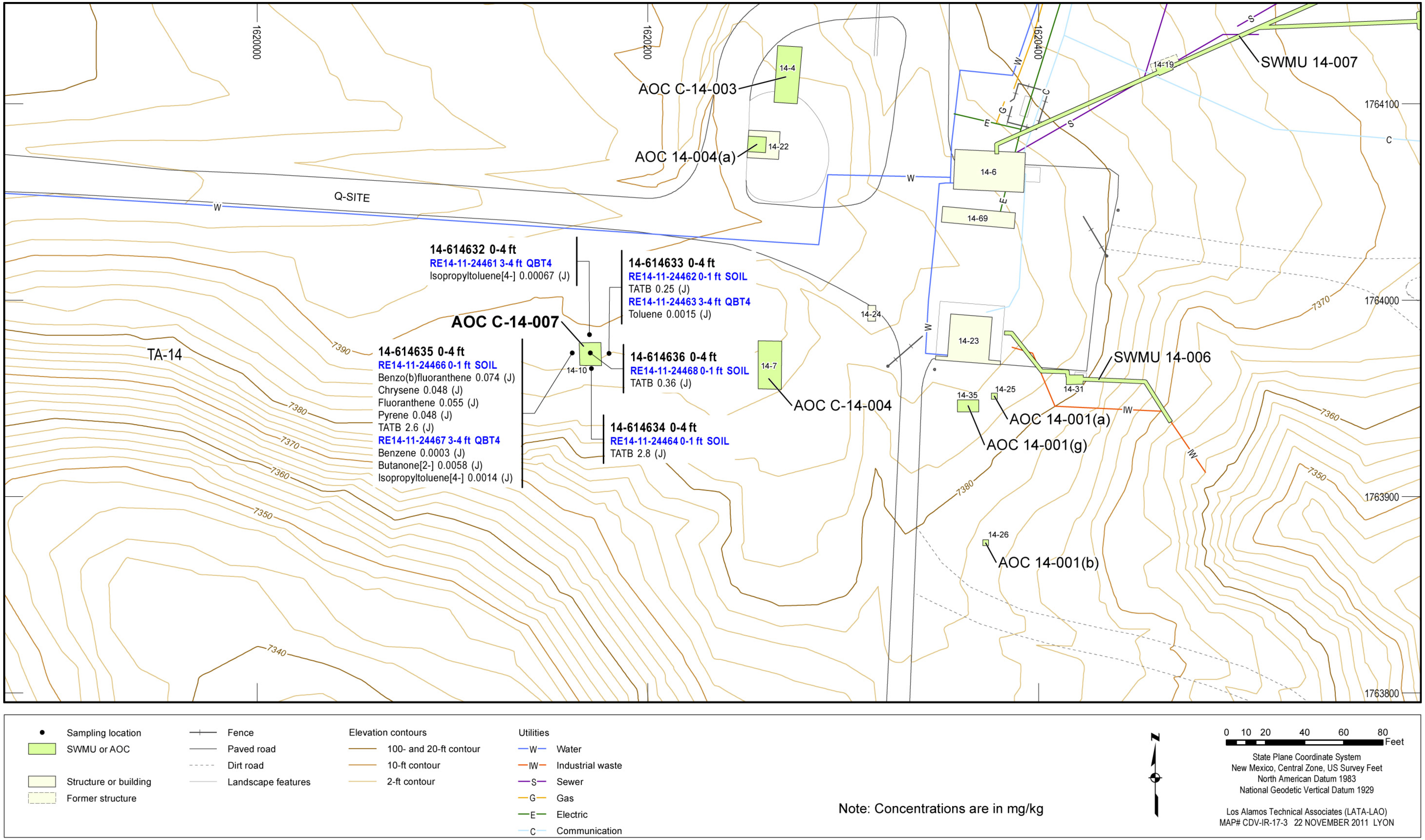


Figure 6.19-2 Inorganic chemicals detected or detected above BVs at AOC C-14-007



14-614632 0-4 ft
RE14-11-24461 3-4 ft QBT4
Isopropyltoluene[4-] 0.00067 (J)

14-614633 0-4 ft
RE14-11-24462 0-1 ft SOIL
TATB 0.25 (J)
RE14-11-24463 3-4 ft QBT4
Toluene 0.0015 (J)

14-614635 0-4 ft
RE14-11-24466 0-1 ft SOIL
Benzo(b)fluoranthene 0.074 (J)
Chrysene 0.048 (J)
Fluoranthene 0.055 (J)
Pyrene 0.048 (J)
TATB 2.6 (J)
RE14-11-24467 3-4 ft QBT4
Benzene 0.0003 (J)
Butanone[2-] 0.0058 (J)
Isopropyltoluene[4-] 0.0014 (J)

14-614636 0-4 ft
RE14-11-24468 0-1 ft SOIL
TATB 0.36 (J)

14-614634 0-4 ft
RE14-11-24464 0-1 ft SOIL
TATB 2.8 (J)

Note: Concentrations are in mg/kg

Figure 6.19-3 Organic chemicals detected at AOC C-14-007

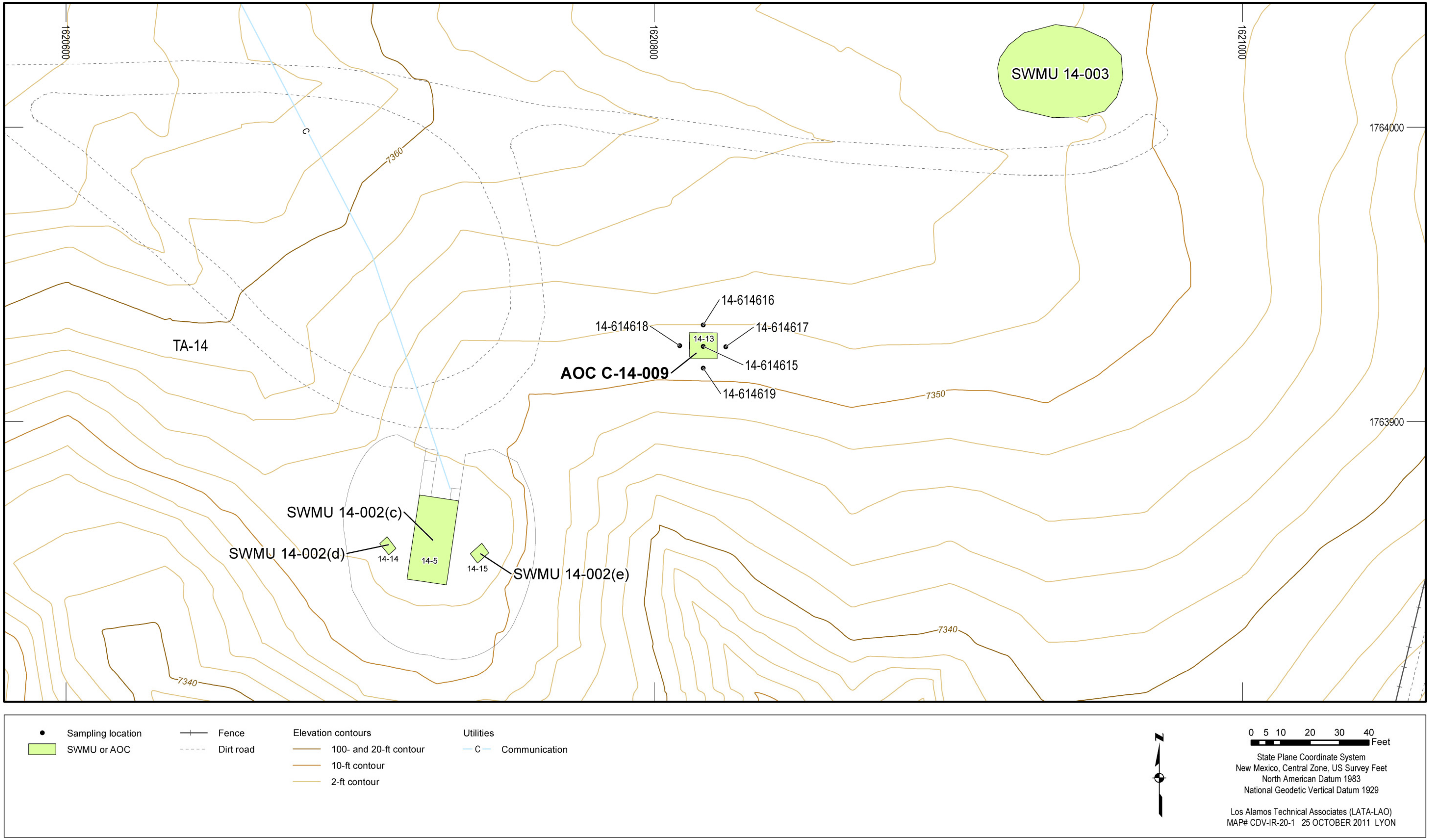


Figure 6.20-1 AOC C-14-009 site map and sampling locations

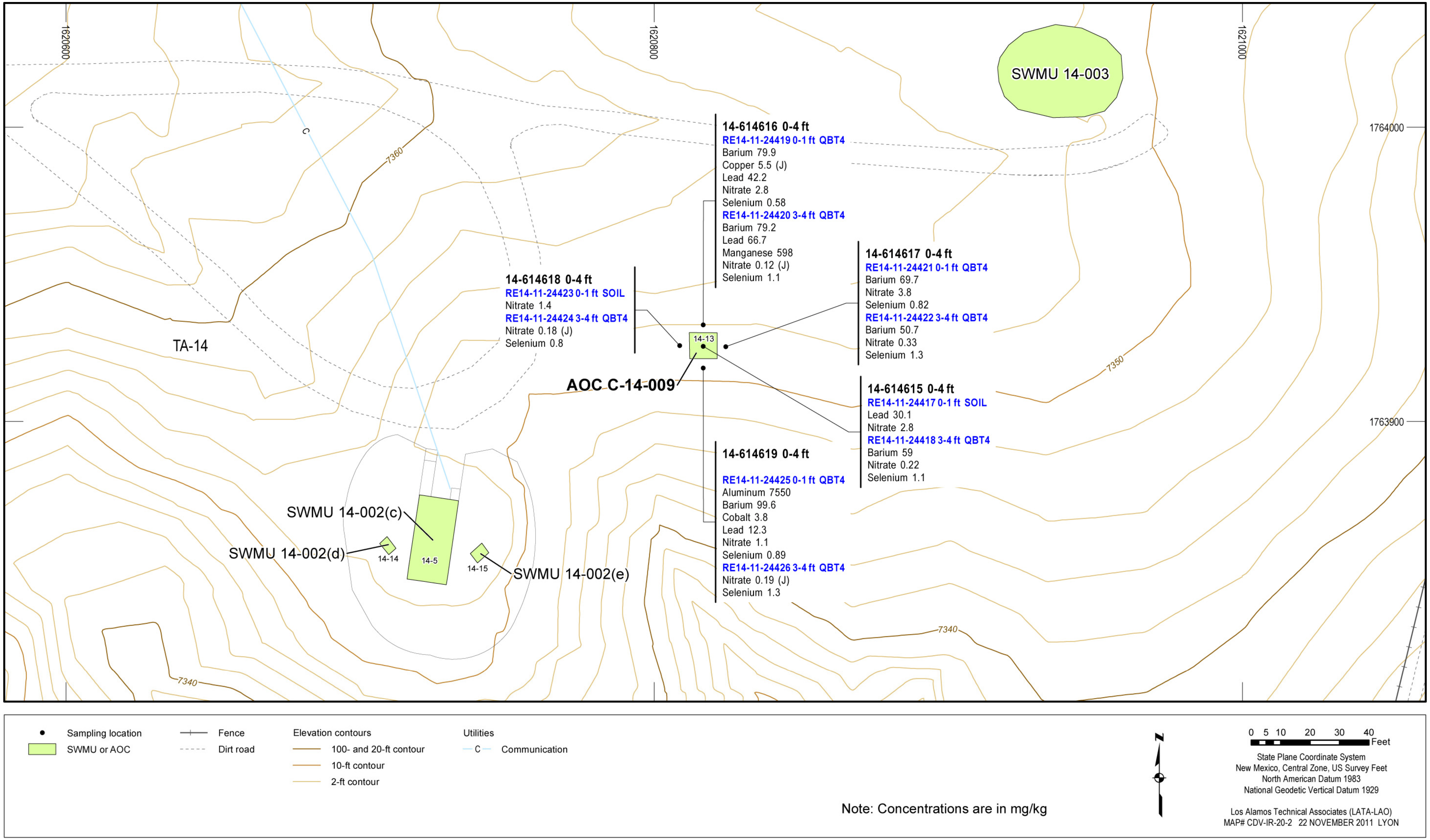
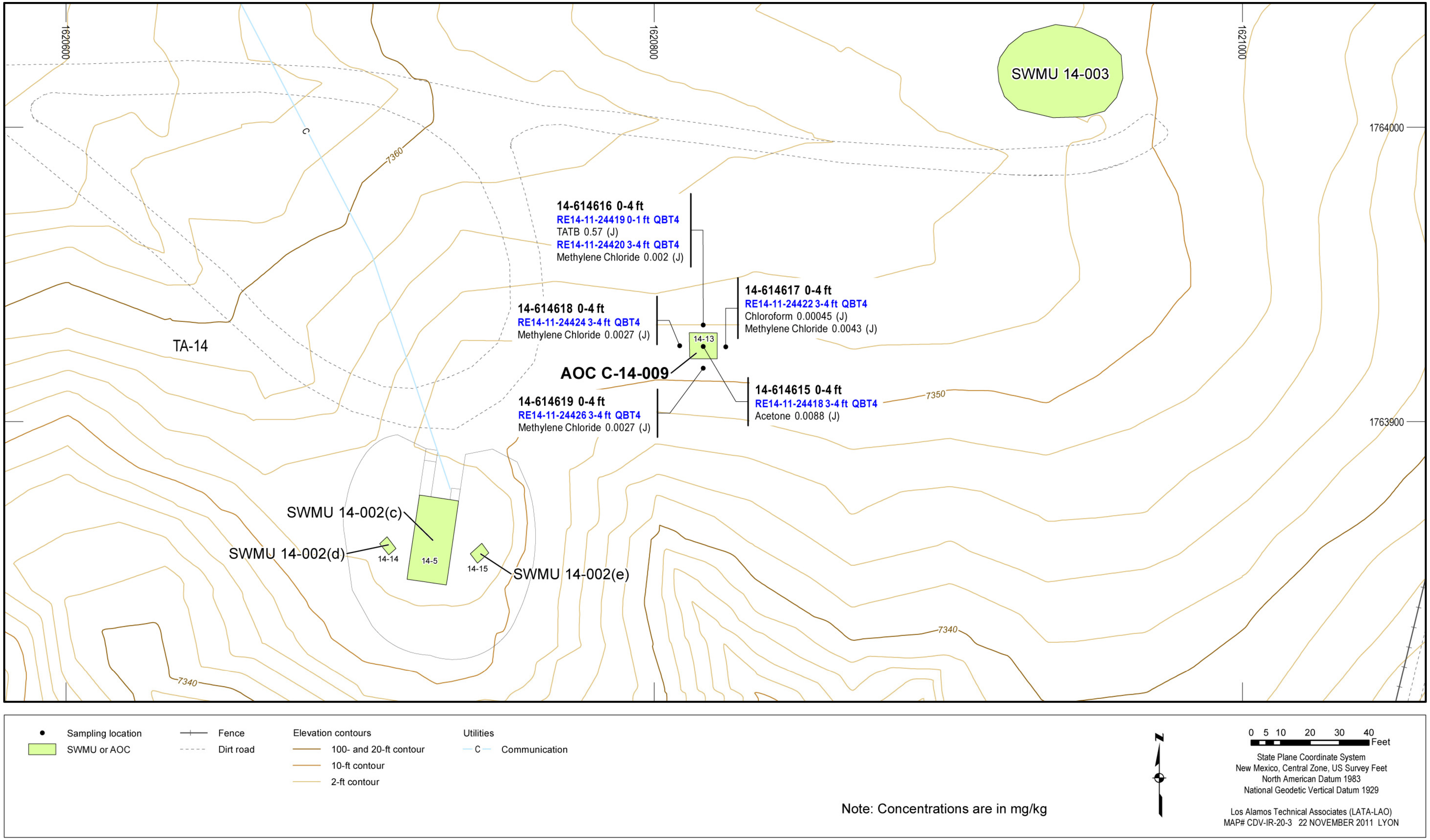


Figure 6.20-2 Inorganic chemicals detected or detected above BVs at AOC C-14-009



Note: Concentrations are in mg/kg

Figure 6.20-3 Organic chemicals detected at AOC C-14-009

Table 1.1-1
Summary of TA-14 Sites within the Cañon de Valle Aggregate Area and Their Status

Consolidated Unit	Site Number	Description	Reference	Comment
n/a[a]	AOC 14-001(a)	Pull box	Investigation report, section 6.2	Sampled in the 2011 investigation
n/a	AOC 14-001(b)	Pull box	Investigation report, section 6.3	Sampled in the 2011 investigation
n/a	AOC 14-001(c)	Pull box	Investigation report, section 6.4	Sampled in the 2011 investigation
n/a	AOC 14-001(d)	Pull box	Investigation report, section 6.5	Sampled in the 2011 investigation
n/a	AOC 14-001(e)	Pull box	Investigation report, section 6.6	Sampled in the 2011 investigation
n/a	AOC 14-001(g)	Firing site	Investigation report, section 6.7	Sampled in the 2011 investigation
14-002(a)-99	AOC 14-001(f)	Bullet test facility	March 1, 2005 Compliance Order on Consent, Table IV-2	Investigation deferred per Consent Order Table IV-2
	SWMU 14-002(a)	Former firing site	March 1, 2005 Compliance Order on Consent, Table IV-2	Investigation deferred per Consent Order Table IV-2
	SWMU 14-002(b)	Former firing site	March 1, 2005 Compliance Order on Consent, Table IV-2	Investigation deferred per Consent Order Table IV-2
	SWMU 14-002(f)	Former structure	Investigation report, section 6.8.4	Delayed investigation proposed in this report
	SWMU 14-009	Surface disposal area	Investigation report, section 6.8.5	Sampled in the 2011 investigation
	SWMU 14-010	Former sump	Investigation report, section 6.8.6	Sampled in the 2011 investigation
	AOC C-14-008	Former magazine	Investigation report, section 6.8.7	Sampled in the 2011 investigation
14-002(c)-99	SWMU 14-002(c)	Decommissioned firing site	Investigation report, section 6.9.1	Sampled in the 2011 investigation
	SWMU 14-002(d)	X-unit chamber	March 1, 2005 Compliance Order on Consent, Table IV-2	Investigation deferred per Consent Order Table IV-2
	SWMU 14-002(e)	X-unit chamber	March 1, 2005 Compliance Order on Consent, Table IV-2	Investigation deferred per Consent Order Table IV-2
n/a	SWMU 14-003	Former burning area	Investigation report, section 6.10	Sampled in the 2011 investigation
n/a	AOC 14-004(a)	Storage area	Investigation report, section 6.11	Delayed investigation proposed in this report
n/a	SWMU 14-004(b)	Satellite accumulation area	NMED 2001, 070010 (A.1, 05/02/01)	Removed from Module VIII HWFP[b] 12/23/98
n/a	AOC 14-004(c)	Storage area	EPA 2005, 088464	NFA approved 01/21/05

Table 1.1-1 (continued)

Consolidated Unit	Site Number	Description	Reference	Comment
n/a	SWMU 14-005	Incinerator	LANL 2011, 207337	Subject to RCRA Closure not Consent Order
n/a	SWMU 14-006	Decommissioned sump and outfall	Investigation report, section 6.12	Sampled in the 2011 investigation
n/a	SWMU 14-007	Decommissioned septic system	Investigation report, section 6.13	Sampled in the 2011 investigation
n/a	AOC 14-008	Landfill and surface disposal	EPA 2005, 088464	NFA approved 01/21/05
n/a	AOC C-14-001	Former magazine	Investigation report, section 6.14	Sampled in the 2011 investigation
n/a	AOC C-14-002	Former building	Investigation report, section 6.15	Delayed investigation proposed in this report
n/a	AOC C-14-003	Former building	Report section 6.16	Delayed investigation proposed in this report
n/a	AOC C-14-004	Former building	Investigation report, section 6.17	Sampled in the 2011 investigation
n/a	AOC C-14-005	Former building	Investigation report, section 6.18	Sampled in the 2011 investigation
n/a	AOC C-14-007	Former building	Investigation report, section 6.19	Sampled in the 2011 investigation
n/a	AOC C-14-009	Former magazine	Investigation report, section 6.20	Sampled in the 2011 investigation

[a] n/a = Not applicable.

[b] HWFP = The Laboratory’s Hazardous Waste Facility Permit.

Table 3.0-1
Crosswalk Table of Sampling Requirements in the Approved Investigation Work Plan and the FIP

Consolidated Unit	SWMU/AOC	Description	Sampling Requirements in the Approved Work Plan	Sampling Requirements in the FIP
	AOC 14-001(a)	Pull box	Recommended for NFA	Collect samples from one location downgradient of the pull box for PCBs.
	AOC 14-001(b)	Pull box	Recommended for NFA	Collect samples from one location downgradient of the pull box for PCBs.
	AOC 14-001(c)	Pull box	Recommended for NFA	Collect samples from one location downgradient of the pull box for PCBs.
	AOC 14-001(d)	Pull box	Recommended for NFA	Collect samples from one location downgradient of the pull box for PCBs.
	AOC 14-001(e)	Pull box	Recommended for NFA	Collect samples from one location downgradient of the pull box for PCBs.
	AOC 14-001(g)	Firing site	Collect samples at locations where HE removal and/or radiological anomaly removal has been conducted	Collect samples from 15 locations within the drainages downgradient of the active firing site.
14-002(a)-99	AOC 14-001(f)	Bullet test facility	No sampling proposed	No sampling proposed
	SWMU 14-002(a)	Former firing site	No sampling proposed	No sampling proposed
	SWMU 14-002(b)	Former firing site	No sampling proposed	No sampling proposed
	SWMU 14-002(f)	Former structure	Collect samples from three locations	FIP proposed delayed sampling until adjacent firing sites are inactive.
	SWMU 14-009	Surface disposal area	Remove soil and debris then collect confirmatory samples from six locations. Collect drainage samples from five locations.	Collect samples from 10 locations within the disposal area, from 4 locations on the bench at the bottom of the slope, and from 3 locations in the drainage. Soil and debris removal will be based on the results of the analytical samples and may be conducted during Phase II.
	SWMU 14-010	Former sump	Collect samples from the locations of the former sump and drainline	Collect samples from one location at the former outfall and from four locations in the downgradient drainage.
	AOC C-14-008	Former magazine	Recommended for NFA	Collect samples from one location inside the former storage magazine and four locations outside the former storage magazine.

Table 3.0-1 (continued)

Consolidated Unit	SWMU/AOC	Description	Sampling Requirements in the Approved Work Plan	Sampling Requirements in the FIP
14-002(c)-99	SWMU 14-002(c)	Decommissioned firing site	Collect samples from four historical locations.	Collect samples from four historical locations.
	SWMU 14-002(d)	X-unit chamber	No sampling proposed	No sampling proposed
	SWMU 14-002(e)	X-unit chamber	No sampling proposed	No sampling proposed
	SWMU 14-003	Former burning area	No sampling proposed	Collect samples from seven locations within the burning are, from four step-out locations, and from two downgradient locations.
	AOC 14-004(a)	Storage area	Collect samples from two locations within the earthen floor of the magazine.	Although samples were recommended to be collected from the locations specified within the approved work plan, the magazine is active and the floor is concrete. Sampling will be delayed until decommissioning of magazine.
	SWMU 14-004(b)	Satellite accumulation area	No sampling proposed	No sampling proposed
	AOC 14-004(c)	Storage area	No sampling proposed	No sampling proposed
	SWMU 14-005	Incinerator	No sampling proposed	No sampling proposed
	SWMU 14-006	Decommissioned sump and outfall	Remove the sump and drainline. Collect confirmatory samples from eight locations.	Sump and drainlines have been filled with concrete. Collect samples from 11 locations along the inlet and outlet lines, next to the sump, and in the drainage below the outfall.
	SWMU 14-007	Decommissioned septic system	Remove the septic tank and drainlines. Collect confirmatory samples from two locations. Collect nature and extent samples from two historical sampling locations.	Although the septic tank was proposed for removal, it was filled with concrete for safety concerns. Collect samples from 21 locations along the inlet and outlet lines, next to the septic tank, and in the drain field.
	AOC 14-008	Landfill and surface disposal	No sampling proposed	No sampling proposed
	AOC C-14-001	Former magazine	Recommended for NFA	Collect samples from one location inside the former storage magazine and four locations outside the former storage magazine.
	AOC C-14-002	Former building	Recommended for NFA	Delayed

Table 3.0-1 (continued)

Consolidated Unit	SWMU/AOC	Description	Sampling Requirements in the Approved Work Plan	Sampling Requirements in the FIP
	AOC C-14-003	Former building	Recommended for NFA	Although sampling was proposed, the site boundary was modified and the site is partially covered by the berm area north of the active storage magazine [AOC 14-004(a)]. Sampling will be delayed until decommissioning of magazine.
	AOC C-14-004	Former building	Collect samples from two locations inside the shop.	Collect samples from two locations inside the former shop and four locations outside the former shop.
	AOC C-14-005	Former building	Collect samples from two locations inside the former magazine.	Collect samples from one location inside the former magazine and four locations outside the former storage magazine.
	AOC C-14-007	Former building	Collect samples from two locations inside the former storage building.	Collect samples from one location inside the former storage magazine and four locations outside the former storage magazine.
	AOC C-14-009	Former magazine	Recommended for NFA	Collect samples from one location inside the former storage magazine and four locations outside the former storage magazine.

Note: Shading denotes consolidated unit.

Table 3.2-1
Crosswalk of Proposed and Sampled Locations in 2011 Investigation with Surveyed Coordinates

Consolidated Unit/SWMU/AOC	Proposed Location in FIP	Location ID	Easting (ft)	Northing (ft)
14-001(a)	1a-1	14-614493	1620377.081	1763947.019
14-001(b)	1b-1	14-614494	1620373.019	1763872.271
14-001(c)	1c-1-reloc	14-614495	1620369.839	1763779.911
14-001(d)	1d-1	14-614496	1620362.081	1763692.112
14-001(e)	1e-1	14-614497	1620355.581	1763592.659
14-001(g)	1g-1	14-614463	1620275.438	1763785.142
14-001(g)	1g-2-reloc	14-614464	1620198.86	1763666.677
14-001(g)	1g-3	14-614475	1620174.743	1763549.03
14-001(g)	1g-4-reloc	14-614465	1620123.184	1763405.833
14-001(g)	1g-5-reloc	14-614467	1620339.362	1763559.265
14-001(g)	1g-6-reloc	14-614466	1620329.43	1763428.027
14-001(g)	1g-7-reloc	14-614476	1620376.864	1763319.192
14-001(g)	1g-8-reloc	14-614468	1620467.845	1763733.031
14-001(g)	1g-9	14-614469	1620520.577	1763689.308
14-001(g)	1g-10-reloc	14-614470	1620506.223	1763590.439
14-001(g)	1g-11	14-614471	1620540.021	1763447.642
14-001(g)	1g-12-reloc	14-614472	1620554.603	1763862.467
14-001(g)	1g-13-reloc	14-614473	1620632.093	1763837.232
14-001(g)	1g-14	14-614474	1620817.799	1763644.169
14-001(g)	1g-15-reloc	14-614477	1620914.311	1763465.317
Consolidated Unit 14-002(a)-99				
14-009	9-1	14-614514	1619558.051	1764028.265
14-009	9-2	14-614515	1619553.084	1764012.121
14-009	9-3	14-614527	1619568.607	1764005.29
14-009	9-4	14-614516	1619567.986	1763987.904
14-009	9-5-reloc	14-614517	1619587.135	1763993.448
14-009	9-6	14-614518	1619585.062	1763970.518
14-009	9-7-reloc	14-614519	1619613.728	1763964.623
14-009	9-8	14-614520	1619604.622	1763957.168
14-009	9-9	14-614528	1619626.044	1763969.586
14-009	9-10	14-614521	1619626.665	1763950.648
14-009	9-11	14-614522	1619539.121	1763986.013
14-009	9-12	14-614523	1619541.864	1763973.6
14-009	9-13-reloc	14-614524	1619545.571	1763954.167
14-009	9-14	14-614529	1619578.484	1763942.088
14-009	9-15	14-614525	1619549.541	1763928.706

Table 3.2-1 (continued)

Consolidated Unit/SWMU/AOC	Proposed Location in FIP	Location ID	Easting (ft)	Northing (ft)
14-009	9-16-reloc	14-614526	1619538.578	1763912.313
14-009	9-17-reloc	14-614530	1619498.041	1763886.723
14-010	10-1	14-614595	1619685.649	1763985.154
14-010	10-2-reloc	14-614596	1619693.246	1763960.593
14-010	10-3-reloc	14-614599	1619714.638	1763926.914
14-010	10-4-reloc	14-614597	1619817.798	1763914.248
14-010	10-5	14-614598	1619866.185	1763889.711
C-14-008	C8-1	14-614637	1619827.679	1764151.778
C-14-008	C8-2	14-614638	1619827.831	1764160.685
C-14-008	C8-3	14-614639	1619835.901	1764151.321
C-14-008	C8-4	14-614640	1619827.679	1764142.49
C-14-008	C8-5	14-614641	1619819.381	1764151.778
Consolidated Unit 14-002(c)-99				
14-002(c)	2c-1-reloc	14-614487	1620722.539	1763862.064
14-002(c)	2c-2-reloc	14-614486	1620726.474	1763860.299
14-002(c)	14-01089	14-01089	1620710.3	1763851.9
14-002(c)	14-01090	14-01090	1620704.4	1763861.7
14-002(c)	14-01091	14-01091	1620734.7	1763858.3
14-002(c)	14-01092	14-01092	1620744.6	1763856.8
14-003	3-1	14-614501	1620929.861	1764026.672
14-003	3-2	14-614502	1620942.919	1764026.564
14-003	3-3	14-614503	1620924.675	1764018.942
14-003	3-4	14-614511	1620936.2	1764018.542
14-003	3-5	14-614504	1620947.619	1764018.561
14-003	3-6	14-614505	1620930.744	1764010.853
14-003	3-7	14-614506	1620940.953	1764010.228
14-003	3-8	14-614507	1620938.591	1764040.918
14-003	3-9	14-614512	1620964.341	1764018.257
14-003	3-10	14-614508	1620935.466	1763997.793
14-003	3-11	14-614509	1620905.466	1764020.918
14-003	3-12	14-614510	1621002.203	1763984.811
14-003	3-13	14-614513	1621039.904	1764012.162
14-006	6-1-reloc	14-614539	1620386.043	1763981.04
14-006	6-2	14-614532	1620400.801	1763962.761
14-006	6-3	14-614533	1620413.464	1763960.557
14-006	6-4	14-614531	1620418.347	1763956.26
14-006	6-5	14-614534	1620423.893	1763958.13
14-006	6-6-reloc	14-614540	1620451.73	1763952.636

Table 3.2-1 (continued)

Consolidated Unit/SWMU/AOC	Proposed Location in FIP	Location ID	Easting (ft)	Northing (ft)
14-006	6-7-reloc	14-614535	1620462.691	1763941.167
14-006	6-8	14-614536	1620468.561	1763936.928
14-006	6-9	14-614537	1620477.307	1763926.964
14-006	6-10	14-614538	1620493.626	1763908.54
14-006	6-11	14-614541	1620517.666	1763880.99
14-007	7-1	14-614551	1620379.799	1764077.748
14-007	7-2-reloc	14-614552	1620423.22	1764097.313
14-007	7-3-reloc	14-614542	1620461.045	1764113.824
14-007	7-4-reloc	14-614544	1620466.122	1764121.764
14-007	7-5	14-614543	1620469.139	1764119.086
14-007	7-6	14-614553	1620512.847	1764138.093
14-007	7-7	14-614545	1620536.649	1764149.304
14-007	7-8	14-614546	1620562.059	1764160.1
14-007	7-9	14-614547	1620567.099	1764160.138
14-007	7-10	14-614548	1620577.455	1764159.125
14-007	7-11	14-614554	1620589.161	1764159.238
14-007	7-12	14-614549	1620556.002	1764140.359
14-007	7-13	14-614550	1620593.705	1764141.815
14-007	7-14	14-614555	1620594.452	1764146.068
14-007	7-15	14-614561	1620594.902	1764138.751
14-007	7-16	14-614556	1620603.031	1764146.518
14-007	7-17	14-614557	1620603.338	1764138.864
14-007	7-18	14-614558	1620602.645	1764151.854
14-007	7-19	14-614562	1620614.189	1764146.925
14-007	7-20	14-614559	1620614.383	1764139.132
14-007	7-21	14-614560	1620601.319	1764133.659
C-14-001	C1-1	14-614605	1619168.32	1764223.492
C-14-001	C1-2	14-614606	1619174.882	1764230.68
C-14-001	C1-3	14-614607	1619175.82	1764217.242
C-14-001	C1-4-reloc	14-614608	1619159.733	1764219.36
C-14-001	C1-5	14-614609	1619159.882	1764230.68
C-14-004	C4-1	14-614622	1620260.709	1763974.817
C-14-004	C4-2-reloc	14-614623	1620259.411	1763956.113
C-14-004	C4-3	14-614626	1620262.271	1763984.975
C-14-004	C4-4	14-614624	1620273.992	1763967.98
C-14-004	C4-5	14-614642	1620262.467	1763948.837
C-14-004	C4-6	14-614625	1620251.137	1763964.464
C-14-005	C5-1	14-614627	1620374.005	1764168.788

Table 3.2-1 (continued)

Consolidated Unit/SWMU/AOC	Proposed Location in FIP	Location ID	Easting (ft)	Northing (ft)
C-14-005	C5-2	14-614628	1620374.005	1764174.844
C-14-005	C5-3	14-614631	1620382.209	1764168.593
C-14-005	C5-4	14-614629	1620365.801	1764168.984
C-14-005	C5-5	14-614630	1620374.201	1764162.928
C-14-007	C7-1	14-614636	1620170.462	1763973.059
C-14-007	C7-2	14-614632	1620170.072	1763982.435
C-14-007	C7-3	14-614633	1620180.034	1763972.864
C-14-007	C7-4	14-614634	1620171.048	1763965.245
C-14-007	C7-5	14-614635	1620161.281	1763973.059
C-14-009	C9-1	14-614615	1620816.642	1763925.592
C-14-009	C9-2	14-614616	1620816.642	1763932.819
C-14-009	C9-3	14-614617	1620824.261	1763925.396
C-14-009	C9-4	14-614619	1620816.642	1763918.169
C-14-009	C9-5	14-614618	1620808.634	1763925.787

Notes: Shading denotes consolidated unit. Prposed locations delineated by “reloc” were relocated based on field conditions.

Table 3.2-2
Field-Screening Results for Samples Collected in 2011 Investigation

Consolidated Unit/SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/Gamma Reading (dpm)*	HE Spot Test
14-001(a)	14-614493	3	4	RE14-11-23996	0.0	0	≤814	negative
14-001(a)	14-614493	6	7	RE14-11-23997	0.0	≤20	≤724	negative
14-001(b)	14-614494	3	4	RE14-11-23998	0.0	≤54	≤414	negative
14-001(b)	14-614494	6	7	RE14-11-23999	0.0	0	≤277	negative
14-001(c)	14-614495	3	4	RE14-11-24000	0.0	≤15	≤525	negative
14-001(c)	14-614495	6	7	RE14-11-24001	0.0	≤20	≤646	negative
14-001(d)	14-614496	3	4	RE14-11-24002	0.0	≤10	≤662	negative
14-001(d)	14-614496	6	7	RE14-11-24003	0.0	≤15	≤604	negative
14-001(e)	14-614497	3	4	RE14-11-24004	0.0	≤66	≤1139	negative
14-001(e)	14-614497	6	7	RE14-11-24005	0.0	≤32	≤1134	negative
14-001(g)	14-614463	0	1	RE14-11-23225	0.0	≤47	≤1002	negative
14-001(g)	14-614463	2	3	RE14-11-23237	0.0	≤37	≤886	negative
14-001(g)	14-614464	0	1	RE14-11-23226	0.0	≤27	≤833	negative
14-001(g)	14-614464	2	3	RE14-11-23238	0.0	≤61	≤1336	negative
14-001(g)	14-614475	0	1	RE14-11-23249	0.0	≤61	≤992	negative
14-001(g)	14-614475	2	3	RE14-11-23252	0.0	≤66	≤1039	negative
14-001(g)	14-614465	0	1	RE14-11-23227	0.0	≤22	≤1155	negative
14-001(g)	14-614465	2	3	RE14-11-23239	0.0	≤61	≤1287	negative
14-001(g)	14-614467	0	1	RE14-11-23229	0.0	≤17	≤1060	negative
14-001(g)	14-614467	2	3	RE14-11-23241	0.0	≤42	≤1266	negative
14-001(g)	14-614466	0	1	RE14-11-23228	0.0	≤71	≤1044	negative
14-001(g)	14-614466	2	3	RE14-11-23240	0.0	≤71	≤1371	negative
14-001(g)	14-614476	0	1	RE14-11-23250	0.0	≤22	≤897	negative
14-001(g)	14-614476	2	3	RE14-11-23253	0.0	≤66	≤1340	negative
14-001(g)	14-614468	0	1	RE14-11-23230	0.0	≤37	≤775	negative
14-001(g)	14-614468	2	3	RE14-11-23242	0.0	≤7	≤1187	negative
14-001(g)	14-614469	0	1	RE14-11-23231	0.0	≤17	≤939	negative
14-001(g)	14-614469	2	3	RE14-11-23243	0.0	≤42	≤870	negative
14-001(g)	14-614470	0	1	RE14-11-23232	0.0	≤52	≤1287	negative
14-001(g)	14-614470	2	3	RE14-11-23244	0.0	≤32	≤1155	negative
14-001(g)	14-614471	0	1	RE14-11-23233	0.0	≤32	≤891	negative
14-001(g)	14-614471	2	3	RE14-11-23245	0.0	≤47	≤1313	negative
14-001(g)	14-614472	0	1	RE14-11-23234	0.0	≤17	≤475	negative
14-001(g)	14-614472	2	3	RE14-11-23246	0.0	≤37	≤1013	negative
14-001(g)	14-614473	0	1	RE14-11-23235	0.0	≤22	≤707	negative
14-001(g)	14-614473	2	3	RE14-11-23247	0.0	≤37	≤1081	negative

Table 3.2-2 (continued)

Consolidated Unit/SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/Gamma Reading (dpm)*	HE Spot Test
14-001(g)	14-614474	0	1	RE14-11-23236	0.0	≤76	≤886	negative
14-001(g)	14-614474	2	3	RE14-11-23248	0.0	≤47	≤1197	negative
14-001(g)	14-614477	0	1	RE14-11-23251	0.0	0	≤538	negative
14-001(g)	14-614477	2	3	RE14-11-23254	0.0	≤22	≤485	negative
Consolidated Unit 14-002(a)-99								
14-009	14-614514	0	1	RE14-11-24070	0.0	≤24	≤747	negative
14-009	14-614514	5	6	RE14-11-24071	0.0	≤73	≤889	negative
14-009	14-614515	0	1	RE14-11-24072	0.0	≤44	≤1242	negative
14-009	14-614515	2.5	3.5	RE14-11-24073	0.0	≤68	≤1327	negative
14-009	14-614527	0	1	RE14-11-24096	0.0	≤10	≤1026	negative
14-009	14-614527	2.5	3.5	RE14-11-24097	0.0	≤15	≤654	negative
14-009	14-614516	0	1	RE14-11-24074	0.0	≤58	≤683	negative
14-009	14-614516	2	3	RE14-11-24075	0.0	≤44	≤1353	negative
14-009	14-614517	0	1	RE14-11-24076	0.0	0	≤702	negative
14-009	14-614517	4.5	5.5	RE14-11-24077	0.0	≤55	≤900	negative
14-009	14-614518	0	1	RE14-11-24078	0.0	≤78	≤805	negative
14-009	14-614518	2	3	RE14-11-24079	0.0	≤24	≤1111	negative
14-009	14-614519	0	1	RE14-11-24080	0.0	0	≤1042	negative
14-009	14-614519	1.5	2.5	RE14-11-24081	0.0	0	≤689	negative
14-009	14-614520	0	1	RE14-11-24082	0.0	≤93	≤1121	negative
14-009	14-614520	2	3	RE14-11-24083	0.0	≤112	≤1659	negative
14-009	14-614528	0	1	RE14-11-24098	0.0	≤147	≤3100	negative
14-009	14-614528	3.5	4.5	RE14-11-24099	0.0	≤78	≤1975	negative
14-009	14-614521	0	1	RE14-11-24084	0.0	0	≤871	negative
14-009	14-614521	2	3	RE14-11-24085	0.0	≤19	≤1351	negative
14-009	14-614522	0	1	RE14-11-24086	0.0	0	≤993	negative
14-009	14-614522	1	2	RE14-11-24087	0.0	≤29	≤1520	negative
14-009	14-614523	0	1	RE14-11-24088	0.0	≤19	≤1272	negative
14-009	14-614523	1	2	RE14-11-24089	0.0	≤43	≤1304	negative
14-009	14-614524	0	1	RE14-11-24090	0.0	0	≤1135	negative
14-009	14-614524	1	2	RE14-11-24091	0.0	≤48	≤1014	negative
14-009	14-614529	0	1	RE14-11-24100	0.0	0	≤1520	negative
14-009	14-614529	1	2	RE14-11-24101	0.0	0	≤945	negative
14-009	14-614525	0	1	RE14-11-24092	0.0	≤24	≤1683	negative
14-009	14-614525	1	2	RE14-11-24093	0.0	0	≤1404	negative
14-009	14-614526	0	1	RE14-11-24094	0.0	0	≤1683	negative
14-009	14-614526	1	2	RE14-11-24095	0.0	0	≤1314	negative

Table 3.2-2 (continued)

Consolidated Unit/SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/Gamma Reading (dpm)*	HE Spot Test
14-009	14-614530	0	1	RE14-11-24102	0.0	0	≤697	negative
14-009	14-614530	1	2	RE14-11-24103	0.0	0	≤908	negative
14-010	14-614595	0.3	1.3	RE14-11-24362	0.0	≤21	≤988	negative
14-010	14-614595	3	4	RE14-11-24363	0.0	≤16	≤1273	negative
14-010	14-614596	0	1	RE14-11-24364	0.0	≤90	≤1267	negative
14-010	14-614596	3	4	RE14-11-24365	0.0	≤21	≤1141	negative
14-010	14-614599	0	1	RE14-11-24370	0.0	≤51	≤909	negative
14-010	14-614599	3	4	RE14-11-24371	0.0	≤36	≤1067	negative
14-010	14-614597	0	1	RE14-11-24366	0.0	0	≤1041	negative
14-010	14-614597	3	4	RE14-11-24367	0.0	≤21	≤977	negative
14-010	14-614598	0	1	RE14-11-24368	0.0	≤21	≤577	negative
14-010	14-614598	3	4	RE14-11-24369	0.0	0	≤635	negative
C-14-008	14-614637	0	1	RE14-11-24474	0.0	≤26	≤719	negative
C-14-008	14-614637	3	4	RE14-11-24475	0.0	≤7	≤577	negative
C-14-008	14-614638	0	1	RE14-11-24476	0.0	≤11	≤593	negative
C-14-008	14-614638	3	4	RE14-11-24477	0.0	≤2	≤524	negative
C-14-008	14-614639	0	1	RE14-11-24478	0.0	0	≤619	negative
C-14-008	14-614639	3	4	RE14-11-24479	0.0	≤16	≤445	negative
C-14-008	14-614640	0	1	RE14-11-24480	0.0	≤7	≤339	negative
C-14-008	14-614640	3	4	RE14-11-24481	0.0	0	≤487	negative
C-14-008	14-614641	0	1	RE14-11-24482	0.0	≤7	≤693	negative
C-14-008	14-614641	3	4	RE14-11-24483	0.0	≤7	≤593	negative
Consolidated Unit 14-002(c)-99								
14-002(c)	14-614487	0	1	RE14-11-23921	0.0	≤63	≤953	negative
14-002(c)	14-614487	2	3	RE14-11-23922	0.0	≤9	≤675	negative
14-002(c)	14-614486	0	1	RE14-11-23919	0.0	≤44	≤954	negative
14-002(c)	14-614486	2	3	RE14-11-23920	0.0	≤53	≤633	negative
14-002(c)	14-01089	1	2	RE14-11-23923	0.0	≤157	≤3110	negative
14-002(c)	14-01089	5	6	RE14-11-23924	0.0	≤21	≤972	negative
14-002(c)	14-01090	1	2	RE14-11-23925	0.0	≤16	≤3210	negative
14-002(c)	14-01090	5	6	RE14-11-23926	0.0	≤103	≤3370	negative
14-002(c)	14-01091	1	2	RE14-11-23927	0.0	≤93	≤3100	negative
14-002(c)	14-01091	6	7	RE14-11-23928	0.0	≤58	≤3150	negative
14-002(c)	14-01092	1	2	RE14-11-23929	0.0	≤103	≤1076	negative
14-002(c)	14-01092	6	7	RE14-11-23930	0.0	≤68	≤1234	negative
14-003	14-614501	0	1	RE14-11-24034	0.0	≤49	≤970	negative
14-003	14-614501	3.5	4.5	RE14-11-24035	0.0	≤53	≤733	negative

Table 3.2-2 (continued)

Consolidated Unit/SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/Gamma Reading (dpm)*	HE Spot Test
14-003	14-614502	0	1	RE14-11-24036	0.0	≤58	≤954	negative
14-003	14-614502	3.5	4.5	RE14-11-24037	0.0	≤24	≤722	negative
14-003	14-614503	0	1	RE14-11-24038	0.0	≤19	≤764	negative
14-003	14-614503	3.5	4.5	RE14-11-24039	0.0	≤34	≤638	negative
14-003	14-614511	0	1	RE14-11-24054	0.0	≤54	≤2640	negative
14-003	14-614511	3.5	4.5	RE14-11-24055	0.0	≤49	≤2600	negative
14-003	14-614504	0	1	RE14-11-24040	0.0	≤127	≤3060	negative
14-003	14-614504	4.5	5.5	RE14-11-24041	0.0	≤63	≤3420	negative
14-003	14-614505	0	1	RE14-11-24042	0.0	≤63	≤3290	negative
14-003	14-614505	5	6	RE14-11-24043	0.0	≤83	≤3500	negative
14-003	14-614506	0	1	RE14-11-24044	0.0	≤108	≤3100	negative
14-003	14-614506	5	6	RE14-11-24045	0.0	≤73	≤3130	negative
14-003	14-614507	0	1	RE14-11-24046	0.0	≤147	≤3130	negative
14-003	14-614507	3	4	RE14-11-24047	0.0	≤83	≤2520	negative
14-003	14-614512	0	1	RE14-11-24056	0.0	≤78	≤3150	negative
14-003	14-614512	3	4	RE14-11-24057	0.0	≤68	≤3020	negative
14-003	14-614508	0	1	RE14-11-24048	0.0	≤63	≤3030	negative
14-003	14-614508	3	4	RE14-11-24049	0.0	≤58	≤2740	negative
14-003	14-614509	0	1	RE14-11-24050	0.0	≤113	≤2870	negative
14-003	14-614509	3	4	RE14-11-24051	0.0	≤83	≤2920	negative
14-003	14-614510	0	1	RE14-11-24052	0.0	≤63	≤2680	negative
14-003	14-614510	3	4	RE14-11-24053	0.0	≤34	≤3090	negative
14-003	14-614513	0	1	RE14-11-24058	0.0	≤29	≤2740	negative
14-003	14-614513	3	4	RE14-11-24059	0.0	≤39	≤3050	negative
14-006	14-614539	2	3	RE14-11-24134	0.0	≤5	≤524	negative
14-006	14-614539	6	7	RE14-11-24135	0.0	0	≤287	negative
14-006	14-614532	5	6	RE14-11-24120	0.0	≤39	≤582	negative
14-006	14-614532	8	9	RE14-11-24121	0.0	≤69	≤1009	negative
14-006	14-614533	5	6	RE14-11-24122	0.0	≤54	≤719	negative
14-006	14-614533	8	9	RE14-11-24123	0.0	≤24	≤514	negative
14-006	14-614531	5	6	RE14-11-24118	0.0	≤29	≤914	negative
14-006	14-614531	8	9	RE14-11-24119	0.0	≤54	≤925	negative
14-006	14-614534	4	5	RE14-11-24124	0.0	≤49	≤666	negative
14-006	14-614534	7	8	RE14-11-24125	0.0	≤29	≤587	negative
14-006	14-614540	1.5	2.5	RE14-11-24136	0.0	≤5	≤856	negative
14-006	14-614540	4.5	5.5	RE14-11-24137	0.0	≤54	≤1020	negative
14-006	14-614535	1	2	RE14-11-24126	0.0	≤19	≤788	negative

Table 3.2-2 (continued)

Consolidated Unit/SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/Gamma Reading (dpm)*	HE Spot Test
14-006	14-614535	4	5	RE14-11-24127	0.0	≤34	≤313	negative
14-006	14-614536	0	1	RE14-11-24128	0.0	≤29	≤297	negative
14-006	14-614536	3	4	RE14-11-24129	0.0	≤49	≤962	negative
14-006	14-614537	0	1	RE14-11-24130	0.0	≤29	≤514	negative
14-006	14-614537	3	4	RE14-11-24131	0.0	≤19	≤919	negative
14-006	14-614538	0	1	RE14-11-24132	0.0	≤5	≤849	negative
14-006	14-614538	3	4	RE14-11-24133	0.0	≤24	≤329	negative
14-006	14-614541	0	1	RE14-11-24138	0.0	≤64	≤682	negative
14-006	14-614541	3	4	RE14-11-24139	0.0	≤29	≤814	negative
14-007	14-614551	2.5	3.5	RE14-11-24168	0.0	≤77	≤960	negative
14-007	14-614551	5.5	6.5	RE14-11-24169	0.0	≤52	≤859	negative
14-007	14-614552	0	1	RE14-11-24178	0.0	≤63	≤3340	negative
14-007	14-614552	3	4	RE14-11-24179	0.0	≤103	≤3110	negative
14-007	14-614552	6	7	RE14-11-25905	0.0	≤1	≤1099	negative
14-007	14-614542	0	1	RE14-11-24150	0.0	≤58	≤2920	negative
14-007	14-614542	3	4	RE14-11-24151	0.0	≤49	≤2620	negative
14-007	14-614542	6	7	RE14-11-25906	0.0	≤49	≤984	negative
14-007	14-614544	0	1	RE14-11-24154	0.0	≤58	≤3080	negative
14-007	14-614544	3	4	RE14-11-24155	0.0	≤88	≤2880	negative
14-007	14-614544	6	7	RE14-11-25907	0.0	≤64	≤899	negative
14-007	14-614544	9	10	RE14-11-25908	0.0	≤39	≤1458	negative
14-007	14-614543	0	1	RE14-11-24152	0.0	≤83	≤3050	negative
14-007	14-614543	3	4	RE14-11-24153	0.0	≤68	≤3290	negative
14-007	14-614543	6	7	RE14-11-25909	0.0	≤84	≤1000	negative
14-007	14-614553	0	1	RE14-11-24180	0.0	≤113	≤3120	negative
14-007	14-614553	3	4	RE14-11-24181	0.0	≤108	≤3230	negative
14-007	14-614553	6	7	RE14-11-25910	0.0	≤25	≤1258	negative
14-007	14-614545	0	1	RE14-11-24156	0.0	≤88	≤2800	negative
14-007	14-614545	3	4	RE14-11-24157	0.0	≤88	≤2850	negative
14-007	14-614545	6	7	RE14-11-25911	0.0	≤84	≤1079	negative
14-007	14-614546	0	1	RE14-11-24158	0.0	≤73	≤2930	negative
14-007	14-614546	3	4	RE14-11-24159	0.0	≤103	≤3200	negative
14-007	14-614547	0	1	RE14-11-24160	0.0	≤88	≤2770	negative
14-007	14-614547	3	4	RE14-11-24161	0.0	≤63	≤3060	negative
14-007	14-614548	0	1	RE14-11-24162	0.0	≤88	≤2960	negative
14-007	14-614548	3	4	RE14-11-24163	0.0	≤49	≤3040	negative
14-007	14-614554	0	1	RE14-11-24182	0.0	≤78	≤2940	negative

Table 3.2-2 (continued)

Consolidated Unit/SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/Gamma Reading (dpm)*	HE Spot Test
14-007	14-614554	3	4	RE14-11-24183	0.0	≤83	≤3310	negative
14-007	14-614549	0	1	RE14-11-24164	0.0	≤63	≤3350	negative
14-007	14-614549	3	4	RE14-11-24165	0.0	≤83	≤3250	negative
14-007	14-614549	6	7	RE14-11-25912	0.0	≤15	≤567	negative
14-007	14-614550	0	1	RE14-11-24166	0.0	≤93	≤3140	negative
14-007	14-614550	3	4	RE14-11-24167	0.0	≤93	≤3220	negative
14-007	14-614550	6	7	RE14-11-25913	0.0	≤20	≤1174	negative
14-007	14-614555	0	1	RE14-11-24184	0.0	≤78	≤3050	negative
14-007	14-614555	3	4	RE14-11-24185	0.0	≤41	≤596	negative
14-007	14-614555	6	7	RE14-11-24186	0.0	≤26	≤601	negative
14-007	14-614561	0	1	RE14-11-24202	0.0	≤41	≤548	negative
14-007	14-614561	3	4	RE14-11-24203	0.0	≤71	≤511	negative
14-007	14-614561	6	7	RE14-11-24204	0.0	≤22	≤717	negative
14-007	14-614556	0	1	RE14-11-24187	0.0	0	≤553	negative
14-007	14-614556	3	4	RE14-11-24188	0.0	≤7	≤717	negative
14-007	14-614556	6	7	RE14-11-24189	0.0	0	≤664	negative
14-007	14-614557	0	1	RE14-11-24190	0.0	≤22	≤517	negative
14-007	14-614557	3	4	RE14-11-24191	0.0	≤7	≤374	negative
14-007	14-614557	6	7	RE14-11-24192	0.0	≤31	≤923	negative
14-007	14-614558	0	1	RE14-11-24193	0.0	≤2	≤469	negative
14-007	14-614558	3	4	RE14-11-24194	0.0	≤12	≤638	negative
14-007	14-614558	6	7	RE14-11-24195	0.0	≤93	≤1328	negative
14-007	14-614562	0	1	RE14-11-24205	0.0	≤39	≤917	negative
14-007	14-614562	3	4	RE14-11-24206	0.0	≤44	≤954	negative
14-007	14-614562	6	7	RE14-11-24207	0.0	≤34	≤1080	negative
14-007	14-614559	0	1	RE14-11-24196	0.0	≤44	≤848	negative
14-007	14-614559	3	4	RE14-11-24197	0.0	≤44	≤696	negative
14-007	14-614559	6	7	RE14-11-24198	0.0	≤39	≤1275	negative
14-007	14-614560	0	1	RE14-11-24199	0.0	≤34	≤1075	negative
14-007	14-614560	3	4	RE14-11-24200	0.0	≤49	≤917	negative
14-007	14-614560	6	7	RE14-11-24201	0.0	≤34	≤1123	negative
C-14-001	14-614605	0	1	RE14-11-24389	0.0	0	≤1004	negative
C-14-001	14-614605	3	4	RE14-11-24390	0.0	≤65	≤878	negative
C-14-001	14-614606	0	1	RE14-11-24391	0.0	≤39	≤770	negative
C-14-001	14-614606	3	4	RE14-11-24392	0.0	≤39	≤974	negative
C-14-001	14-614607	0	1	RE14-11-24393	0.0	0	≤1282	negative
C-14-001	14-614607	3	4	RE14-11-24394	0.0	0	≤1088	negative

Table 3.2-2 (continued)

Consolidated Unit/SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/Gamma Reading (dpm)*	HE Spot Test
C-14-001	14-614608	0	1	RE14-11-24395	0.0	0	≤794	negative
C-14-001	14-614608	3	4	RE14-11-24396	0.0	≤29	≤1202	negative
C-14-001	14-614609	0	1	RE14-11-24397	0.0	≤19	≤950	negative
C-14-001	14-614609	3	4	RE14-11-24398	0.0	0	≤1040	negative
C-14-004	14-614622	0	1	RE14-11-24431	0.0	≤37	≤786	negative
C-14-004	14-614622	3	4	RE14-11-24432	0.0	≤52	≤712	negative
C-14-004	14-614623	0	1	RE14-11-24433	0.0	≤13	≤1123	negative
C-14-004	14-614623	3	4	RE14-11-24434	0.0	≤37	≤775	negative
C-14-004	14-614626	0	1	RE14-11-24439	0.0	≤62	≤569	negative
C-14-004	14-614626	3	4	RE14-11-24440	0.0	≤27	≤559	negative
C-14-004	14-614624	0	1	RE14-11-24435	0.0	≤32	≤596	negative
C-14-004	14-614624	3	4	RE14-11-24436	0.0	≤32	≤770	negative
C-14-004	14-614642	0	1	RE14-11-24832	0.0	≤22	≤728	negative
C-14-004	14-614642	3	4	RE14-11-24833	0.0	≤32	≤986	negative
C-14-004	14-614625	0	1	RE14-11-24437	0.0	≤47	≤928	negative
C-14-004	14-614625	3	4	RE14-11-24438	0.0	≤57	≤1202	negative
C-14-005	14-614627	0	1	RE14-11-24446	0.0	≤54	≤553	negative
C-14-005	14-614627	3	4	RE14-11-24447	0.0	≤64	≤1138	negative
C-14-005	14-614628	0	1	RE14-11-24448	0.0	≤25	≤843	negative
C-14-005	14-614628	3	4	RE14-11-24449	0.0	≤44	≤1012	negative
C-14-005	14-614631	0	1	RE14-11-24454	0.0	≤39	≤1144	negative
C-14-005	14-614631	3	4	RE14-11-24455	0.0	≤39	≤769	negative
C-14-005	14-614629	0	1	RE14-11-24450	0.0	≤34	≤938	negative
C-14-005	14-614629	3	4	RE14-11-24451	0.0	≤34	≤885	negative
C-14-005	14-614630	0	1	RE14-11-24452	0.0	≤10	≤985	negative
C-14-005	14-614630	3	4	RE14-11-24453	0.0	≤39	≤1260	negative
C-14-007	14-614636	0	1	RE14-11-24468	0.0	0	≤424	negative
C-14-007	14-614636	3	4	RE14-11-24469	0.0	≤18	≤1333	negative
C-14-007	14-614632	0	1	RE14-11-24460	0.0	0	≤1057	negative
C-14-007	14-614632	3	4	RE14-11-24461	0.0	≤28	≤1396	negative
C-14-007	14-614633	0	1	RE14-11-24462	0.0	≤20	≤962	negative
C-14-007	14-614633	3	4	RE14-11-24463	0.0	≤13	≤1212	negative
C-14-007	14-614634	0	1	RE14-11-24464	0.0	≤33	≤1001	negative
C-14-007	14-614634	3	4	RE14-11-24465	0.0	≤23	≤996	negative
C-14-007	14-614635	0	1	RE14-11-24466	0.0	≤43	≤758	negative
C-14-007	14-614635	3	4	RE14-11-24467	0.0	≤43	≤1080	negative
C-14-009	14-614615	0	1	RE14-11-24417	0.0	≤29	≤917	negative

Table 3.2-2 (continued)

Consolidated Unit/SWMU/AOC	Location ID	Start Depth (ft)	End Depth (ft)	Sample ID	PID Reading (ppm)	Alpha Reading (dpm)*	Beta/Gamma Reading (dpm)*	HE Spot Test
C-14-009	14-614615	3	4	RE14-11-24418	0.0	≤14	≤854	negative
C-14-009	14-614616	0	1	RE14-11-24419	0.0	≤34	≤817	negative
C-14-009	14-614616	3	4	RE14-11-24420	0.0	≤39	≤975	negative
C-14-009	14-614617	0	1	RE14-11-24421	0.0	≤29	≤659	negative
C-14-009	14-614617	3	4	RE14-11-24422	0.0	≤58	≤780	negative
C-14-009	14-614619	0	1	RE14-11-24425	0.0	≤14	≤775	negative
C-14-009	14-614619	3	4	RE14-11-24426	0.0	≤58	≤986	negative
C-14-009	14-614618	0	1	RE14-11-24423	0.0	≤34	≤944	negative
C-14-009	14-614618	3	4	RE14-11-24424	0.0	≤34	≤1255	negative

Note: Shading denotes consolidated unit.
*Results reported represent site background levels.

Table 6.2-1
Samples Collected and Analyses Requested at AOCs 14-001(a,b,c,d,e)

Site	Sample ID	Location ID	Depth (ft)	Media	PCBs
AOC 14-001(a)	RE14-11-23996	14-614493	3–4	SOIL	11-3409
	RE14-11-23997	14-614493	6–7	SOIL	11-3409
AOC 14-001(b)	RE14-11-23998	14-614494	3–4	SOIL	11-3280
	RE14-11-23999	14-614494	6–7	SOIL	11-3280
AOC 14-001(c)	RE14-11-24000	14-614495	3–4	QBT4	11-3280
	RE14-11-24001	14-614495	6–7	QBT4	11-3280
AOC 14-001(d)	RE14-11-24002	14-614496	3–4	QBT4	11-3280
	RE14-11-24003	14-614496	6–7	QBT4	11-3280
AOC 14-001(e)	RE14-11-24004	14-614497	3–4	QBT4	11-3280
	RE14-11-24005	14-614497	6–7	QBT4	11-3280

Table 6.7-1
Samples Collected and Analyses Requested at AOC 14-001(g)

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE14-11-23225	14-614463	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—*	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23237	14-614463	2–3	QBT4	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	11-3284	11-3285
RE14-11-23226	14-614464	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23238	14-614464	2–3	QBT4	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	11-3284	11-3285
RE14-11-23227	14-614465	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23239	14-614465	2–3	QBT4	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	11-3284	11-3285
RE14-11-23228	14-614466	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23240	14-614466	2–3	QBT4	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	11-3284	11-3285
RE14-11-23229	14-614467	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23241	14-614467	2–3	QBT4	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	11-3284	11-3285
RE14-11-23230	14-614468	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23242	14-614468	2–3	QBT4	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	11-3284	11-3285
RE14-11-23231	14-614469	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23243	14-614469	2–3	QBT4	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	11-3284	11-3285
RE14-11-23232	14-614470	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23244	14-614470	2–3	QBT4	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	11-3284	11-3285
RE14-11-23233	14-614471	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23245	14-614471	2–3	QBT4	11-3288	11-3289	11-3287	11-3289	11-3288	—	11-3288	11-3289	11-3287	11-3287	11-3288
RE14-11-23234	14-614472	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23246	14-614472	2–3	SOIL	11-3288	11-3289	11-3287	11-3289	11-3288	—	11-3288	11-3289	11-3287	11-3287	11-3288
RE14-11-23235	14-614473	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23247	14-614473	2–3	SOIL	11-3288	11-3289	11-3287	11-3289	11-3288	—	11-3288	11-3289	11-3287	11-3287	11-3288

Table 6.7-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE14-11-23236	14-614474	0–1	SOIL	11-3285	11-3286	11-3284	11-3286	11-3285	—	11-3285	11-3286	11-3284	—	11-3285
RE14-11-23248	14-614474	2–3	SOIL	11-3288	11-3289	11-3287	11-3289	11-3288	—	11-3288	11-3289	11-3287	11-3287	11-3288
RE14-11-23249	14-614475	0–1	QBT4	11-3288	11-3289	11-3287	11-3289	11-3288	11-3287	11-3288	11-3289	11-3287	—	11-3288
RE14-11-23252	14-614475	2–3	QBT4	11-3288	11-3289	11-3287	11-3289	11-3288	11-3287	11-3288	11-3289	11-3287	11-3287	11-3288
RE14-11-23250	14-614476	0–1	QBT4	11-3288	11-3289	11-3287	11-3289	11-3288	11-3287	11-3288	11-3289	11-3287	—	11-3288
RE14-11-23253	14-614476	2–3	QBT4	11-3288	11-3289	11-3287	11-3289	11-3288	11-3287	11-3288	11-3289	11-3287	11-3287	11-3288
RE14-11-23251	14-614477	0–1	SOIL	11-3288	11-3289	11-3287	11-3289	11-3288	11-3287	11-3288	11-3289	11-3287	—	11-3288
RE14-11-23254	14-614477	2–3	SOIL	11-3288	11-3289	11-3287	11-3289	11-3288	11-3287	11-3288	11-3289	11-3287	11-3287	11-3288

*— = Analysis not requested.

Table 6.7-2
Inorganic Chemicals above BVs at AOC 14-001(g)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Beryllium	Calcium	Chromium	Copper	Cyanide (Total)	Lead	Mercury	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**1.21**	**2200**	**7.14**	**4.66**	**0.5**	**11.2**	**0.1**	**6.58**	**na[b]**	**na**	**0.3**
Soil BV[a]				**29200**	**0.83**	**295**	**1.83**	**6120**	**19.3**	**14.7**	**0.5**	**22.3**	**0.1**	**15.4**	**na**	**na**	**1.52**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**144**	**na**	**449[d]**	**12400**	**6190**	**800**	**92.9[e]**	**6190**	**496000**	**217**	**1550**
Industrial SSL[c]				**1130000**	**454**	**224000**	**2260**	**na**	**2920[d]**	**45400**	**22700**	**800**	**310[f]**	**22700**	**1820000**	**795**	**5680**
Residential SSL[c]				**78100**	**31.3**	**15600**	**156**	**na**	**219[d]**	**3130**	**1560**	**400**	**23[f]**	**1560**	**125000**	**54.8**	**391**
RE14-11-23225	14-614463	0–1	SOIL	—[g]	—	—	—	—	—	—	0.61 (U)	—	—	—	0.55	0.0078	2.1 (J-)
RE14-11-23237	14-614463	2–3	QBT4	—	—	—	—	—	—	—	0.55 (U)	—	—	—	0.18 (J)	—	1.9 (J-)
RE14-11-23226	14-614464	0–1	SOIL	—	—	—	—	—	—	—	0.58 (U)	30	—	—	6.2	—	—
RE14-11-23238	14-614464	2–3	QBT4	—	0.51 (U)	—	—	—	—	—	0.51 (U)	—	—	—	0.26	—	1.5 (J-)
RE14-11-23227	14-614465	0–1	SOIL	—	—	—	—	—	—	—	0.55 (U)	—	—	—	1.1	—	1.6 (J-)
RE14-11-23239	14-614465	2–3	QBT4	—	—	—	—	—	—	7.3 (J)	0.52 (U)	—	—	—	0.31	—	1.8 (J-)
RE14-11-23228	14-614466	0–1	SOIL	—	—	—	—	—	—	—	0.57 (U)	—	—	—	0.57	—	—
RE14-11-23240	14-614466	2–3	QBT4	—	—	—	—	—	—	—	0.52 (U)	—	—	—	0.069 (J)	—	1.8 (J-)
RE14-11-23229	14-614467	0–1	SOIL	—	—	—	—	—	—	—	0.59 (U)	—	0.409	—	1	—	1.8 (J-)
RE14-11-23241	14-614467	2–3	QBT4	—	—	—	—	—	—	—	0.51 (U)	—	—	—	0.17 (J)	—	1.9 (J-)
RE14-11-23230	14-614468	0–1	SOIL	—	—	—	—	—	—	—	0.56 (U)	—	—	—	8	—	1.6 (J-)
RE14-11-23242	14-614468	2–3	QBT4	—	—	—	—	—	—	—	0.52 (U)	—	—	—	2.2	—	1.6 (J-)
RE14-11-23231	14-614469	0–1	SOIL	—	—	—	—	—	—	—	0.56 (U)	—	—	—	1.9	—	2.1 (J-)
RE14-11-23243	14-614469	2–3	QBT4	7810	—	49.4	1.4	2460	7.5	5.7 (J)	0.55 (U)	—	—	6.7	0.33	—	3.3 (J-)
RE14-11-23232	14-614470	0–1	SOIL	—	—	—	—	—	—	—	0.52 (U)	—	—	—	0.063 (J)	—	1.6 (J-)
RE14-11-23244	14-614470	2–3	QBT4	—	—	—	—	—	—	—	0.52 (U)	—	—	—	0.081 (J)	—	2.2 (J-)
RE14-11-23233	14-614471	0–1	SOIL	—	—	—	—	—	—	—	0.55 (U)	—	—	—	5.4	—	1.6 (J-)
RE14-11-23245	14-614471	2–3	QBT4	—	—	49.2	—	—	—	—	0.53 (U)	—	—	—	1.4	—	1.6 (J+)
RE14-11-23234	14-614472	0–1	SOIL	—	—	—	—	—	—	29.9 (J)	0.55 (U)	—	—	—	2.3	0.0059	—
RE14-11-23246	14-614472	2–3	SOIL	—	—	—	—	—	—	—	0.52 (U)	—	—	—	0.34	0.026	—
RE14-11-23235	14-614473	0–1	SOIL	—	—	—	—	—	—	—	0.6 (U)	57.6	—	—	5	—	1.6 (J-)
RE14-11-23247	14-614473	2–3	SOIL	—	—	—	—	—	—	—	0.52 (U)	—	—	—	0.3	—	1.9 (J+)
RE14-11-23236	14-614474	0–1	SOIL	—	—	—	—	—	—	—	0.55 (U)	—	—	—	0.058 (J)	—	2.3 (J-)
RE14-11-23248	14-614474	2–3	SOIL	—	—	—	—	—	—	—	0.58 (U)	—	—	—	0.22 (J)	—	2.9 (J+)
RE14-11-23249	14-614475	0–1	QBT4	—	—	—	—	—	—	—	0.53 (U)	—	—	—	0.39	—	1.2 (J+)
RE14-11-23252	14-614475	2–3	QBT4	—	—	—	—	—	—	—	0.53 (U)	—	—	—	0.094 (J)	—	2.3 (J+)
RE14-11-23250	14-614476	0–1	QBT4	—	—	—	—	—	—	—	0.57 (U)	—	—	—	0.85	—	1.9 (J+)

Table 6.7-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Beryllium	Calcium	Chromium	Copper	Cyanide (Total)	Lead	Mercury	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**1.21**	**2200**	**7.14**	**4.66**	**0.5**	**11.2**	**0.1**	**6.58**	**na**	**na**	**0.3**
Soil BV[a]				**29200**	**0.83**	**295**	**1.83**	**6120**	**19.3**	**14.7**	**0.5**	**22.3**	**0.1**	**15.4**	**na**	**na**	**1.52**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**144**	**na**	**449[d]**	**12400**	**6190**	**800**	**92.9[e]**	**6190**	**496000**	**217**	**1550**
Industrial SSL[c]				**1130000**	**454**	**224000**	**2260**	**na**	**2920[d]**	**45400**	**22700**	**800**	**310[f]**	**22700**	**1820000**	**795**	**5680**
Residential SSL[c]				**78100**	**31.3**	**15600**	**156**	**na**	**219[d]**	**3130**	**1560**	**400**	**23[f]**	**1560**	**125000**	**54.8**	**391**
RE14-11-23253	14-614476	2–3	QBT4	—	—	—	—	—	—	—	0.52 (U)	—	—	—	0.14 (J)	—	2 (J+)
RE14-11-23251	14-614477	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	—	3.9	—	1.6 (J+)
RE14-11-23254	14-614477	2–3	SOIL	—	—	—	—	—	—	—	0.73 (U)	—	—	—	0.18 (J)	—	1.7 (J+)

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.7-3
Organic Chemicals Detected at AOC 14-001(g)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Benzene	Bis(2-ethylhexyl)phthalate	Dichlorobenzene[1,3-]	Diethylphthalate	Di-n-butylphthalate	HMX	Isopropyltoluene[4-]	RDX	TATB	Toluene	Trichloroethene
Construction Worker SSL[a]				**18600**	**471**	**4760**	**5780[b]**	**191000**	**23800**	**11900**	**10300[c]**	**715**	**8760[d,e]**	**21100**	**4600**
Industrial SSL[a]				**36700**	**85.4**	**1370**	**140[f]**	**547000**	**68400**	**34200**	**14900[c]**	**174**	**27000[d,g]**	**57900**	**253**
Residential SSL[a]				**3440**	**15.5**	**347**	**69[f]**	**48900**	**6110**	**3060**	**3210[c]**	**44.2**	**2200[d,g]**	**5570**	**45.7**
RE14-11-23225	14-614463	0–1	SOIL	—[h]	NA[i]	—	—	—	—	0.14 (J+)	NA	—	3.6 (J)	NA	NA
RE14-11-23237	14-614463	2–3	QBT4	—	—	—	—	—	—	—	—	—	0.28 (J)	—	—
RE14-11-23226	14-614464	0–1	SOIL	—	NA	—	—	—	—	0.51 (J+)	NA	—	0.56 (J)	NA	NA
RE14-11-23238	14-614464	2–3	QBT4	—	—	—	—	—	—	—	—	—	0.23 (J)	—	0.0009 (J)
RE14-11-23239	14-614465	2–3	QBT4	—	—	—	—	—	—	—	—	—	0.37 (J)	—	—
RE14-11-23228	14-614466	0–1	SOIL	—	NA	0.053 (J)	—	—	—	—	NA	—	—	NA	NA
RE14-11-23240	14-614466	2–3	QBT4	—	—	—	—	—	—	4.8 (J+)	0.004 (J)	—	—	—	—
RE14-11-23229	14-614467	0–1	SOIL	—	NA	—	—	—	—	—	NA	—	0.23 (J)	NA	NA
RE14-11-23230	14-614468	0–1	SOIL	—	NA	—	—	—	—	7.5 (J+)	NA	—	1.7 (J)	NA	NA
RE14-11-23242	14-614468	2–3	QBT4	—	—	0.09 (J)	—	—	—	1 (J+)	—	—	—	—	—
RE14-11-23231	14-614469	0–1	SOIL	—	NA	—	—	—	—	0.046 (J+)	NA	—	—	NA	NA
RE14-11-23243	14-614469	2–3	QBT4	—	—	—	—	—	—	0.039 (J+)	—	—	—	—	0.00091 (J)
RE14-11-23233	14-614471	0–1	SOIL	—	NA	—	—	—	—	—	NA	—	0.27 (J)	NA	NA
RE14-11-23245	14-614471	2–3	QBT4	—	0.00067 (J)	—	—	—	—	—	—	—	—	0.0021 (J)	—
RE14-11-23234	14-614472	0–1	SOIL	—	NA	0.093 (J)	—	—	—	0.92 (J+)	NA	—	1.6 (J)	NA	NA
RE14-11-23246	14-614472	2–3	SOIL	—	0.00072 (J)	—	0.00038 (J)	—	—	1.9	—	0.25 (J)	—	0.0014 (J)	—
RE14-11-23235	14-614473	0–1	SOIL	—	NA	—	—	—	0.14 (J)	0.28 (J+)	NA	—	0.88 (J)	NA	NA
RE14-11-23247	14-614473	2–3	SOIL	—	0.00059 (J)	—	—	—	—	0.29	—	—	—	0.002 (J)	—
RE14-11-23236	14-614474	0–1	SOIL	—	NA	—	—	—	—	—	NA	—	0.1 (J)	NA	NA
RE14-11-23248	14-614474	2–3	SOIL	—	0.00031 (J)	—	—	—	—	—	—	—	—	0.0027 (J)	—
RE14-11-23249	14-614475	0–1	QBT4	—	NA	—	—	0.059 (J)	—	—	NA	—	—	NA	NA
RE14-11-23252	14-614475	2–3	QBT4	—	0.0003 (J)	—	—	—	—	—	—	—	—	0.0019 (J)	—
RE14-11-23250	14-614476	0–1	QBT4	—	NA	—	—	—	—	—	NA	—	1.1 (J)	NA	NA
RE14-11-23254	14-614477	2–3	SOIL	0.061 (J)	—	—	—	—	—	—	0.0052 (J)	—	—	—	—

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

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

[b] SSLs calculated using toxicity value from EPA (2007, 099314) and equation and parameters from NMED (2009, 108070).

[c] Isopropylbenzene used as a surrogate based on structural similarity.

[d] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

[e] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

[f] SSLs are from EPA (2007, 099314).

[g] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

[h] — = Not detected.

[i] NA = Not analyzed.

Table 6.7-4
Radionuclides Detected or Detected above BVs/FVs at AOC 14-001(g)

Sample ID	Location ID	Depth (ft)	Media	Cesium-134	Cesium-137	Strontium-90
Qbt 2, 3, 4 BV[a]				**na**[b]	**na**	**na**
Soil BV[a]				**na**	**1.65**	**1.31**
Construction Worker SAL[c]				**7.7**	**18**	**800**
Industrial SAL[c]				**9.7**	**23**	**1900**
Residential SAL[c]				**2.4**	**5.6**	**5.7**
RE14-11-23239	14-614465	2–3	QBT4	—[d]	0.203	—
RE14-11-23230	14-614468	0–1	SOIL	0.051	—	—
RE14-11-23245	14-614471	2–3	QBT4	—	0.441	—
RE14-11-23246	14-614472	2–3	SOIL	—	—	0.302
RE14-11-23249	14-614475	0–1	QBT4	—	0.106	—
RE14-11-23250	14-614476	0–1	QBT4	—	0.473	—
RE14-11-23254	14-614477	2–3	SOIL	—	0.207	—

Notes: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs from LANL (2009, 107655).

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

Table 6.8-1
Samples Collected and Analyses Requested at SWMU 14-009

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE14-11-24070	14-614514	0–1	SOIL	11-3511	11-3512	11-3512	11-3512	11-3511	—*	11-3511	11-3512	11-3512	—	11-3511
RE14-11-24071	14-614514	5–6	QBT4	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	11-3512	11-3511
RE14-11-24072	14-614515	0–1	SOIL	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	—	11-3511
RE14-11-24073	14-614515	2.5–3.5	QBT4	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	11-3512	11-3511
RE14-11-24074	14-614516	0–1	SOIL	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	—	11-3511
RE14-11-24075	14-614516	2–3	QBT4	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	11-3512	11-3511
RE14-11-24076	14-614517	0–1	SOIL	11-3704	11-3704	11-3703	11-3704	11-3704	—	11-3704	11-3704	11-3703	—	11-3704
RE14-11-24077	14-614517	4.5–5.5	QBT4	11-3704	11-3704	11-3703	11-3704	11-3704	—	11-3704	11-3704	11-3703	11-3703	11-3704
RE14-11-24078	14-614518	0–1	SOIL	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	—	11-3511
RE14-11-24079	14-614518	2–3	QBT4	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	11-3512	11-3511
RE14-11-24080	14-614519	0–1	SOIL	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	—	11-3511
RE14-11-24081	14-614519	1.5–2.5	QBT4	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	11-3512	11-3511
RE14-11-24082	14-614520	0–1	SOIL	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	—	11-3511
RE14-11-24083	14-614520	2–3	QBT4	11-3511	11-3512	11-3512	11-3512	11-3511	—	11-3511	11-3512	11-3512	11-3512	11-3511
RE14-11-24084	14-614521	0–1	SOIL	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	—	11-3525
RE14-11-24085	14-614521	2–3	QBT4	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	11-3524	11-3525
RE14-11-24086	14-614522	0–1	SOIL	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	—	11-3525
RE14-11-24087	14-614522	1–2	QBT4	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	11-3524	11-3525
RE14-11-24088	14-614523	0–1	SOIL	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	—	11-3525
RE14-11-24089	14-614523	1–2	QBT4	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	11-3524	11-3525
RE14-11-24090	14-614524	0–1	SOIL	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	—	11-3525
RE14-11-24091	14-614524	1–2	QBT4	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	11-3524	11-3525
RE14-11-24092	14-614525	0–1	SED	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	—	11-3525
RE14-11-24093	14-614525	1–2	QBT4	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	11-3524	11-3525
RE14-11-24094	14-614526	0–1	SED	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	—	11-3525
RE14-11-24095	14-614526	1–2	QBT4	11-3525	11-3526	11-3524	11-3526	11-3525	—	11-3525	11-3526	11-3524	11-3524	11-3525
RE14-11-24096	14-614527	0–1	SOIL	11-3704	11-3704	11-3703	11-3704	11-3704	11-3703	11-3704	11-3704	11-3703	—	11-3704
RE14-11-24097	14-614527	2.5–3.5	QBT4	11-3704	11-3704	11-3703	11-3704	11-3704	11-3703	11-3704	11-3704	11-3703	11-3703	11-3704
RE14-11-24098	14-614528	0–1	SOIL	11-3511	11-3512	11-3512	11-3512	11-3511	11-3512	11-3511	11-3512	11-3512	—	11-3511
RE14-11-24099	14-614528	3.5–4.5	QBT4	11-3511	11-3512	11-3512	11-3512	11-3511	11-3512	11-3511	11-3512	11-3512	11-3512	11-3511
RE14-11-24100	14-614529	0–1	SED	11-3525	11-3526	11-3524	11-3526	11-3525	11-3524	11-3525	11-3526	11-3524	—	11-3525
RE14-11-24101	14-614529	1–2	QBT4	11-3525	11-3526	11-3524	11-3526	11-3525	11-3524	11-3525	11-3526	11-3524	11-3524	11-3525
RE14-11-24102	14-614530	0–1	SED	11-3525	11-3526	11-3524	11-3526	11-3525	11-3524	11-3525	11-3526	11-3524	—	11-3525
RE14-11-24103	14-614530	1–2	QBT4	11-3525	11-3526	11-3524	11-3526	11-3525	11-3524	11-3525	11-3526	11-3524	11-3524	11-3525

*— = Analysis not requested.

Table 6.8-2
Inorganic Chemicals above BVs at SWMU 14-009

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Mercury	Nickel	Nitrate	Selenium	Thallium	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**0.1**	**6.58**	**na**[b]	**0.3**	**1.1**	**17**	**63.5**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**	**2370**	**0.1**	**9.38**	**na**	**0.3**	**0.73**	**19.7**	**60.2**
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**0.1**	**15.4**	**na**	**1.52**	**0.73**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**124**	**65.4**	**4350**	**na**	**449**[d]	**34.6**[e]	**12400**	**6190**	**217000**	**800**	**na**	**92.9**[e]	**6190**	**496000**	**1550**	**20.4**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**224000**	**na**	**2920**[d]	**300**[f]	**45400**	**22700**	**795000**	**800**	**na**	**310**[f]	**22700**	**1820000**	**5680**	**74.9**	**5680**	**341000**
Residential SSL[c]				**78100**	**31.3**	**3.9**	**15600**	**na**	**219**[d]	**23**[f]	**3130**	**1560**	**54800**	**400**	**na**	**23**[f]	**1560**	**125000**	**391**	**5.16**	**391**	**23500**
RE14-11-24070	14-614514	0–1	SOIL	—[g]	—	—	—	—	—	—	—	0.58 (U)	—	—	—	—	—	14.3	—	—	—	—
RE14-11-24071	14-614514	5–6	QBT4	16200	—	2.9	183	3520	11.4 (J-)	5.7	7.3	0.55 (U)	—	15.7 (J+)	2100	—	8.6 (J-)	3.3	1.3 (J-)	—	24.7	—
RE14-11-24072	14-614515	0–1	SOIL	—	—	—	—	—	—	—	—	0.6 (U)	—	—	—	—	—	5.3	—	—	—	—
RE14-11-24073	14-614515	2.5–3.5	QBT4	10100	—	2.8	108	—	7.6 (J-)	3.4	7.6	0.54 (U)	—	24.5 (J+)	—	—	—	7	1.4 (J-)	—	—	—
RE14-11-24074	14-614516	0–1	SOIL	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	4.4	—	—	—	—
RE14-11-24075	14-614516	2–3	QBT4	—	—	—	78.9	—	—	—	—	0.51 (U)	—	13.1 (J+)	—	—	—	1	1.2 (J-)	—	—	—
RE14-11-24076	14-614517	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.1	—	—	—	—
RE14-11-24077	14-614517	4.5–5.5	QBT4	—	—	—	68.8	—	—	—	—	0.53 (U)	—	11.4 (J+)	—	—	—	0.57	1.7	—	—	—
RE14-11-24078	14-614518	0–1	SOIL	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—	—	6.4	—	—	—	—
RE14-11-24079	14-614518	2–3	QBT4	—	—	—	116	3920	—	—	—	0.51 (U)	—	—	—	—	—	0.96	0.94 (J-)	—	17.3	—
RE14-11-24080	14-614519	0–1	SOIL	—	—	—	—	—	—	9.5	77.8	0.54 (U)	—	60.2 (J+)	—	0.629 (J+)	24.7 (J-)	2.8	—	—	—	—
RE14-11-24081	14-614519	1.5–2.5	QBT4	—	0.73	2.9	70.1	3090	49.6 (J-)	4.6	73	0.54 (U)	14700 (J)	36.9 (J+)	—	0.343 (J+)	50.6 (J-)	3.1	1.1 (J-)	—	—	—
RE14-11-24082	14-614520	0–1	SOIL	—	—	—	—	—	—	—	28.1	0.52 (U)	—	34.3 (J+)	—	0.14 (J+)	—	2.5	—	—	—	—
RE14-11-24083	14-614520	2–3	QBT4	—	—	—	—	—	—	—	9.8	0.54 (U)	—	45.5 (J+)	—	—	—	0.71	2 (J-)	—	—	—
RE14-11-24084	14-614521	0–1	SOIL	—	—	—	—	—	—	—	—	0.62 (U)	—	42.4	—	—	—	1.2	2.2 (J)	0.82	—	—
RE14-11-24085	14-614521	2–3	QBT4	—	0.53 (U)	—	—	—	—	—	—	0.53 (U)	—	32.1	—	—	—	0.18 (J)	1.5 (J)	—	—	—
RE14-11-24086	14-614522	0–1	SOIL	—	—	—	—	—	—	—	—	0.59 (U)	—	—	—	—	—	0.4	1.9 (J)	—	—	—
RE14-11-24087	14-614522	1–2	QBT4	—	0.53 (U)	—	—	—	—	—	—	0.53 (U)	—	12.1	—	—	—	0.12 (J)	2.5 (J)	—	—	—
RE14-11-24088	14-614523	0–1	SOIL	—	—	—	—	—	—	—	—	0.57 (U)	—	23.7	—	—	—	1.7	2.3 (J)	—	—	—
RE14-11-24089	14-614523	1–2	QBT4	—	0.51 (U)	—	—	—	—	—	—	0.51 (U)	—	—	—	—	—	0.55	2.3 (J)	—	—	—
RE14-11-24090	14-614524	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.2	2.4 (J)	—	—	51.8
RE14-11-24091	14-614524	1–2	QBT4	—	0.51 (U)	—	—	—	—	—	—	0.51 (U)	—	—	—	—	—	0.33	2.8 (J)	—	—	—
RE14-11-24092	14-614525	0–1	SED	—	—	4.5	—	—	—	—	—	—	—	38.4	—	—	—	0.64	1.5 (J)	—	—	—
RE14-11-24093	14-614525	1–2	QBT4	—	—	—	—	—	—	—	—	0.52 (U)	—	17.6	—	—	—	0.16 (J)	2 (J)	—	—	—
RE14-11-24094	14-614526	0–1	SED	—	—	—	—	—	—	—	42	—	—	36	—	0.147	—	0.69	0.8 (J)	—	—	—
RE14-11-24095	14-614526	1–2	QBT4	—	—	—	—	—	—	—	6.5	0.52 (U)	—	12.1	—	—	—	0.1 (J)	2 (J)	—	—	—
RE14-11-24096	14-614527	0–1	SOIL	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	2.5	—	—	—	—
RE14-11-24097	14-614527	2.5–3.5	QBT4	9970	23.8	—	118	2470 (J+)	—	3.4	6.7	0.53 (U)	—	12.4 (J+)	—	—	—	9.5	1.2	—	17.9	—

Table 6.8-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Mercury	Nickel	Nitrate	Selenium	Thallium	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**0.1**	**6.58**	**na**	**0.3**	**1.1**	**17**	**63.5**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**4420**	**10.5**	**4.73**	**11.2**	**0.82**	**13800**	**19.7**	**2370**	**0.1**	**9.38**	**na**	**0.3**	**0.73**	**19.7**	**60.2**
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**0.1**	**15.4**	**na**	**1.52**	**0.73**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**124**	**65.4**	**4350**	**na**	**449**[d]	**34.6**[e]	**12400**	**6190**	**217000**	**800**	**na**	**92.9**[e]	**6190**	**496000**	**1550**	**20.4**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**224000**	**na**	**2920**[d]	**300**[f]	**45400**	**22700**	**795000**	**800**	**na**	**310**[f]	**22700**	**1820000**	**5680**	**74.9**	**5680**	**341000**
Residential SSL[c]				**78100**	**31.3**	**3.9**	**15600**	**na**	**219**[d]	**23**[f]	**3130**	**1560**	**54800**	**400**	**na**	**23**[f]	**1560**	**125000**	**391**	**5.16**	**391**	**23500**
RE14-11-24098	14-614528	0–1	SOIL	—	—	—	—	—	—	—	17.8	0.55 (U)	—	—	—	0.14 (J+)	—	4.2	—	—	—	—
RE14-11-24099	14-614528	3.5–4.5	QBT4	10400	—	—	142	2480	7.7 (J-)	4.1	8.5	0.55 (U)	—	12 (J+)	—	—	—	1.6	1.3 (J-)	—	18.1	—
RE14-11-24100	14-614529	0–1	SED	—	—	—	—	—	—	—	18.1	—	—	53.1	—	—	—	1.5	1.7 (J)	—	—	—
RE14-11-24101	14-614529	1–2	QBT4	—	0.59 (U)	—	—	—	—	—	—	0.59 (U)	—	—	—	—	—	0.3	2.2 (J)	—	—	—
RE14-11-24102	14-614530	0–1	SED	—	—	—	—	—	—	—	—	—	—	31.9	—	—	—	1.1	2.3 (J)	—	—	—
RE14-11-24103	14-614530	1–2	QBT4	—	0.52 (U)	—	—	—	—	—	—	0.52 (U)	—	—	—	—	—	0.098 (J)	2.2 (J)	—	—	—

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.8-3
Organic Chemicals Detected at SWMU 14-009

Sample ID	Location ID	Depth (ft)	Media	Acetone	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Chrysene	Di-n-butylphthalate	Dinitrotoluene[2,4-]	Fluoranthene	Hexanone[2-]	HMX	Indeno(1,2,3-cd)pyrene	Nitrosodiphenylamine[N-]	PETN	Phenanthrene	Pyrene	RDX	TATB
Construction Worker SSL[a]				**263000**	**66800**	**213**	**21.3**	**213**	**2060**	**4760**	**20600**	**23800**	**476**	**8910**	**1530[b]**	**11900**	**213**	**34000**	**na[c]**	**7150**	**6680**	**715**	**8760[d,e]**
Industrial SSL[a]				**851000**	**183000**	**23.4**	**2.34**	**23.4**	**234**	**1370**	**2340**	**68400**	**103**	**24400**	**1400[f]**	**34200**	**23.4**	**3910**	**na**	**20500**	**18300**	**174**	**27000[d,f]**
Residential SSL[a]				**67500**	**17200**	**6.21**	**0.621**	**6.21**	**62.1**	**347**	**621**	**6110**	**15.7**	**2290**	**210[f]**	**3060**	**6.21**	**993**	**na**	**1830**	**1720**	**44.2**	**2200[d,f]**
RE14-11-24070	14-614514	0–1	SOIL	NA[g]	—[h]	0.11 (J)	0.11 (J)	0.16 (J)	0.07 (J)	—	0.12 (J)	—	—	0.31 (J)	NA	—	0.041 (J)	—	—	0.13 (J)	0.22 (J)	—	—
RE14-11-24071	14-614514	5–6	QBT4	—	—	—	—	—	—	—	—	—	—	0.062 (J)	—	—	—	—	—	—	0.046 (J)	—	—
RE14-11-24073	14-614515	2.5–3.5	QBT4	0.0073 (J)	—	—	—	—	—	—	—	0.14 (J)	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24074	14-614516	0–1	SOIL	NA	0.04 (J)	0.097 (J)	0.087 (J)	0.11 (J)	0.05 (J)	—	0.1 (J)	—	—	0.24 (J)	NA	—	—	—	—	0.19 (J)	0.2 (J)	—	0.12 (J)
RE14-11-24076	14-614517	0–1	SOIL	NA	—	—	—	0.039 (J)	—	—	—	—	—	0.063 (J)	NA	—	—	—	0.43	—	0.048 (J)	—	—
RE14-11-24077	14-614517	4.5–5.5	QBT4	—	—	0.056 (J)	0.048 (J)	0.066 (J)	—	—	0.052 (J)	—	—	0.14 (J)	0.011 (J)	0.64	—	—	—	0.059 (J)	0.091 (J)	—	—
RE14-11-24080	14-614519	0–1	SOIL	NA	—	—	—	—	—	—	—	—	—	—	NA	44 (J)	—	—	—	—	—	0.15 (J-)	20 (J)
RE14-11-24081	14-614519	1.5–2.5	QBT4	—	—	—	—	—	—	—	—	—	—	—	—	120 (J)	—	—	—	—	—	0.94 (J+)	15 (J)
RE14-11-24082	14-614520	0–1	SOIL	NA	—	—	—	—	—	0.057 (J)	—	—	0.16	—	NA	200 (J)	—	0.096 (J)	—	—	—	0.31 (J+)	16 (J)
RE14-11-24083	14-614520	2–3	QBT4	0.0086 (J)	—	—	—	—	—	—	—	—	—	—	—	370 (J)	—	—	—	—	—	—	2.6 (J)
RE14-11-24084	14-614521	0–1	SOIL	NA	—	—	—	—	—	—	—	0.16 (J)	—	—	NA	1.2	—	—	—	—	—	—	NA
RE14-11-24085	14-614521	2–3	QBT4	0.0081 (J)	—	—	—	—	—	—	—	—	—	—	—	0.27 (J)	—	—	—	—	—	—	NA
RE14-11-24088	14-614523	0–1	SOIL	NA	—	—	—	—	—	—	—	0.15 (J)	—	—	NA	—	—	—	—	—	—	—	NA
RE14-11-24089	14-614523	1–2	QBT4	0.0099 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	NA
RE14-11-24090	14-614524	0–1	SOIL	NA	—	—	—	—	—	—	—	—	—	—	NA	0.039 (J)	—	—	—	—	—	—	NA
RE14-11-24092	14-614525	0–1	SED	NA	—	—	—	—	—	—	—	0.052 (J)	—	—	NA	9.1	—	—	—	—	—	—	NA
RE14-11-24093	14-614525	1–2	QBT4	—	—	—	—	—	—	—	—	—	—	—	—	1.9 (J)	—	—	—	—	—	—	NA
RE14-11-24094	14-614526	0–1	SED	NA	—	—	—	—	—	—	—	—	—	—	NA	120 (J)	—	—	—	—	—	—	NA
RE14-11-24095	14-614526	1–2	QBT4	0.0067 (J)	—	—	—	—	—	—	—	—	—	—	—	130 (J)	—	—	—	—	—	0.57 (J)	NA
RE14-11-24097	14-614527	2.5–3.5	QBT4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.17 (J)
RE14-11-24098	14-614528	0–1	SOIL	NA	—	—	—	—	—	—	—	—	—	—	NA	0.26 (J)	—	—	—	—	—	—	18 (J)
RE14-11-24099	14-614528	3.5–4.5	QBT4	—	—	—	—	—	—	—	—	—	—	—	—	0.8 (J)	—	—	—	—	—	—	1.6 (J)
RE14-11-24100	14-614529	0–1	SED	NA	—	—	—	—	—	—	—	0.14 (J)	—	—	NA	23 (J)	—	—	—	—	—	0.16 (J)	NA
RE14-11-24101	14-614529	1–2	QBT4	—	—	—	—	—	—	—	—	—	—	—	—	5.3	—	—	—	—	—	—	NA
RE14-11-24103	14-614530	1–2	QBT4	0.0067 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	NA

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

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

[b] Butanone [2-] is used as a surrogate based on structural similarity.

[c] na = Not available.

[d] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

[e] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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] NA = Not analyzed.

[h] — = Not detected.

Table 6.8-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 14-009

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Strontium-90	Uranium-234	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**na**[b]	**na**	**1.98**	**0.09**	**1.93**
Sediment BV[a]				**0.9**	**1.04**	**2.59**	**0.2**	**2.29**
Soil BV[a]				**1.65**	**1.31**	**2.59**	**0.2**	**2.29**
Construction Worker SAL[c]				**18**	**800**	**220**	**43**	**160**
Industrial SAL[c]				**23**	**1900**	**1500**	**87**	**430**
Residential SAL[c]				**5.6**	**5.7**	**170**	**17**	**87**
RE14-11-24071	14-614514	5–6	QBT4	—[d]	1.3	—	—	—
RE14-11-24075	14-614516	2–3	QBT4	0.116	—	—	—	—
RE14-11-24080	14-614519	0–1	SOIL	—	—	—	0.47	16.8
RE14-11-24081	14-614519	1.5–2.5	QBT4	—	—	7.35 (J)	0.97	46.6
RE14-11-24082	14-614520	0–1	SOIL	—	—	—	0.327	15.5
RE14-11-24083	14-614520	2–3	QBT4	—	0.37	—	—	3.26
RE14-11-24084	14-614521	0–1	SOIL	—	—	—	—	2.48
RE14-11-24085	14-614521	2–3	QBT4	0.243	—	—	—	—
RE14-11-24094	14-614526	0–1	SED	—	—	—	0.218	12.1
RE14-11-24095	14-614526	1–2	QBT4	—	0.44	—	—	—
RE14-11-24096	14-614527	0–1	SOIL	—	—	—	0.276	13.9
RE14-11-24097	14-614527	2.5–3.5	QBT4	—	—	—	—	3.88
RE14-11-24098	14-614528	0–1	SOIL	—	—	21 (J)	2.79	162
RE14-11-24099	14-614528	3.5–4.5	QBT4	—	—	1.99 (J)	0.153	6.01
RE14-11-24100	14-614529	0–1	SED	—	—	8.34 (J+)	0.814 (J+)	45 (J+)

Notes: Results are in pCi/g. Data qualifiers are defined in Appendix A.

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

[b] na = Not available.

[c] SALs from LANL (2009, 107655).

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

Table 6.8-5
Samples Collected and Analyses Requested at SWMU 14-010

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
0214-97-0034	14-01038	0–0.5	SED	—*	—	—	3365R	—	—	—	—	—	—	—
0214-97-0045	14-01038	0–0.5	SED	—	—	3628R	—	—	—	—	—	—	—	—
0214-97-0035	14-01039	0–0.5	SED	—	—	—	3365R	—	—	—	—	—	—	—
0214-97-0046	14-01039	0–0.5	SED	—	—	3628R	—	—	—	—	—	—	—	—
0214-97-0036	14-01040	0–0.5	SED	—	—	—	3365R	—	—	—	—	—	—	—
0214-97-0047	14-01040	0–0.5	SED	—	—	3628R	—	—	—	—	—	—	—	—
0214-97-0037	14-01041	0–0.5	SED	—	—	—	3365R	—	—	—	—	—	—	—
0214-97-0050	14-01041	0–0.5	SED	—	—	3628R	—	—	—	—	—	—	—	—
0214-97-0041	14-01042	0–0.5	SED	—	—	—	3365R	—	—	—	—	—	—	—
0214-97-0048	14-01042	0–0.5	SED	—	—	3628R	—	—	—	—	—	—	—	—
0214-97-0042	14-01043	0–0.08	SED	—	—	—	3365R	—	—	—	—	—	—	—
0214-97-0049	14-01043	0–0.5	SED	—	—	3628R	—	—	—	—	—	—	—	—
RE14-11-24362	14-614595	0.3–1.3	SOIL	11-3362	11-3348	11-3361	11-3348	11-3362	—	11-3362	11-3348	11-3361	—	11-3362
RE14-11-24363	14-614595	3–4	QBT4	11-3362	11-3348	11-3361	11-3348	11-3362	—	11-3362	11-3348	11-3361	11-3361	11-3362
RE14-11-24364	14-614596	0–1	SOIL	11-3362	11-3348	11-3361	11-3348	11-3362	—	11-3362	11-3348	11-3361	—	11-3362
RE14-11-24365	14-614596	3–4	QBT4	11-3362	11-3348	11-3361	11-3348	11-3362	—	11-3362	11-3348	11-3361	11-3361	11-3362
RE14-11-24366	14-614597	0–1	SOIL	11-3362	11-3348	11-3361	11-3348	11-3362	—	11-3362	11-3348	11-3361	—	11-3362
RE14-11-24367	14-614597	3–4	QBT4	11-3362	11-3348	11-3361	11-3348	11-3362	—	11-3362	11-3348	11-3361	11-3361	11-3362
RE14-11-24368	14-614598	0–1	SOIL	11-3362	11-3348	11-3361	11-3348	11-3362	—	11-3362	11-3348	11-3361	—	11-3362
RE14-11-24369	14-614598	3–4	QBT4	11-3362	11-3348	11-3361	11-3348	11-3362	—	11-3362	11-3348	11-3361	11-3361	11-3362
RE14-11-24370	14-614599	0–1	SOIL	11-3362	11-3348	11-3361	11-3348	11-3362	11-3361	11-3362	11-3348	11-3361	—	11-3362
RE14-11-24371	14-614599	3–4	QBT4	11-3362	11-3348	11-3361	11-3348	11-3362	11-3361	11-3362	11-3348	11-3361	11-3361	11-3362

*— = Analysis not requested.

Table 6.8-6
Inorganic Chemicals above BVs at SWMU 14-010

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Copper	Cyanide (Total)	Lead	Nitrate	Selenium	Silver	Zinc
Qbt 2, 3, 4 BV[a]				**0.5**	**2.79**	**4.66**	**0.5**	**11.2**	**na**[b]	**0.3**	**1**	**63.5**
Soil BV[a]				**0.83**	**8.17**	**14.7**	**0.5**	**22.3**	**na**	**1.52**	**1**	**48.8**
Construction Worker SSL[c]				**124**	**65.4**	**12400**	**6190**	**800**	**496000**	**1550**	**1550**	**92900**
Industrial SSL[c]				**454**	**17.7**	**45400**	**22700**	**800**	**1820000**	**5680**	**5680**	**341000**
Residential SSL[c]				**31.3**	**3.9**	**3130**	**1560**	**400**	**125000**	**391**	**391**	**23500**
RE14-11-24362	14-614595	0.3–1.3	SOIL	—[d]	—	—	0.6 (U)	—	1.2	—	—	—
RE14-11-24363	14-614595	3–4	QBT4	—	5.4	—	0.59 (U)	—	2.7	1.7	—	—
RE14-11-24364	14-614596	0–1	SOIL	—	—	25.9	0.55 (U)	42.6	5.7	—	—	—
RE14-11-24365	14-614596	3–4	QBT4	0.7	3.4	4.8	0.6 (U)	—	1.7	1.9	—	—
RE14-11-24366	14-614597	0–1	SOIL	—	—	—	0.58 (U)	—	3.5	—	—	—
RE14-11-24367	14-614597	3–4	QBT4	—	3.7	—	0.53 (U)	—	0.56	2.4	—	—
RE14-11-24368	14-614598	0–1	SOIL	—	—	—	0.62 (U)	—	1.5	—	—	—
RE14-11-24369	14-614598	3–4	QBT4	—	—	—	0.56 (U)	19.1	0.33	1.6	—	—
RE14-11-24370	14-614599	0–1	SOIL	—	—	53.4	0.57 (U)	42.1	4.7	—	2	—
RE14-11-24371	14-614599	3–4	QBT4	—	—	—	0.57 (U)	64.8	0.39	1.7	—	88.2

Notes: Results are in mg/kg. Data qualifiers are defined 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 6.8-7
Organic Chemicals Detected at SWMU 14-010

Sample ID	Location ID	Depth (ft)	Media	Bis(2-ethylhexyl)phthalate	Di-n-butylphthalate	HMX	RDX	TATB	Trinitrotoluene[2,4,6-]
Construction Worker SSL[a]				**4760**	**23800**	**11900**	**715**	**8760**[b,c]	**141**
Industrial SSL[a]				**1370**	**68400**	**34200**	**174**	**27000**[b,d]	**469**
Residential SSL[a]				**347**	**6110**	**3060**	**44.2**	**2200**[b,d]	**35.9**
0214-97-0045	14-01038	0–0.5	SED	NA[e]	NA	94.3	—[f]	NA	0.093
0214-97-0046	14-01039	0–0.5	SED	NA	NA	61.9	—	NA	—
0214-97-0047	14-01040	0–0.5	SED	NA	NA	1.03	—	NA	—
0214-97-0050	14-01041	0–0.5	SED	NA	NA	1.38	—	NA	0.162
0214-97-0048	14-01042	0–0.5	SED	NA	NA	2.19	—	NA	—
0214-97-0049	14-01043	0–0.5	SED	NA	NA	1.29	—	NA	0.162
RE14-11-24362	14-614595	0.3–1.3	SOIL	—	—	0.74	—	—	—
RE14-11-24363	14-614595	3–4	QBT4	0.15 (J)	—	0.19	—	—	—
RE14-11-24364	14-614596	0–1	SOIL	—	0.46	110	0.38	14 (J)	—
RE14-11-24365	14-614596	3–4	QBT4	0.087 (J)	—	5	—	1.2 (J)	—
RE14-11-24366	14-614597	0–1	SOIL	—	—	0.039 (J)	—	—	—
RE14-11-24368	14-614598	0–1	SOIL	0.11 (J)	—	0.078 (J)	—	—	—
RE14-11-24369	14-614598	3–4	QBT4	—	—	0.046 (J)	—	—	—
RE14-11-24370	14-614599	0–1	SOIL	—	—	52	—	3.9 (J)	—
RE14-11-24371	14-614599	3–4	QBT4	—	—	18	—	1.2 (J)	—

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

[a] SSLs are from NMED (2009, 108070).

[b] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

[c] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

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

[e] NA = Not analyzed.

[f] — = Not detected.

Table 6.8-8
Radionuclides Detected or Detected above BVs/FVs at SWMU 14-010

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Uranium-234	Uranium-235	Uranium-235/236	Uranium-238
Qbt 2, 3, 4 BV[a]				**na**[b]	**1.98**	**0.09**	**0.09**	**1.93**
Sediment BV[a]				**na**	**2.59**	**0.2**	**0.2**	**2.29**
Soil BV[a]				**1.65**	**2.59**	**0.2**	**0.2**	**2.29**
Construction Worker SAL[c]				**18**	**220**	**43**	**43**	**160**
Industrial SAL[c]				**23**	**1500**	**87**	**87**	**430**
Residential SAL[c]				**5.6**	**170**	**17**	**17**	**87**
0214-97-0034	14-01038	0–0.5	SED	NA[d]	3.4406	0.3218	NA	24.0455
0214-97-0035	14-01039	0–0.5	SED	NA	—[e]	0.2286	NA	12.0008
0214-97-0037	14-01041	0–0.5	SED	NA	—	—	NA	3.3591
0214-97-0041	14-01042	0–0.5	SED	NA	—	—	NA	2.2975
RE14-11-24364	14-614596	0–1	SOIL	—	2.73	NA	0.22	16
RE14-11-24365	14-614596	3–4	QBT4	—	—	NA	—	2.14
RE14-11-24367	14-614597	3–4	QBT4	0.142	—	NA	—	—
RE14-11-24370	14-614599	0–1	SOIL	—	—	NA	—	8.36

Notes: Results are in pCi/g.

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

[b] na = Not available.

[c] SALs from LANL (2009, 107655).

[d] NA = Not analyzed.

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

Table 6.8-9
Samples Collected and Analyses Requested at AOC C-14-008

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Explosive Compounds	TAL Metals	PCBs	Perchlorate	SVOCs	VOCs	Cyanide (Total)
RE14-11-24474	14-614637	0–1	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	—*	11-3364
RE14-11-24475	14-614637	3–4	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	11-3363	11-3364
RE14-11-24476	14-614638	0–1	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	—	11-3364
RE14-11-24477	14-614638	3–4	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	11-3363	11-3364
RE14-11-24478	14-614639	0–1	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	—	11-3364
RE14-11-24479	14-614639	3–4	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	11-3363	11-3364
RE14-11-24480	14-614640	0–1	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	—	11-3364
RE14-11-24481	14-614640	3–4	QBT4	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	11-3363	11-3364
RE14-11-24482	14-614641	0–1	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	—	11-3364
RE14-11-24483	14-614641	3–4	SOIL	11-3364	11-3363	11-3364	11-3363	11-3364	11-3363	11-3363	11-3364

*— = Analysis not requested.

Table 6.8-10
Inorganic Chemicals above BVs at AOC C-14-008

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Nickel	Nitrate	Perchlorate	Selenium	Vanadium
Qbt 2, 3, 4 BV[a]				**7340**	**2.79**	**46**	**1.21**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**6.58**	**na[b]**	**na**	**0.3**	**17**
Soil BV[a]				**29200**	**8.17**	**295**	**1.83**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**15.4**	**na**	**na**	**1.52**	**39.6**
Construction Worker SSL[c]				**40700**	**65.4**	**4350**	**144**	**na**	**449[d]**	**34.6[e]**	**12400**	**6190**	**217000**	**800**	**na**	**6190**	**496000**	**217**	**1550**	**1550**
Industrial SSL[c]				**1130000**	**17.7**	**224000**	**2260**	**na**	**2920[d]**	**300[f]**	**45400**	**22700**	**795000**	**800**	**na**	**22700**	**1820000**	**795**	**5680**	**5680**
Residential SSL[c]				**78100**	**3.9**	**15600**	**156**	**na**	**219[d]**	**23[f]**	**3130**	**1560**	**54800**	**400**	**na**	**1560**	**125000**	**54.8**	**391**	**391**
RE14-11-24474	14-614637	0–1	SOIL	—[g]	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	1.1	—	—	—
RE14-11-24475	14-614637	3–4	SOIL	33100	—	356 (J+)	2	—	—	—	—	0.57 (U)	—	—	—	—	0.22 (J)	—	2.2	—
RE14-11-24476	14-614638	0–1	SOIL	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—	0.56	—	—	—
RE14-11-24477	14-614638	3–4	SOIL	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—	0.13 (J)	—	2.4	—
RE14-11-24478	14-614639	0–1	SOIL	—	—	—	—	—	—	—	—	0.58 (U)	—	—	—	—	0.4	—	—	—
RE14-11-24479	14-614639	3–4	SOIL	30800	—	324 (J+)	—	—	—	—	—	0.58 (U)	—	—	—	—	0.14 (J)	0.0024 (J)	2.1	—
RE14-11-24480	14-614640	0–1	SOIL	—	—	—	—	—	—	—	—	0.61 (U)	—	—	—	—	1.2	—	—	—
RE14-11-24481	14-614640	3–4	QBT4	20700	3.5	270 (J+)	1.5	3830	10.8	5.6	8	0.56 (U)	15500	14.3	2730	10	0.17 (J)	—	1.8	23.2
RE14-11-24482	14-614641	0–1	SOIL	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—	1.2	—	1.6	—
RE14-11-24483	14-614641	3–4	SOIL	—	—	344 (J+)	—	—	—	—	—	0.57 (U)	—	—	—	—	0.11 (J)	—	—	—

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.9-1
Samples Collected and Analyses Requested at SWMU 14-002(c)

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE14-11-23923	14-01089	1–2	SOIL	11-3063	11-3064	11-3062	11-3064	11-3063	—*	11-3063	11-3064	11-3062	11-3062	11-3063
RE14-11-23924	14-01089	5–6	QBT4	11-3063	11-3064	11-3062	11-3064	11-3063	—	11-3063	11-3064	11-3062	11-3062	11-3063
RE14-11-23925	14-01090	1–2	SOIL	11-3063	11-3064	11-3062	11-3064	11-3063	—	11-3063	11-3064	11-3062	11-3062	11-3063
RE14-11-23926	14-01090	5–6	QBT4	11-3063	11-3064	11-3062	11-3064	11-3063	—	11-3063	11-3064	11-3062	11-3062	11-3063
RE14-11-23927	14-01091	1–2	SOIL	11-3063	11-3064	11-3062	11-3064	11-3063	—	11-3063	11-3064	11-3062	11-3062	11-3063
RE14-11-23928	14-01091	6–7	QBT4	11-3063	11-3064	11-3062	11-3064	11-3063	—	11-3063	11-3064	11-3062	11-3062	11-3063
RE14-11-23929	14-01092	1–2	SOIL	11-3109	11-3110	11-3108	11-3110	11-3109	11-3108	11-3109	11-3110	11-3108	11-3108	11-3109
RE14-11-23930	14-01092	6–7	QBT4	11-3109	11-3110	11-3108	11-3110	11-3109	11-3108	11-3109	11-3110	11-3108	11-3108	11-3109
RE14-11-23919	14-614486	0–1	SOIL	11-3109	11-3110	11-3108	11-3110	11-3109	11-3108	11-3109	11-3110	11-3108	—	11-3109
RE14-11-23920	14-614486	2–3	SOIL	11-3109	11-3110	11-3108	11-3110	11-3109	11-3108	11-3109	11-3110	11-3108	11-3108	11-3109
RE14-11-23921	14-614487	0–1	SOIL	11-3109	11-3110	11-3108	11-3110	11-3109	11-3108	11-3109	11-3110	11-3108	—	11-3109
RE14-11-23922	14-614487	2–3	SOIL	11-3109	11-3110	11-3108	11-3110	11-3109	11-3108	11-3109	11-3110	11-3108	11-3108	11-3109

*— = Analysis not requested.

Table 6.9-2
Inorganic Chemicals above BVs at SWMU 14-002(c)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Selenium	Thallium	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**6.58**	**na[b]**	**na**	**0.3**	**1.1**	**17**	**63.5**
Soil BV[a]				**29200**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**15.4**	**na**	**na**	**1.52**	**0.73**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**65.4**	**4350**	**309**	**na**	**449[d]**	**34.6[e]**	**12400**	**6190**	**217000**	**800**	**na**	**463**	**6190**	**496000**	**217**	**1550**	**20.4**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**17.7**	**224000**	**1120**	**na**	**2920[d]**	**300[f]**	**45400**	**22700**	**795000**	**800**	**na**	**145000**	**22700**	**1820000**	**795**	**5680**	**74.9**	**5680**	**341000**
Residential SSL[c]				**78100**	**3.9**	**15600**	**77.9**	**na**	**219[d]**	**23[f]**	**3130**	**1560**	**54800**	**400**	**na**	**10700**	**1560**	**125000**	**54.8**	**391**	**5.16**	**391**	**23500**
RE14-11-23923	14-01089	1–2	SOIL	—[g]	—	—	0.43	—	—	—	—	0.56 (U)	—	34.4 (J)	—	—	—	0.5	—	1.7	—	—	516
RE14-11-23924	14-01089	5–6	QBT4	9190	3.5	86.6 (J-)	—	—	—	—	—	0.53 (U)	—	26.5 (J)	—	—	—	0.19 (J)	0.0056	2.1	—	—	88.9
RE14-11-23925	14-01090	1–2	SOIL	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	0.24	—	—	—	—	—
RE14-11-23926	14-01090	5–6	QBT4	13100	3.7	142 (J-)	—	2480	7.9	8.5 (J)	6.6	0.54 (U)	15900	80.6 (J)	2770	744 (J)	10.4	1.8	0.0035 (J)	3.2	1.3	—	98.8
RE14-11-23927	14-01091	1–2	SOIL	—	—	—	—	—	—	—	—	0.52 (U)	—	39.9 (J)	—	—	—	1	—	—	—	—	—
RE14-11-23928	14-01091	6–7	QBT4	11300	3.1	127 (J-)	—	—	7.7	3.7 (J)	5.3	0.53 (U)	—	27.4 (J)	2000	—	—	71.8	0.0032 (J)	2.1	—	18	—
RE14-11-23929	14-01092	1–2	SOIL	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	0.44	—	—	—	—	—
RE14-11-23930	14-01092	6–7	QBT4	—	—	71.4 (J)	—	—	—	—	—	0.52 (U)	—	18	—	—	—	13.4	—	1.8 (J-)	—	—	139
RE14-11-23919	14-614486	0–1	SOIL	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	1.2	—	—	—	—	—
RE14-11-23920	14-614486	2–3	SOIL	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	0.63	0.0033 (J)	—	—	—	82.9
RE14-11-23921	14-614487	0–1	SOIL	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	1.3	0.0056	—	—	—	—
RE14-11-23922	14-614487	2–3	SOIL	—	—	—	—	—	—	—	—	0.53 (U)	—	42	—	—	—	1.2	0.0097	—	—	—	69.8

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.9-3
Organic Chemicals Detected at SWMU 14-002(c)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Chloroform	Dichlorobenzene[1,4-]	Dichloroethene[1,1-]	Diethylphthalate	Di-n-butylphthalate	Ethylbenzene	HMX	Methylene Chloride	RDX	Toluene	Trichlorofluoromethane	Xylene (Total)
Construction Worker SSL[a]				**263000**	**671**	**3780**	**1830**	**191000**	**23800**	**6630**	**11900**	**10600**	**715**	**21100**	**5820**	**3130**
Industrial SSL[a]				**851000**	**31.9**	**180**	**2220**	**547000**	**68400**	**385**	**34200**	**1090**	**174**	**57900**	**6760**	**3610**
Residential SSL[a]				**67500**	**5.72**	**32.2**	**618**	**48900**	**6110**	**69.7**	**3060**	**199**	**44.2**	**5570**	**2010**	**1090**
RE14-11-23923	14-01089	1–2	SOIL	—[b]	—	—	—	—	0.12 (J)	—	—	—	—	—	—	—
RE14-11-23927	14-01091	1–2	SOIL	—	—	—	—	—	0.14 (J)	—	0.097 (J)	—	1.2	—	—	—
RE14-11-23928	14-01091	6–7	QBT4	—	—	—	—	0.092 (J)	—	—	—	—	—	—	—	—
RE14-11-23929	14-01092	1–2	SOIL	—	—	—	—	—	—	—	—	0.0029 (J)	—	—	—	—
RE14-11-23930	14-01092	6–7	QBT4	—	—	—	—	—	—	—	—	0.0023 (J)	—	—	—	—
RE14-11-23922	14-614487	2–3	SOIL	0.082 (J)	0.0016 (J)	0.0072 (J)	0.0021 (J)	—	—	0.0011 (J)	—	0.019 (J)	—	0.0017 (J)	0.0023 (J)	0.0023 (J)

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

[a] SSLs are from NMED (2009, 108070).

[b] — = Not detected.

Table 6.10-1
Samples Collected and Analyses Requested at SWMU 14-003

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Dioxins/Furans	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	Uranium	VOCs	Cyanide (Total)
0214-97-0012	14-01035	0–1	SED	—*	—	—	3179R	—	3180R	—	—	—	—	3181R	—	—
0214-97-0017	14-01087	0–0.5	SOIL	—	—	—	3392R	—	3393R	—	—	—	—	3394R	—	—
0214-97-0018	14-01088	0–0.5	SOIL	—	—	—	3392R	—	3393R	—	—	—	—	3394R	—	—
0214-97-0007	14-614909	0–0.83	SOIL	—	—	—	3179R	—	3180R	—	—	—	—	3181R	—	—
0214-97-0008	14-614910	0–0.83	SOIL	—	—	—	3179R	—	3180R	—	—	—	—	3181R	—	—
0214-97-0009	14-614911	0–0.83	SOIL	—	—	—	3179R	—	3180R	—	—	—	—	3181R	—	—
0214-97-0010	14-614912	0–0.66	SOIL	—	—	—	3179R	—	3180R	—	—	—	—	3181R	—	—
0214-97-0011	14-614913	0–1	SOIL	—	—	—	3179R	—	3180R	—	—	—	—	3181R	—	—
0214-97-0013	14-614914	0–0.5	SOIL	—	—	—	3392R	—	3393R	—	—	—	—	3394R	—	—
0214-97-0014	14-614915	0–0.5	SOIL	—	—	—	3392R	—	3393R	—	—	—	—	3394R	—	—
0214-97-0015	14-614916	0–0.5	SOIL	—	—	—	3392R	—	3393R	—	—	—	—	3394R	—	—
0214-97-0016	14-614917	0–0.5	SOIL	—	—	—	3392R	—	3393R	—	—	—	—	3394R	—	—
RE14-11-24034	14-614501	0–1	SOIL	11-3106	11-3104	11-3107	11-3105	11-3107	11-3106	—	11-3106	11-3107	11-3105	—	—	11-3106
RE14-11-24035	14-614501	3.5–4.5	QBT4	11-3106	11-3104	11-3107	11-3105	11-3107	11-3106	—	11-3106	11-3107	11-3105	—	11-3105	11-3106
RE14-11-24036	14-614502	0–1	SOIL	11-3106	11-3104	11-3107	11-3105	11-3107	11-3106	—	11-3106	11-3107	11-3105	—	—	11-3106
RE14-11-24037	14-614502	3.5–4.5	QBT4	11-3106	11-3104	11-3107	11-3105	11-3107	11-3106	—	11-3106	11-3107	11-3105	—	11-3105	11-3106
RE14-11-24038	14-614503	0–1	SOIL	11-3106	11-3104	11-3107	11-3105	11-3107	11-3106	—	11-3106	11-3107	11-3105	—	—	11-3106
RE14-11-24039	14-614503	3.5–4.5	QBT4	11-3106	11-3104	11-3107	11-3105	11-3107	11-3106	—	11-3106	11-3107	11-3105	—	11-3105	11-3106
RE14-11-24040	14-614504	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24041	14-614504	4.5–5.5	QBT4	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	11-3136	11-3137
RE14-11-24042	14-614505	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24043	14-614505	5–6	QBT4	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	11-3136	11-3137
RE14-11-24044	14-614506	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24045	14-614506	5–6	QBT4	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	11-3136	11-3137
RE14-11-24046	14-614507	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24047	14-614507	3–4	QBT4	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	11-3136	11-3137
RE14-11-24048	14-614508	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24049	14-614508	3–4	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	11-3136	11-3137
RE14-11-24050	14-614509	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24051	14-614509	3–4	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	11-3136	11-3137
RE14-11-24052	14-614510	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24053	14-614510	3–4	QBT4	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	—	11-3137	11-3138	11-3136	—	11-3136	11-3137
RE14-11-24054	14-614511	0–1	SOIL	11-3106	11-3104	11-3107	11-3105	11-3107	11-3106	11-3105	11-3106	11-3107	11-3105	—	—	11-3106

Table 6.10-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Dioxins/Furans	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	Uranium	VOCs	Cyanide (Total)
RE14-11-24055	14-614511	3.5–4.5	QBT4	11-3106	11-3104	11-3107	11-3105	11-3107	11-3106	11-3105	11-3106	11-3107	11-3105	—	11-3105	11-3106
RE14-11-24056	14-614512	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	11-3136	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24057	14-614512	3–4	QBT4	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	11-3136	11-3137	11-3138	11-3136	—	11-3136	11-3137
RE14-11-24058	14-614513	0–1	SOIL	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	11-3136	11-3137	11-3138	11-3136	—	—	11-3137
RE14-11-24059	14-614513	3–4	QBT4	11-3137	11-3135	11-3138	11-3136	11-3138	11-3137	11-3136	11-3137	11-3138	11-3136	—	11-3136	11-3137

*— = Analysis not requested.

Table 6.10-2
Inorganic Chemicals above BVs at SWMU 14-003

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**0.1**	**6.58**	**na**[b]	**na**	**3500**	**0.3**	**1**	**1.1**	**na**	**17**	**63.5**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**na**	**13800**	**19.7**	**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**2690**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**0.1**	**15.4**	**na**	**na**	**3460**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**124**	**65.4**	**4350**	**144**	**309**	**na**	**449**[d]	**34.6**[e]	**12400**	**6190**	**217000**	**800**	**na**	**463**	**92.9**[e]	**6190**	**496000**	**217**	**na**	**1550**	**1550**	**20.4**	**929**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**224000**	**2260**	**1120**	**na**	**2920**[d]	**300**[f]	**45400**	**22700**	**795000**	**800**	**na**	**145000**	**310**[f]	**22700**	**1820000**	**795**	**na**	**5680**	**5680**	**74.9**	**3410**	**5680**	**341000**
Residential SSL[c]				**78100**	**31.3**	**3.9**	**15600**	**156**	**77.9**	**na**	**219**[d]	**23**[f]	**3130**	**1560**	**54800**	**400**	**na**	**10700**	**23**[f]	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**5.16**	**235**	**391**	**23500**
0214-97-0012	14-01035	0–1	SED	—[g]	12 (U)	—	170	—	0.58 (U)	—	—	6.7	—	NA[h]	—	—	—	—	0.12 (U)	—	NA	NA	—	1.2 (U)	2.3 (U)	—	3.33	21	—
0214-97-0017	14-01087	0–0.5	SOIL	—	5.04 (U)	—	—	—	0.504 (U)	—	—	—	—	NA	—	—	—	—	—	—	NA	NA	—	—	—	—	3.72 (U)	—	—
0214-97-0018	14-01088	0–0.5	SOIL	—	4.96 (U)	—	—	—	0.496 (U)	—	—	—	—	NA	—	—	—	—	—	—	NA	NA	—	—	—	—	3.37 (U)	—	—
0214-97-0007	14-614909	0–0.83	SOIL	—	12 (U)	—	330	—	0.61 (U)	—	—	—	—	NA	—	—	—	—	0.12 (U)	—	NA	NA	—	—	2.4 (U)	1	3.01	—	—
0214-97-0008	14-614910	0–0.83	SOIL	42000	13 (U)	—	860	2.1	0.64 (U)	—	21	—	—	NA	22000	—	—	—	0.13 (U)	17	NA	NA	3500	—	2.6 (U)	0.9	3.11	—	55
0214-97-0009	14-614911	0–0.83	SOIL	31000	13 (U)	—	1800	—	0.64 (U)	—	—	—	—	NA	—	—	—	—	0.13 (U)	—	NA	NA	—	—	2.6 (U)	—	3.14	—	—
0214-97-0010	14-614912	0–0.66	SOIL	34000	12 (U)	—	460	—	0.6 (U)	—	—	9.4	—	NA	—	—	—	—	0.12 (U)	—	NA	NA	—	—	2.4 (U)	0.89	3.45	—	51
0214-97-0011	14-614913	0–1	SOIL	—	12 (U)	—	—	—	0.6 (U)	—	—	—	—	NA	—	—	—	—	0.12 (U)	—	NA	NA	—	—	2.4 (U)	1.2	3.29	—	71
0214-97-0013	14-614914	0–0.5	SOIL	—	4.77 (U)	—	303	—	0.477 (U)	—	—	—	—	NA	—	—	—	—	—	—	NA	NA	—	—	—	—	3.83	—	—
0214-97-0014	14-614915	0–0.5	SOIL	—	4.77 (U)	—	—	—	0.477 (U)	—	—	—	—	NA	—	—	—	—	—	—	NA	NA	—	—	1.97	—	4.61	—	—
0214-97-0015	14-614916	0–0.5	SOIL	—	5.28 (U)	—	746	—	0.528 (U)	—	—	—	—	NA	—	—	—	—	—	—	NA	NA	—	—	1.5	—	3.46 (U)	—	—
0214-97-0016	14-614917	0–0.5	SOIL	—	4.46 (U)	—	—	—	0.446 (U)	—	—	—	—	NA	—	—	—	—	—	—	NA	NA	—	—	—	—	2.98 (U)	—	—
RE14-11-24034	14-614501	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (UJ)	—	—	—	—	—	—	0.84	—	—	—	—	—	NA	—	—
RE14-11-24035	14-614501	3.5–4.5	QBT4	8680	—	—	138	—	—	—	7.7	5	5.4 (J)	0.52 (UJ)	—	—	—	—	—	—	0.11 (J)	—	—	0.78	—	—	NA	19.8	—
RE14-11-24036	14-614502	0–1	SOIL	—	—	—	361	—	—	—	—	—	—	0.53 (UJ)	—	—	—	—	—	—	1.1	—	—	—	—	—	NA	—	—
RE14-11-24037	14-614502	3.5–4.5	QBT4	10500	—	3	151	—	—	—	8.3	7.2	6 (J)	0.53 (UJ)	—	12.3	2030	—	—	6.6	—	—	—	0.9	—	—	NA	21.8	—
RE14-11-24038	14-614503	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.55 (UJ)	—	—	—	—	—	—	1.4	—	—	—	—	—	NA	—	—
RE14-11-24039	14-614503	3.5–4.5	QBT4	12300	—	3.4	250	—	—	3420	9.5	6.2	7.8 (J)	0.54 (UJ)	—	13.2	2120	—	—	8.5	17.5	—	—	1.1	—	—	NA	22.7	—
RE14-11-24040	14-614504	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	0.17 (J)	—	—	—	—	—	NA	—	—
RE14-11-24041	14-614504	4.5–5.5	QBT4	14500	—	—	205 (J-)	—	—	3540	8.8	4.1	5.9	0.56 (U)	—	—	2260 (J-)	—	—	6.9	—	—	—	1.4 (U)	—	—	NA	17.6	—
RE14-11-24042	14-614505	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	2.2	—	—	—	—	—	NA	—	—
RE14-11-24043	14-614505	5–6	QBT4	13200	—	—	150 (J-)	—	—	5030	9.3	3.6	5.9	0.55 (U)	—	—	2250 (J-)	—	—	6.6	0.87	—	—	1.3 (U)	—	—	NA	17.9	—
RE14-11-24044	14-614506	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	0.52	—	—	2.1 (U)	—	—	NA	—	—
RE14-11-24045	14-614506	5–6	QBT4	13500	—	—	135 (J-)	—	—	2280	7.9	3.7	5	0.55 (U)	—	13.3	1910 (J-)	—	—	—	0.18 (J)	0.0049 (J)	—	1.1 (U)	—	—	NA	—	—
RE14-11-24046	14-614507	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	0.39	0.0022 (J)	—	—	—	—	NA	—	—
RE14-11-24047	14-614507	3–4	QBT4	16600	—	3.3	223 (J-)	—	—	2220	9.5	5.5	7.9	0.55 (U)	—	13.2	2200 (J-)	—	—	7.9	0.082 (J)	—	—	1.4 (U)	—	—	NA	21.8	—
RE14-11-24048	14-614508	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	2.7	—	—	—	—	—	NA	—	—
RE14-11-24049	14-614508	3–4	SOIL	—	—	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—	—	—	0.29	—	—	—	—	—	NA	—	—

Table 6.10-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**1.1**	**na**	**17**	**63.5**
Sediment BV[a]				**15400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4420**	**10.5**	**4.73**	**11.2**	**na**	**13800**	**19.7**	**2370**	**543**	**0.1**	**9.38**	**na**	**na**	**2690**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**0.1**	**15.4**	**na**	**na**	**3460**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**124**	**65.4**	**4350**	**144**	**309**	**na**	**449[d]**	**34.6[e]**	**12400**	**6190**	**217000**	**800**	**na**	**463**	**92.9[e]**	**6190**	**496000**	**217**	**na**	**1550**	**1550**	**20.4**	**929**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**224000**	**2260**	**1120**	**na**	**2920[d]**	**300[f]**	**45400**	**22700**	**795000**	**800**	**na**	**145000**	**310[f]**	**22700**	**1820000**	**795**	**na**	**5680**	**5680**	**74.9**	**3410**	**5680**	**341000**
Residential SSL[c]				**78100**	**31.3**	**3.9**	**15600**	**156**	**77.9**	**na**	**219[d]**	**23[f]**	**3130**	**1560**	**54800**	**400**	**na**	**10700**	**23[f]**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**5.16**	**235**	**391**	**23500**
RE14-11-24050	14-614509	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	1.2	—	—	—	—	—	NA	—	—
RE14-11-24051	14-614509	3–4	SOIL	—	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	0.28	—	—	1.7 (U)	—	—	NA	—	—
RE14-11-24052	14-614510	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	1.5	—	—	—	—	—	NA	—	—
RE14-11-24053	14-614510	3–4	QBT4	13100	—	—	184 (J-)	—	—	—	9	4.4	6.3	0.54 (U)	—	—	2050 (J-)	—	—	7.1	0.2 (J)	0.0031 (J)	—	1 (U)	—	—	NA	18.7	—
RE14-11-24054	14-614511	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—	—	—	—	—	1.6	—	—	—	—	—	NA	—	—
RE14-11-24055	14-614511	3.5–4.5	QBT4	11300	—	3.3	265	—	—	4440	8.7	7.8	7.1 (J)	0.54 (UJ)	—	13.8	2030	486	—	7.9	0.22	0.029	—	0.86	—	—	NA	21.9	—
RE14-11-24056	14-614512	0–1	SOIL	—	—	—	318 (J-)	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	1.8	—	—	—	—	—	NA	—	—
RE14-11-24057	14-614512	3–4	QBT4	17000	—	—	236 (J-)	—	—	3020	9	4.7	6.3	0.55 (U)	—	11.5	2010 (J-)	—	—	7.8	0.22	—	—	1.6 (U)	—	—	NA	19.6	—
RE14-11-24058	14-614513	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	2.1	—	—	—	—	—	NA	—	—
RE14-11-24059	14-614513	3–4	QBT4	13700	—	3.5	204 (J-)	—	—	—	10.9	5	7.3	0.55 (U)	15200	12.1	2360 (J-)	—	—	8.4	0.14 (J)	—	—	1.3 (U)	—	—	NA	21.7	—

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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.

[h] NA = Not analyzed.

Table 6.10-3
Organic Chemicals Detected at SWMU 14-003

Sample ID	Location ID	Depth (ft)	Media	Amino-4,6-dinitrotoluene[2-]	Bis(2-ethylhexyl)phthalate	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	Heptachlorodibenzodioxins (Total)	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	Heptachlorodibenzofurans (Total)	Hexachlorodibenzodioxins (Total)	Hexachlorodibenzofuran[1,2,3,4,7,8-]	Hexachlorodibenzofurans (Total)	HMX
Construction Worker SSL[a]				**601[b]**	**4760**	**na[c]**	**na**	**na**	**na**	**na**	**na**	**na**	**11900**
Industrial SSL[a]				**2000[d]**	**1370**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**34200**
Residential SSL[a]				**150[d]**	**347**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**3060**
0214-97-0015	14-614916	0–0.5	SOIL	0.107	NA[e]	NA	NA	NA	NA	NA	NA	NA	—[f]
RE14-11-24034	14-614501	0–1	SOIL	—	—	0.00000155 (J)	0.00000414 (J)	0.00000119 (J)	0.00000119 (J)	0.000000583 (J)	0.000000616 (J)	0.00000186 (J)	—
RE14-11-24035	14-614501	3.5–4.5	QBT4	—	—	0.000000534 (J)	0.000000534 (J)	—	—	—	—	—	—
RE14-11-24036	14-614502	0–1	SOIL	—	0.079 (J)	0.00000146 (J)	0.00000329 (J)	0.00000219 (J)	0.00000284 (J)	—	—	0.000000831 (J)	—
RE14-11-24037	14-614502	3.5–4.5	QBT4	—	—	—	—	—	—	—	—	—	—
RE14-11-24039	14-614503	3.5–4.5	QBT4	—	—	—	—	—	—	—	—	—	—
RE14-11-24040	14-614504	0–1	SOIL	—	—	0.00000084 (J)	0.00000189 (J)	—	—	—	—	—	—
RE14-11-24041	14-614504	4.5–5.5	QBT4	—	—	—	—	—	—	—	—	—	—
RE14-11-24042	14-614505	0–1	SOIL	—	—	—	0.000000482 (J)	—	—	—	—	—	—
RE14-11-24043	14-614505	5–6	QBT4	—	—	—	—	—	—	—	—	—	—
RE14-11-24044	14-614506	0–1	SOIL	—	—	0.000000583 (J)	0.000000583 (J)	—	—	—	—	—	—
RE14-11-24045	14-614506	5–6	QBT4	—	—	—	—	—	—	—	—	—	—
RE14-11-24046	14-614507	0–1	SOIL	—	—	0.000000931 (J)	0.00000193 (J)	—	—	—	—	—	—
RE14-11-24047	14-614507	3–4	QBT4	—	—	—	—	—	—	—	—	—	—
RE14-11-24048	14-614508	0–1	SOIL	—	—	0.00000209 (J)	0.00000412 (J)	0.000000697 (J)	0.0000025 (J)	—	—	—	—
RE14-11-24049	14-614508	3–4	SOIL	—	—	—	—	—	—	—	—	—	—
RE14-11-24050	14-614509	0–1	SOIL	—	—	0.000000823 (J)	0.000000823 (J)	—	—	—	—	—	—
RE14-11-24051	14-614509	3–4	SOIL	—	—	—	—	—	—	—	—	—	—
RE14-11-24053	14-614510	3–4	QBT4	—	—	—	—	—	—	—	—	—	—
RE14-11-24054	14-614511	0–1	SOIL	0.045 (J)	0.055 (J)	—	—	—	—	—	—	—	0.052 (J)
RE14-11-24055	14-614511	3.5–4.5	QBT4	—	—	—	—	—	—	—	—	—	0.13 (J)
RE14-11-24056	14-614512	0–1	SOIL	—	—	0.00000126 (J)	0.00000342 (J)	—	—	0.000000477 (J)	—	0.00000381 (J)	—
RE14-11-24057	14-614512	3–4	QBT4	—	—	—	—	—	—	—	—	—	—
RE14-11-24058	14-614513	0–1	SOIL	—	—	0.00000152 (J)	0.00000389 (J)	0.000000642 (J)	0.00000173 (J)	—	—	—	—
RE14-11-24059	14-614513	3–4	QBT4	—	—	—	—	—	—	—	—	—	—

Table 6.10-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	Pentachlorodibenzofuran[2,3,4,7,8-]	Pentachlorodibenzofurans (Totals)	PETN	TATB	Tetrachlorodibenzofuran[2,3,7,8-]	Tetrachlorodibenzofurans (Totals)	Trinitrotoluene[2,4,6-]
Construction Worker SSL^a				**10600**	**na**	**na**	**na**	**na**	**na**	**8760^{g,b}**	**0.0127**	**na**	**141**
Industrial SSL^a				**1090**	**na**	**na**	**na**	**na**	**na**	**27000^{g,d}**	**0.00147**	**na**	**469**
Residential SSL^a				**199**	**na**	**na**	**na**	**na**	**na**	**2200^{g,d}**	**0.000374**	**na**	**35.9**
0214-97-0015	14-614916	0–0.5	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.131
RE14-11-24034	14-614501	0–1	SOIL	NA	0.00000708 (J)	—	—	0.0000013 (J)	—	0.16 (J)	0.000000428 (J)	0.0000014	—
RE14-11-24035	14-614501	3.5–4.5	QBT4	0.0029 (J)	—	—	—	—	—	—	—	—	—
RE14-11-24036	14-614502	0–1	SOIL	NA	—	0.00000154 (J)	—	—	—	—	—	—	—
RE14-11-24037	14-614502	3.5–4.5	QBT4	0.003 (J)	—	—	—	—	—	—	—	—	—
RE14-11-24039	14-614503	3.5–4.5	QBT4	0.0028 (J)	0.0000039 (J)	—	—	—	—	—	0.000000191 (J)	0.000000191 (J)	—
RE14-11-24040	14-614504	0–1	SOIL	NA	0.00000691 (J)	—	—	—	—	—	0.000000253 (J)	0.000000738 (J)	—
RE14-11-24041	14-614504	4.5–5.5	QBT4	—	0.00000266 (J)	—	—	—	—	—	NA	0.000000235 (J)	—
RE14-11-24042	14-614505	0–1	SOIL	NA	0.00000319 (J)	—	—	—	—	—	—	—	—
RE14-11-24043	14-614505	5–6	QBT4	—	NA	—	—	—	—	—	NA	0.000000388 (J)	—
RE14-11-24044	14-614506	0–1	SOIL	NA	0.00000317 (J)	—	—	—	—	—	—	—	—
RE14-11-24045	14-614506	5–6	QBT4	—	—	—	—	—	—	—	0.000000235 (J)	0.000000235 (J)	—
RE14-11-24046	14-614507	0–1	SOIL	NA	0.00000679 (J)	—	—	—	—	—	NA	0.000000217 (J)	—
RE14-11-24047	14-614507	3–4	QBT4	—	0.00000364 (J)	—	—	—	—	—	—	—	—
RE14-11-24048	14-614508	0–1	SOIL	NA	0.0000187	0.00000259 (J)	—	—	—	—	—	0.000000286 (J)	—
RE14-11-24049	14-614508	3–4	SOIL	—	0.00000205 (J)	—	—	—	—	—	0.000000164 (J)	0.000000164 (J)	—
RE14-11-24050	14-614509	0–1	SOIL	NA	0.00000669 (J)	—	—	—	—	—	0.000000297 (J)	0.000000297 (J)	—
RE14-11-24051	14-614509	3–4	SOIL	—	0.00000404 (J)	—	—	—	—	—	—	—	—
RE14-11-24053	14-614510	3–4	QBT4	—	0.00000179 (J)	—	—	—	—	—	—	0.000000348 (J)	—
RE14-11-24054	14-614511	0–1	SOIL	NA	0.0000036 (J)	—	—	—	0.13 (J)	0.11 (J)	—	—	—
RE14-11-24055	14-614511	3.5–4.5	QBT4	0.0033 (J)	0.0000041 (J)	—	—	—	—	—	0.000000194 (J)	0.000000194 (J)	—
RE14-11-24056	14-614512	0–1	SOIL	NA	0.00000797 (J)	—	0.000000678 (J)	0.00000599	—	—	—	0.000000643	—

Table 6.10-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	Pentachlorodibenzofuran[2,3,4,7,8-]	Pentachlorodibenzofurans (Totals)	PETN	TATB	Tetrachlorodibenzofuran[2,3,7,8-]	Tetrachlorodibenzofurans (Totals)	Trinitrotoluene[2,4,6-]
Construction Worker SSL[a]				**10600**	**na**	**na**	**na**	**na**	**na**	**8760[g,b]**	**0.0127**	**na**	**141**
Industrial SSL[a]				**1090**	**na**	**na**	**na**	**na**	**na**	**27000[g,d]**	**0.00147**	**na**	**469**
Residential SSL[a]				**199**	**na**	**na**	**na**	**na**	**na**	**2200[g,d]**	**0.000374**	**na**	**35.9**
RE14-11-24057	14-614512	3–4	QBT4	—	0.0000022 (J)	—	—	—	—	—	—	—	—
RE14-11-24058	14-614513	0–1	SOIL	NA	0.0000147	0.00000158 (J)	—	—	—	0.15 (J)	—	—	—
RE14-11-24059	14-614513	3–4	QBT4	—	0.00000208 (J)	—	—	—	—	—	—	—	—

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

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

[b] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

[c] na = Not available.

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

[e] NA = Not analyzed.

[f] — = Not detected.

[g] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

Table 6.10-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 14-003

Sample ID	Location ID	Depth (ft)	Media	Cesium-134	Cesium-137
Qbt 2, 3, 4 BV				**na[a]**	**na**
Construction Worker SAL[b]				**7.7**	**18**
Industrial SAL[b]				**9.7**	**23**
Residential SAL[b]				**2.4**	**5.6**
RE14-11-24037	14-614502	3.5–4.5	QBT4	0.052	—[c]
RE14-11-24057	14-614512	3–4	QBT4	—	0.141

Notes: Results are in pCi/g.

[a] na = Not available.

[b] SALs from LANL (2009, 107655).

[c] — = Not detected.

Table 6.12-1
Samples Collected and Analyses Requested at SWMU 14-006

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE14-11-24118	14-614531	5–6	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—*	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24119	14-614531	8–9	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24120	14-614532	5–6	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24121	14-614532	8–9	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24122	14-614533	5–6	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24123	14-614533	8–9	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24124	14-614534	4–5	SOIL	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24125	14-614534	7–8	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24126	14-614535	1–2	SOIL	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24127	14-614535	4–5	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24128	14-614536	0–1	SOIL	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	—	11-3271
RE14-11-24129	14-614536	3–4	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24130	14-614537	0–1	SOIL	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	—	11-3271
RE14-11-24131	14-614537	3–4	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24132	14-614538	0–1	SOIL	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	—	11-3271
RE14-11-24133	14-614538	3–4	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	—	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24134	14-614539	2–3	SOIL	11-3404	11-3404	11-3404	11-3404	11-3404	—	11-3404	11-3404	11-3404	11-3404	11-3404
RE14-11-24135	14-614539	6–7	QBT4	11-3404	11-3404	11-3404	11-3404	11-3404	—	11-3404	11-3404	11-3404	11-3404	11-3404
RE14-11-24136	14-614540	1.5–2.5	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	11-3270	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24137	14-614540	4.5–5.5	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	11-3270	11-3271	11-3272	11-3270	11-3270	11-3271
RE14-11-24138	14-614541	0–1	SOIL	11-3271	11-3272	11-3270	11-3272	11-3271	11-3270	11-3271	11-3272	11-3270	—	11-3271
RE14-11-24139	14-614541	3–4	QBT4	11-3271	11-3272	11-3270	11-3272	11-3271	11-3270	11-3271	11-3272	11-3270	11-3270	11-3271

*— = Analysis not requested.

Table 6.12-2
Inorganic Chemicals above BVs at SWMU 14-006

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**0.1**	**6.58**	**na[b]**	**na**	**0.3**	**17**	**63.5**
Soil BV[a]				**29200**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**0.1**	**15.4**	**na**	**na**	**1.52**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**65.4**	**4350**	**144**	**309**	**na**	**449[d]**	**34.6[e]**	**12400**	**6190**	**217000**	**800**	**na**	**92.9[e]**	**6190**	**496000**	**217**	**1550**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**17.7**	**224000**	**2260**	**1120**	**na**	**2920[d]**	**300[f]**	**45400**	**22700**	**795000**	**800**	**na**	**310[f]**	**22700**	**1820000**	**795**	**5680**	**5680**	**341000**
Residential SSL[c]				**78100**	**3.9**	**15600**	**156**	**77.9**	**na**	**219[d]**	**23[f]**	**3130**	**1560**	**54800**	**400**	**na**	**23[f]**	**1560**	**125000**	**54.8**	**391**	**391**	**23500**
RE14-11-24118	14-614531	5–6	QBT4	9510	—[g]	118	—	—	3030	—	—	5.1	0.63 (U)	—	73 (J+)	—	—	—	0.95	—	1.4 (J-)	—	—
RE14-11-24119	14-614531	8–9	QBT4	—	—	—	—	—	—	—	—	—	0.62 (U)	—	—	—	—	—	0.52	0.0034 (J)	3.1 (J-)	—	—
RE14-11-24120	14-614532	5–6	QBT4	14600	3.6	188	—	—	5610	8.3	—	8.6	0.66 (U)	—	—	2490	—	8.3	0.65	—	1.5 (J-)	17.7	—
RE14-11-24121	14-614532	8–9	QBT4	—	—	—	—	—	—	—	—	—	0.6 (U)	—	—	—	—	—	0.57	—	2 (J-)	—	—
RE14-11-24122	14-614533	5–6	QBT4	11100	3.1	223	—	—	4780	—	—	6.4	0.63 (U)	—	—	2170	—	—	0.66	—	1.7 (J-)	—	—
RE14-11-24123	14-614533	8–9	QBT4	—	—	—	—	—	—	—	—	5	0.63 (U)	—	—	—	—	—	0.63	0.0041 (J)	2.6 (J-)	—	—
RE14-11-24124	14-614534	4–5	SOIL	—	—	—	—	—	—	—	—	—	0.63 (U)	—	—	—	—	—	1.3	—	—	—	—
RE14-11-24125	14-614534	7–8	QBT4	11400	3	119	—	—	2710	—	—	5.2	0.65 (U)	—	—	2080	—	9.8	0.51	—	3.8 (J-)	—	—
RE14-11-24126	14-614535	1–2	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	0.53	0.046	3.1 (J-)	—	—
RE14-11-24127	14-614535	4–5	QBT4	13100	7.7	—	1.3	—	2430	7.3	—	7.3	0.57 (U)	—	15.3 (J+)	1950	—	7.6	0.32	0.066	5.5 (J-)	—	—
RE14-11-24128	14-614536	0–1	SOIL	—	—	—	—	0.42	—	—	—	39.6	—	—	46.5 (J+)	—	0.234	—	8.1	—	—	—	148
RE14-11-24129	14-614536	3–4	QBT4	—	3.4	—	—	—	—	—	—	7.9	0.53 (U)	—	—	—	—	—	0.074 (J)	0.012	2.4 (J-)	—	—
RE14-11-24130	14-614537	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	2.4	0.0082	2 (J-)	—	—
RE14-11-24131	14-614537	3–4	QBT4	10900	3.2	47.4	—	—	—	7.3	—	5.4	0.54 (U)	—	—	—	—	—	0.14 (J)	0.015	2.3 (J-)	—	—
RE14-11-24132	14-614538	0–1	SOIL	—	—	—	—	0.45	—	—	—	35.4	0.57 (J)	—	30.1 (J+)	—	—	—	5.8	0.018	2.2 (J-)	—	151
RE14-11-24133	14-614538	3–4	QBT4	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—	—	—	—	0.11 (J)	0.017	2.1 (J-)	—	—
RE14-11-24134	14-614539	2–3	SOIL	—	—	—	—	—	—	—	—	82.5	0.63 (U)	—	154	—	—	—	0.58	0.0045 (J)	1.6	—	—
RE14-11-24135	14-614539	6–7	QBT4	15500	4.1	149 (J+)	1.5	—	3090	10.8	6.1	10	0.63 (U)	16300	13.5	3140	—	11.4	1.6	—	2	22.7	—
RE14-11-24136	14-614540	1.5–2.5	QBT4	—	—	53.8	—	—	2830	—	—	4.9	0.54 (U)	—	—	—	—	7.6	0.17 (J)	0.0067	2.6 (J-)	—	—
RE14-11-24137	14-614540	4.5–5.5	QBT4	—	—	—	—	—	—	—	—	4.7	0.57 (U)	—	—	—	—	—	0.086 (J)	—	3.3 (J-)	—	—
RE14-11-24138	14-614541	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	2.1	0.0098	—	—	50.8
RE14-11-24139	14-614541	3–4	QBT4	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—	—	—	—	0.17 (J)	0.012	2.4 (J-)	—	—

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.12-3
Organic Chemicals Detected at SWMU 14-006

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Amino-2,6-dinitrotoluene[4-]	Amino-4,6-dinitrotoluene[2-]	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Chrysene	Dibenz(a,h)anthracene
Construction Worker SSL[a]				**18600**	**601[b]**	**601[b]**	**66800**	**213**	**21.3**	**213**	**6680**	**2060**	**4760**	**20600**	**21.3**
Industrial SSL[a]				**36700**	**1900[c]**	**2000[c]**	**183000**	**23.4**	**2.34**	**23.4**	**18300**	**234**	**1370**	**2340**	**2.34**
Residential SSL[a]				**3440**	**150[c]**	**150[c]**	**17200**	**6.21**	**0.621**	**6.21**	**1720**	**62.1**	**347**	**621**	**0.621**
RE14-11-24118	14-614531	5–6	QBT4	—[d]	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24119	14-614531	8–9	QBT4	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24121	14-614532	8–9	QBT4	—	—	—	—	—	—	—	—	—	0.12 (J)	—	—
RE14-11-24122	14-614533	5–6	QBT4	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24123	14-614533	8–9	QBT4	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24124	14-614534	4–5	SOIL	—	0.068 (J)	0.083 (J)	—	0.13 (J)	0.092 (J)	0.13 (J)	0.043 (J)	0.054 (J)	—	0.13 (J)	—
RE14-11-24125	14-614534	7–8	QBT4	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24126	14-614535	1–2	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24127	14-614535	4–5	QBT4	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24128	14-614536	0–1	SOIL	2.6	0.16 (J)	0.17	3.8	12	9.2	13	4.3	4.7	—	13	1.4
RE14-11-24129	14-614536	3–4	QBT4	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24130	14-614537	0–1	SOIL	—	—	—	—	—	—	0.038 (J)	—	—	—	—	—
RE14-11-24131	14-614537	3–4	QBT4	—	—	—	—	—	—	—	—	—	1.5	—	—
RE14-11-24132	14-614538	0–1	SOIL	0.15 (J)	—	—	0.26 (J)	1.3	1.3	1.8	0.7	0.75	0.075 (J)	1.6	0.18 (J)
RE14-11-24134	14-614539	2–3	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24135	14-614539	6–7	QBT4	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24136	14-614540	1.5–2.5	QBT4	0.38	—	—	0.67	1.6	1.2	1.7	0.83	0.64	—	1.7	—
RE14-11-24137	14-614540	4.5–5.5	QBT4	—	—	—	—	—	—	—	—	—	0.37	—	—
RE14-11-24138	14-614541	0–1	SOIL	0.55	—	—	—	0.1 (J)	0.1 (J)	0.15 (J)	0.08 (J)	0.055 (J)	—	0.13 (J)	—
RE14-11-24139	14-614541	3–4	QBT4	—	—	—	—	—	—	—	—	—	—	—	—

Table 6.12-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Dibenzofuran	Fluoranthene	Fluorene	HMX	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Naphthalene	PETN	Phenanthrene	Pyrene	RDX	TATB	Trinitrotoluene[2,4,6-]
Construction Worker SSL[a]				**552**[b]	**8910**	**8910**	**11900**	**213**	**1240**[b]	**702**	**na**[e]	**7150**	**6680**	**715**	**8760**[f,b]	**141**
Industrial SSL[a]				**1000**[c]	**24400**	**24400**	**34200**	**23.4**	**4100**[c]	**252**	**na**	**20500**	**18300**	**174**	**27000**[f,c]	**469**
Residential SSL[a]				**78**[c]	**2290**	**2290**	**3060**	**6.21**	**310**[c]	**45**	**na**	**1830**	**1720**	**44.2**	**2200**[f,c]	**35.9**
RE14-11-24118	14-614531	5–6	QBT4	—	—	—	0.16 (J)	—	—	—	—	—	—	—	1.1 (J)	—
RE14-11-24119	14-614531	8–9	QBT4	—	—	—	0.086 (J)	—	—	—	—	—	—	—	0.88 (J)	—
RE14-11-24121	14-614532	8–9	QBT4	—	—	—	1.2 (J)	—	—	—	—	—	—	—	1.6 (J)	0.6 (J)
RE14-11-24122	14-614533	5–6	QBT4	—	—	—	1.8 (J)	—	—	—	1.7	—	—	—	4.8 (J)	—
RE14-11-24123	14-614533	8–9	QBT4	—	—	—	0.16 (J)	—	—	—	—	—	—	—	3.4 (J)	—
RE14-11-24124	14-614534	4–5	SOIL	—	0.33 (J)	—	0.28 (J)	0.061 (J)	—	—	—	0.24 (J)	0.25 (J)	—	0.9 (J)	0.39 (J)
RE14-11-24125	14-614534	7–8	QBT4	—	—	—	0.12 (J)	—	—	—	—	—	—	—	0.26 (J)	—
RE14-11-24126	14-614535	1–2	SOIL	—	—	—	0.64 (J)	—	—	—	—	—	—	—	0.32 (J)	—
RE14-11-24127	14-614535	4–5	QBT4	—	—	—	0.21 (J)	—	—	—	—	—	—	—	0.11 (J)	—
RE14-11-24128	14-614536	0–1	SOIL	1.1	35	2.1	1.5 (J)	5.6	0.3 (J)	0.63	—	22	24	2.6	13 (J)	0.83 (J)
RE14-11-24129	14-614536	3–4	QBT4	—	0.062 (J)	—	0.45 (J)	—	—	—	—	—	0.056 (J)	—	—	0.045 (J)
RE14-11-24130	14-614537	0–1	SOIL	—	0.057 (J)	—	0.25 (J)	—	—	—	—	—	0.04 (J)	—	2.3 (J)	—
RE14-11-24131	14-614537	3–4	QBT4	—	—	—	0.84 (J)	—	—	—	—	—	—	—	0.2 (J)	—
RE14-11-24132	14-614538	0–1	SOIL	0.049 (J)	3.1	0.11 (J)	1.5 (J)	0.85	—	—	—	1.5	3	0.12 (J)	5.4 (J)	0.25 (J)
RE14-11-24134	14-614539	2–3	SOIL	—	—	—	0.34	—	—	—	—	—	—	—	—	—
RE14-11-24135	14-614539	6–7	QBT4	—	—	—	0.11 (J)	—	—	—	—	—	—	—	—	—
RE14-11-24136	14-614540	1.5–2.5	QBT4	0.21 (J)	4.5	0.36	0.64 (J)	0.97	0.044 (J)	0.079 (J)	—	3.4	3.7	—	0.83 (J)	—
RE14-11-24137	14-614540	4.5–5.5	QBT4	—	—	—	0.47 (J)	—	—	—	—	—	—	—	—	—
RE14-11-24138	14-614541	0–1	SOIL	—	0.27 (J)	—	1.7 (J)	0.096 (J)	—	—	—	0.11 (J)	0.24 (J)	—	6.9 (J)	0.18 (J)
RE14-11-24139	14-614541	3–4	QBT4	—	—	—	0.16 (J)	—	—	—	—	—	—	—	0.18 (J)	—

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

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

[b] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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] — = Not detected.

[e] na = Not available.

[f] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

Table 6.12-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 14-006

Sample ID	Location ID	Depth (ft)	Media	Strontium-90
Qbt 2, 3, 4 BV				**na**[a]
Soil BV[b]				**1.31**
Construction Worker SAL[c]				**800**
Industrial SAL[c]				**1900**
Residential SAL[c]				**5.7**
RE14-11-24121	14-614532	8–9	QBT4	0.38
RE14-11-24126	14-614535	1–2	SOIL	0.33

Notes: Results are in pCi/g.

[a] na = Not available.

[b] BVs/FVs are from LANL (1998, 059730).

[c] SALs from LANL (2009, 107655).

Table 6.13-1
Samples Collected and Analyses Requested at SWMU 14-007

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE14-11-24150	14-614542	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—*	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24151	14-614542	3–4	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-25906	14-614542	6–7	QBT4	11-3282	11-3283	11-3281	11-3283	11-3282	—	11-3282	11-3283	11-3281	11-3281	11-3282
RE14-11-24152	14-614543	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24153	14-614543	3–4	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-25909	14-614543	6–7	QBT4	11-3282	11-3283	11-3281	11-3283	11-3282	—	11-3282	11-3283	11-3281	11-3281	11-3282
RE14-11-24154	14-614544	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24155	14-614544	3–4	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-25907	14-614544	6–7	SOIL	11-3282	11-3283	11-3281	11-3283	11-3282	—	11-3282	11-3283	11-3281	11-3281	11-3282
RE14-11-25908	14-614544	9–10	QBT4	11-3282	11-3283	11-3281	11-3283	11-3282	—	11-3282	11-3283	11-3281	11-3281	11-3282
RE14-11-24156	14-614545	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24157	14-614545	3–4	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-25911	14-614545	6–7	QBT4	11-3282	11-3283	11-3281	11-3283	11-3282	—	11-3282	11-3283	11-3281	11-3281	11-3282
RE14-11-24158	14-614546	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24159	14-614546	3–4	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-24160	14-614547	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24161	14-614547	3–4	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-24162	14-614548	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24163	14-614548	3–4	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	—	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-24164	14-614549	0–1	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	—	11-3164
RE14-11-24165	14-614549	3–4	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-25912	14-614549	6–7	SOIL	11-3282	11-3283	11-3281	11-3283	11-3282	—	11-3282	11-3283	11-3281	11-3281	11-3282
RE14-11-24166	14-614550	0–1	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	—	11-3164
RE14-11-24167	14-614550	3–4	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-25913	14-614550	6–7	QBT4	11-3282	11-3283	11-3281	11-3283	11-3282	—	11-3282	11-3283	11-3281	11-3281	11-3282
RE14-11-24168	14-614551	2.5–3.5	SOIL	11-3218	11-3218	11-3218	11-3218	11-3218	—	11-3218	11-3218	11-3218	11-3218	11-3218
RE14-11-24169	14-614551	5.5–6.5	SOIL	11-3218	11-3218	11-3218	11-3218	11-3218	—	11-3218	11-3218	11-3218	11-3218	11-3218
RE14-11-24178	14-614552	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	11-3139	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24179	14-614552	3–4	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	11-3139	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-25905	14-614552	6–7	SOIL	11-3406	11-3406	11-3406	11-3406	11-3406	11-3406	11-3406	11-3406	11-3406	11-3406	11-3406
RE14-11-24180	14-614553	0–1	SOIL	11-3140	11-3141	11-3139	11-3141	11-3140	11-3139	11-3140	11-3141	11-3139	—	11-3140
RE14-11-24181	14-614553	3–4	QBT4	11-3140	11-3141	11-3139	11-3141	11-3140	11-3139	11-3140	11-3141	11-3139	11-3139	11-3140
RE14-11-25910	14-614553	6–7	QBT4	11-3282	11-3283	11-3281	11-3283	11-3282	11-3281	11-3282	11-3283	11-3281	11-3281	11-3282
RE14-11-24182	14-614554	0–1	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	11-3163	11-3164	11-3162	11-3163	—	11-3164

Table 6.13-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE14-11-24183	14-614554	3–4	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	11-3163	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24184	14-614555	0–1	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	—	11-3164
RE14-11-24185	14-614555	3–4	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24186	14-614555	6–7	QBT4	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24187	14-614556	0–1	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	—	11-3164
RE14-11-24188	14-614556	3–4	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24189	14-614556	6–7	QBT4	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24190	14-614557	0–1	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	—	11-3164
RE14-11-24191	14-614557	3–4	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24192	14-614557	6–7	QBT4	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24193	14-614558	0–1	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	—	11-3164
RE14-11-24194	14-614558	3–4	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	—	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24195	14-614558	6–7	QBT4	11-3192	11-3191	11-3191	11-3191	11-3192	—	11-3192	11-3191	11-3191	11-3191	11-3192
RE14-11-24196	14-614559	0–1	SOIL	11-3192	11-3191	11-3191	11-3191	11-3192	—	11-3192	11-3191	11-3191	—	11-3192
RE14-11-24197	14-614559	3–4	SOIL	11-3192	11-3191	11-3191	11-3191	11-3192	—	11-3192	11-3191	11-3191	11-3191	11-3192
RE14-11-24198	14-614559	6–7	QBT4	11-3192	11-3191	11-3191	11-3191	11-3192	—	11-3192	11-3191	11-3191	11-3191	11-3192
RE14-11-24199	14-614560	0–1	SOIL	11-3192	11-3191	11-3191	11-3191	11-3192	—	11-3192	11-3191	11-3191	—	11-3192
RE14-11-24200	14-614560	3–4	QBT4	11-3192	11-3191	11-3191	11-3191	11-3192	—	11-3192	11-3191	11-3191	11-3191	11-3192
RE14-11-24201	14-614560	6–7	QBT4	11-3192	11-3191	11-3191	11-3191	11-3192	—	11-3192	11-3191	11-3191	11-3191	11-3192
RE14-11-24202	14-614561	0–1	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	11-3163	11-3164	11-3162	11-3163	—	11-3164
RE14-11-24203	14-614561	3–4	SOIL	11-3164	11-3162	11-3163	11-3162	11-3164	11-3163	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24204	14-614561	6–7	QBT4	11-3164	11-3162	11-3163	11-3162	11-3164	11-3163	11-3164	11-3162	11-3163	11-3163	11-3164
RE14-11-24205	14-614562	0–1	SOIL	11-3192	11-3191	11-3191	11-3191	11-3192	11-3191	11-3192	11-3191	11-3191	—	11-3192
RE14-11-24206	14-614562	3–4	SOIL	11-3192	11-3191	11-3191	11-3191	11-3192	11-3191	11-3192	11-3191	11-3191	11-3191	11-3192
RE14-11-24207	14-614562	6–7	QBT4	11-3192	11-3191	11-3191	11-3191	11-3192	11-3191	11-3192	11-3191	11-3191	11-3191	11-3192

*— = Analysis not requested.

Table 6.13-2
Inorganic Chemicals above BVs at SWMU 14-007

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**0.1**	**6.58**	**na**[b]	**na**	**0.3**	**1**	**17**	**63.5**
Soil BV[a]				**29200**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**0.1**	**15.4**	**na**	**na**	**1.52**	**1**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**65.4**	**4350**	**144**	**309**	**na**	**449**[d]	**34.6**[e]	**12400**	**6190**	**217000**	**800**	**na**	**463**	**92.9**[e]	**6190**	**496000**	**217**	**1550**	**1550**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**17.7**	**224000**	**2260**	**1120**	**na**	**2920**[d]	**300**[f]	**45400**	**22700**	**795000**	**800**	**na**	**145000**	**310**[f]	**22700**	**1820000**	**795**	**5680**	**5680**	**5680**	**341000**
Residential SSL[c]				**78100**	**3.9**	**15600**	**156**	**77.9**	**na**	**219**[d]	**23**[f]	**3130**	**1560**	**54800**	**400**	**na**	**10700**	**23**[f]	**1560**	**125000**	**54.8**	**391**	**391**	**391**	**23500**
RE14-11-24150	14-614542	0–1	SOIL	—[g]	—	—	—	0.41	—	—	—	—	0.54 (U)	—	—	—	—	—	—	6.6	—	—	—	—	—
RE14-11-24151	14-614542	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	—	—	1.7	—	—	—
RE14-11-25906	14-614542	6–7	QBT4	10900	3.1	144	—	—	—	10.2	5.5	7.6	0.54 (U)	—	—	2050	—	—	7.8	0.087 (J)	—	1.7 (J-)	—	21.3	—
RE14-11-24152	14-614543	0–1	SOIL	—	—	—	—	0.52	—	—	—	—	0.54 (U)	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-24153	14-614543	3–4	SOIL	—	—	—	—	—	—	—	15.8	—	0.55 (U)	—	—	—	739	—	—	—	—	—	2.1	—	—
RE14-11-25909	14-614543	6–7	QBT4	14100	3.4	190	—	—	—	9.8	7.4	8.1	0.54 (U)	—	14.7	1940	632 (J)	—	8.6	0.09 (J)	—	1.7 (J-)	—	23	—
RE14-11-24154	14-614544	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	—	0.0024 (J)	—	—	—	—
RE14-11-24155	14-614544	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	—	—	—	—	—	—
RE14-11-25907	14-614544	6–7	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	0.35	—	—	—	—	—
RE14-11-25908	14-614544	9–10	QBT4	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—	—	—	—	—	0.089 (J)	—	2.2 (J-)	—	—	—
RE14-11-24156	14-614545	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	3.8	—	—	2.5	—	—
RE14-11-24157	14-614545	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	—	—	—	10.8	—	—
RE14-11-25911	14-614545	6–7	QBT4	11600	—	120	—	—	2240	9.4	4.3	6.1	0.54 (U)	—	—	1960	—	—	7	0.29	—	1.6 (J-)	2.1	—	—
RE14-11-24158	14-614546	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.2	—	—	16.2	—	—
RE14-11-24159	14-614546	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	0.259	—	—	—	—	14	—	—
RE14-11-24160	14-614547	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.236	—	2.7	—	—	24.2	—	97.6
RE14-11-24161	14-614547	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	—	—	—	4	—	—
RE14-11-24162	14-614548	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.9	—	—	14	—	64.1
RE14-11-24163	14-614548	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	0.101	—	—	—	—	1.3	—	—
RE14-11-24164	14-614549	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	7.1	0.0031 (J)	—	—	—	—
RE14-11-24165	14-614549	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	1.3	0.0051 (J)	—	—	—	—
RE14-11-25912	14-614549	6–7	SOIL	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	1.6	0.0026 (J)	1.7 (J-)	—	—	—
RE14-11-24166	14-614550	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	1.5	—	1.6 (J-)	—	—	—
RE14-11-24167	14-614550	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	0.2 (J)	0.0032 (J)	—	—	—	—
RE14-11-25913	14-614550	6–7	QBT4	9700	—	85.1	—	—	3620	8.5	—	4.7	0.54 (U)	—	—	1840	—	—	—	0.34	—	1.7 (J-)	—	—	—
RE14-11-24168	14-614551	2.5–3.5	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	0.76	0.0028 (J)	—	—	—	53.8
RE14-11-24169	14-614551	5.5–6.5	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	0.21 (J)	—	—	—	—	—

Table 6.13-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**17**	**63.5**
Soil BV[a]				**29200**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**0.1**	**15.4**	**na**	**na**	**1.52**	**1**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**65.4**	**4350**	**144**	**309**	**na**	**449[d]**	**34.6[e]**	**12400**	**6190**	**217000**	**800**	**na**	**463**	**92.9[e]**	**6190**	**496000**	**217**	**1550**	**1550**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**17.7**	**224000**	**2260**	**1120**	**na**	**2920[d]**	**300[f]**	**45400**	**22700**	**795000**	**800**	**na**	**145000**	**310[f]**	**22700**	**1820000**	**795**	**5680**	**5680**	**5680**	**341000**
Residential SSL[c]				**78100**	**3.9**	**15600**	**156**	**77.9**	**na**	**219[d]**	**23[f]**	**3130**	**1560**	**54800**	**400**	**na**	**10700**	**23[f]**	**1560**	**125000**	**54.8**	**391**	**391**	**391**	**23500**
RE14-11-24178	14-614552	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	4.6	—	—	—	—	—
RE14-11-24179	14-614552	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	—	—	1.6	—	—	—
RE14-11-25905	14-614552	6–7	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	0.38	—	—	—	—	—
RE14-11-24180	14-614553	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	7.5	0.0023 (J)	—	—	—	—
RE14-11-24181	14-614553	3–4	QBT4	20800	2.9	257	1.3	—	3650	8.6	4.4	6 (J)	0.56 (U)	—	12.2	2230	—	—	9.3	—	0.0031 (J)	1.2	3.3	19.6	—
RE14-11-25910	14-614553	6–7	QBT4	12000	—	107	—	—	—	7.7	3.3	5.2	0.55 (U)	—	—	1720	—	—	6.8	0.56	—	1.8 (J-)	—	—	—
RE14-11-24182	14-614554	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	9.3	—	—	1.6	—	—
RE14-11-24183	14-614554	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	0.62	0.0043 (J)	—	—	—	—
RE14-11-24184	14-614555	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	6	0.0027 (J)	—	—	—	—
RE14-11-24185	14-614555	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—	—	—	0.17 (J)	0.0023 (J)	1.7 (J-)	—	—	—
RE14-11-24186	14-614555	6–7	QBT4	10800	3.3	203	—	—	2510	8.5	6.8	7.5	0.55 (U)	—	12.8	2110	—	—	7.5	—	0.0041 (J)	1.5 (J-)	—	19.5	—
RE14-11-24187	14-614556	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	2	—	—	—	—	—
RE14-11-24188	14-614556	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	0.37	—	—	—	—	—
RE14-11-24189	14-614556	6–7	QBT4	9210	—	113	—	—	4410	—	—	4.7	0.57 (U)	—	—	1780	—	—	6.6	0.12 (J)	0.0025 (J)	1.9 (J-)	—	—	—
RE14-11-24190	14-614557	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	1.7	—	—	—	—	—
RE14-11-24191	14-614557	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	0.29	—	—	—	—	—
RE14-11-24192	14-614557	6–7	QBT4	—	—	121	—	—	6750	—	—	—	0.54 (U)	—	—	—	—	—	—	0.4	0.0046 (J)	1.9 (J-)	—	—	—
RE14-11-24193	14-614558	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	3.1	—	—	—	—	—
RE14-11-24194	14-614558	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	0.29	—	—	—	—	—
RE14-11-24195	14-614558	6–7	QBT4	10700	2.8	201 (J+)	—	—	—	—	5.7 (J)	5.6	0.55 (U)	—	11.9	—	539 (J)	—	11.9	0.19 (J)	0.0031 (J)	2.1	—	—	—
RE14-11-24196	14-614559	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	2.8	—	—	—	—	—
RE14-11-24197	14-614559	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—	—	—	0.19 (J)	—	—	—	—	—
RE14-11-24198	14-614559	6–7	QBT4	11100	—	103 (J+)	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	6.6	0.13 (J)	—	2	—	—	—
RE14-11-24199	14-614560	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	—	—	4.3	—	—	—	—	—
RE14-11-24200	14-614560	3–4	QBT4	13200	3.2	199 (J+)	—	—	2620	9	8.9 (J)	7.4	0.54 (U)	—	15.9	2120	712 (J)	—	8.1	0.65	—	1.1	—	22.4	—
RE14-11-24201	14-614560	6–7	QBT4	12900	2.8	138 (J+)	—	—	4650	8.2	—	5.3	0.57 (U)	—	—	2430	—	—	7.5	0.69	0.0071	1.4	—	—	—
RE14-11-24202	14-614561	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.7	—	—	—	—	—
RE14-11-24203	14-614561	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	0.46	0.0049 (J)	—	—	—	—

Table 6.13-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Silver	Vanadium	Zinc
Qbt 2, 3, 4 BV[a]				**7340**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1**	**17**	**63.5**
Soil BV[a]				**29200**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**0.1**	**15.4**	**na**	**na**	**1.52**	**1**	**39.6**	**48.8**
Construction Worker SSL[c]				**40700**	**65.4**	**4350**	**144**	**309**	**na**	**449[d]**	**34.6[e]**	**12400**	**6190**	**217000**	**800**	**na**	**463**	**92.9[e]**	**6190**	**496000**	**217**	**1550**	**1550**	**1550**	**92900**
Industrial SSL[c]				**1130000**	**17.7**	**224000**	**2260**	**1120**	**na**	**2920[d]**	**300[f]**	**45400**	**22700**	**795000**	**800**	**na**	**145000**	**310[f]**	**22700**	**1820000**	**795**	**5680**	**5680**	**5680**	**341000**
Residential SSL[c]				**78100**	**3.9**	**15600**	**156**	**77.9**	**na**	**219[d]**	**23[f]**	**3130**	**1560**	**54800**	**400**	**na**	**10700**	**23[f]**	**1560**	**125000**	**54.8**	**391**	**391**	**391**	**23500**
RE14-11-24204	14-614561	6–7	QBT4	11200	—	110 (J)	—	—	3540	—	—	5 (J)	0.55 (U)	—	—	1890	—	—	—	0.45	0.0023 (J)	1.6 (J-)	—	—	—
RE14-11-24205	14-614562	0–1	SOIL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	1.2	—	—	—	—	—
RE14-11-24206	14-614562	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	0.62	—	1.8	—	—	—
RE14-11-24207	14-614562	6–7	QBT4	15900	3.5	137 (J+)	1.7 (J)	—	6870	10.1	—	7	0.61 (U)	16800	—	3530	—	—	11.2	0.31	0.0062	1.4	—	—	—

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.13-3
Organic Chemicals Detected at SWMU 14-007

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acetone	Bis(2-ethylhexyl)phthalate	Dichlorobenzene[1,3-]	Di-n-butylphthalate	Di-n-octylphthalate	Fluoranthene	HMX	Isopropyltoluene[4-]	Methylene Chloride	TATB	Trichloroethene
Construction Worker SSL[a]				**18600**	**263000**	**4760**	**5780**[b]	**23800**	**23800**[c]	**8910**	**11900**	**10300**[d]	**10600**	**8760**[e,f]	**4600**
Industrial SSL[a]				**36700**	**851000**	**1370**	**140**[g]	**68400**	**68400**[c]	**24400**	**34200**	**14900**[d]	**1090**	**27000**[e,h]	**253**
Residential SSL[a]				**3440**	**67500**	**347**	**69**[g]	**6110**	**6110**[c]	**2290**	**3060**	**3210**[d]	**199**	**2200**[e,h]	**45.7**
RE14-11-24150	14-614542	0–1	SOIL	—[i]	NA[j]	22	—	—	0.32 (J)	—	0.076 (J)	NA	NA	1.6 (J)	NA
RE14-11-24151	14-614542	3–4	SOIL	—	—	—	—	—	—	—	—	—	0.0035 (J)	—	—
RE14-11-24152	14-614543	0–1	SOIL	—	NA	0.069 (J)	—	0.055 (J)	—	—	—	NA	NA	4.7 (J)	NA
RE14-11-24153	14-614543	3–4	SOIL	—	0.0094 (J)	—	—	—	—	—	—	—	0.0041 (J)	0.73 (J)	—
RE14-11-25909	14-614543	6–7	QBT4	—	—	—	—	—	—	—	—	—	—	—	0.001 (J)
RE14-11-24154	14-614544	0–1	SOIL	—	NA	—	—	—	—	—	—	NA	NA	2.6 (J)	NA
RE14-11-24155	14-614544	3–4	SOIL	—	0.0079 (J)	—	—	—	—	—	—	—	0.0037 (J)	—	—
RE14-11-24156	14-614545	0–1	SOIL	0.29 (J)	NA	—	—	—	—	—	—	NA	NA	0.57 (J)	NA
RE14-11-24157	14-614545	3–4	SOIL	—	0.0073 (J)	—	—	—	—	—	—	—	0.0036 (J)	—	—
RE14-11-24158	14-614546	0–1	SOIL	—	NA	—	—	—	—	—	—	NA	NA	0.48 (J)	NA
RE14-11-24159	14-614546	3–4	SOIL	—	0.012 (J)	—	0.00034 (J)	—	—	—	—	—	0.0038 (J)	—	—
RE14-11-24160	14-614547	0–1	SOIL	—	NA	—	—	—	—	—	—	NA	NA	0.21 (J)	NA
RE14-11-24161	14-614547	3–4	SOIL	—	0.008 (J)	—	—	—	—	—	—	—	0.0036 (J)	—	—
RE14-11-24162	14-614548	0–1	SOIL	—	NA	—	—	—	—	—	—	NA	NA	0.32 (J)	NA
RE14-11-24163	14-614548	3–4	SOIL	0.074 (J)	0.01 (J)	—	—	—	—	—	—	0.0006 (J)	0.0041 (J)	—	—
RE14-11-24164	14-614549	0–1	SOIL	—	NA	—	—	—	—	—	—	NA	NA	1.2 (J)	NA
RE14-11-25912	14-614549	6–7	SOIL	—	—	—	—	—	—	—	—	—	—	0.16 (J)	0.00094 (J)
RE14-11-24168	14-614551	2.5–3.5	SOIL	—	0.0095 (J)	—	—	—	—	—	—	—	—	3.6 (J-)	—
RE14-11-24169	14-614551	5.5–6.5	SOIL	—	0.0077 (J)	0.13 (J)	—	—	—	—	—	—	—	0.14 (J-)	—
RE14-11-24178	14-614552	0–1	SOIL	—	NA	—	—	—	—	0.036 (J)	—	NA	NA	1.3 (J)	NA
RE14-11-24179	14-614552	3–4	SOIL	—	0.0077 (J)	—	—	—	—	—	0.054 (J)	—	0.0031 (J)	—	—
RE14-11-25905	14-614552	6–7	SOIL	—	—	—	—	—	—	—	—	—	—	0.13 (J)	—
RE14-11-24180	14-614553	0–1	SOIL	—	NA	—	—	—	—	—	—	NA	NA	2.1 (J)	NA
RE14-11-24181	14-614553	3–4	QBT4	—	0.0082 (J)	—	—	—	—	—	—	—	0.0036 (J)	—	—
RE14-11-24182	14-614554	0–1	SOIL	—	NA	0.062 (J)	—	—	—	—	—	NA	NA	1.3 (J)	NA
RE14-11-24184	14-614555	0–1	SOIL	—	NA	0.42	—	—	—	—	—	NA	NA	0.61 (J)	NA

Table 6.13-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acetone	Bis(2-ethylhexyl)phthalate	Dichlorobenzene[1,3-]	Di-n-butylphthalate	Di-n-octylphthalate	Fluoranthene	HMX	Isopropyltoluene[4-]	Methylene Chloride	TATB	Trichloroethene
Construction Worker SSL[a]				**18600**	**263000**	**4760**	**5780[b]**	**23800**	**23800[c]**	**8910**	**11900**	**10300[d]**	**10600**	**8760[e,f]**	**4600**
Industrial SSL[a]				**36700**	**851000**	**1370**	**140[g]**	**68400**	**68400[c]**	**24400**	**34200**	**14900[d]**	**1090**	**27000[e,h]**	**253**
Residential SSL[a]				**3440**	**67500**	**347**	**69[g]**	**6110**	**6110[c]**	**2290**	**3060**	**3210[d]**	**199**	**2200[e,h]**	**45.7**
RE14-11-24186	14-614555	6–7	QBT4	—	—	0.71	—	—	—	—	—	—	—	0.075 (J)	—
RE14-11-24189	14-614556	6–7	QBT4	—	—	0.24 (J)	—	—	—	—	—	—	—	—	—
RE14-11-24196	14-614559	0–1	SOIL	—	NA	—	—	—	—	—	—	NA	NA	0.093 (J)	NA

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

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

[b] SSLs calculated using toxicity value from EPA (2007, 099314) and equation and parameters from NMED (2009, 108070).

[c] Di-n-butylphthalate used as a surrogate based on structural similarity.

[d] Isopropylbenzene used as a surrogate based on structural similarity.

[e] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

[f] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

[g] SSLs are from EPA (2007, 099314).

[h] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

[i] — = Not detected.

[j] NA = Not analyzed.

Table 6.13-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 14-007

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Strontium-90
Soil BV[a]				**1.65**	**1.31**
Construction Worker SAL[b]				**18**	**800**
Industrial SAL[b]				**23**	**1900**
Residential SAL[b]				**5.6**	**5.7**
RE14-11-24153	14-614543	3–4	SOIL	0.146	—[c]
RE14-11-24188	14-614556	3–4	SOIL	—	0.46

Notes: Results are in pCi/g.

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

[b] SALs from LANL (2009, 107655).

[c] — = Not detected.

Table 6.14-1
Samples Collected and Analyses Requested at AOC C-14-001

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Explosive Compounds	TAL Metals	PCBs	Perchlorate	SVOCs	VOCs	Cyanide (Total)
RE14-11-24389	14-614605	0–1	SOIL	11-3716	11-3715	11-3716	—*	11-3716	11-3715	—	11-3716
RE14-11-24390	14-614605	3–4	SOIL	11-3716	11-3715	11-3716	—	11-3716	11-3715	11-3715	11-3716
RE14-11-24391	14-614606	0–1	SOIL	11-3716	11-3715	11-3716	—	11-3716	11-3715	—	11-3716
RE14-11-24392	14-614606	3–4	QBT4	11-3716	11-3715	11-3716	—	11-3716	11-3715	11-3715	11-3716
RE14-11-24393	14-614607	0–1	SOIL	11-3716	11-3715	11-3716	—	11-3716	11-3715	—	11-3716
RE14-11-24394	14-614607	3–4	QBT4	11-3716	11-3715	11-3716	—	11-3716	11-3715	11-3715	11-3716
RE14-11-24395	14-614608	0–1	SOIL	11-3716	11-3715	11-3716	—	11-3716	11-3715	—	11-3716
RE14-11-24396	14-614608	3–4	QBT4	11-3716	11-3715	11-3716	—	11-3716	11-3715	11-3715	11-3716
RE14-11-24397	14-614609	0–1	SOIL	11-3716	11-3715	11-3716	11-3715	11-3716	11-3715	—	11-3716
RE14-11-24398	14-614609	3–4	QBT4	11-3716	11-3715	11-3716	11-3715	11-3716	11-3715	11-3715	11-3716

*— = Analysis not requested.

Table 6.14-2
Inorganic Chemicals above BVs at AOC C-14-001

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Calcium	Chromium	Cobalt	Cyanide (Total)	Nickel	Nitrate	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**2200**	**7.14**	**3.14**	**0.5**	**6.58**	**na[b]**	**0.3**
Soil BV[a]				**29200**	**0.83**	**295**	**6120**	**19.3**	**8.64**	**0.5**	**15.4**	**na**	**1.52**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**na**	**449[d]**	**34.6[e]**	**6190**	**6190**	**496000**	**1550**
Industrial SSL[c]				**1130000**	**454**	**224000**	**na**	**2920[d]**	**300[f]**	**22700**	**22700**	**1820000**	**5680**
Residential SSL[c]				**78100**	**31.3**	**15600**	**na**	**219[d]**	**23[f]**	**1560**	**1560**	**125000**	**391**
RE14-11-24389	14-614605	0–1	SOIL	—[g]	—	—	—	75.5	—	0.54 (U)	—	0.77	—
RE14-11-24390	14-614605	3–4	SOIL	—	—	—	—	—	—	0.54 (U)	—	0.16 (J)	—
RE14-11-24391	14-614606	0–1	SOIL	—	—	—	—	—	—	0.57 (U)	—	0.57	—
RE14-11-24392	14-614606	3–4	QBT4	8650	0.53 (U)	80.4	5300	21.5	3.6	0.53 (U)	12.2	0.35	1.2
RE14-11-24393	14-614607	0–1	SOIL	—	—	—	—	—	—	0.54 (U)	—	0.28	—
RE14-11-24394	14-614607	3–4	QBT4	9680	0.53 (U)	104	—	—	4.3	0.53 (U)	—	0.11 (J)	1.2
RE14-11-24395	14-614608	0–1	SOIL	—	—	—	—	—	—	—	—	0.34	—
RE14-11-24396	14-614608	3–4	QBT4	10200	0.54 (U)	93.1	—	—	3.8	0.54 (U)	—	0.14 (J)	1.4
RE14-11-24397	14-614609	0–1	SOIL	—	—	—	—	—	—	0.55 (U)	—	0.4	—
RE14-11-24398	14-614609	3–4	QBT4	8740	0.53 (U)	82.2	—	—	3.4	0.53 (U)	—	0.22	0.9

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.14-3
Organic Chemicals Detected at AOC C-14-001

Sample ID	Location ID	Depth (ft)	Media	Benzoic Acid
Construction Worker SSL				**952000**[a]
Industrial SSL				**2500000**[b]
Residential SSL				**240000**[b]
RE14-11-24398	14-614609	3–4	QBT4	0.36 (J)

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

[a] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

[b] SSLs are from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm).

Table 6.17-1
Samples Collected and Analyses Requested at AOC C-14-004

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Explosive Compounds	TAL Metals	PCBs	Perchlorate	SVOCs	VOCs	Cyanide (Total)
RE14-11-24431	14-614622	0–1	SOIL	11-3220	11-3219	11-3220	—*	11-3220	11-3219	—	11-3220
RE14-11-24432	14-614622	3–4	QBT4	11-3220	11-3219	11-3220	—	11-3220	11-3219	11-3219	11-3220
RE14-11-24433	14-614623	0–1	SOIL	11-3220	11-3219	11-3220	—	11-3220	11-3219	—	11-3220
RE14-11-24434	14-614623	3–4	QBT4	11-3220	11-3219	11-3220	—	11-3220	11-3219	11-3219	11-3220
RE14-11-24435	14-614624	0–1	SOIL	11-3220	11-3219	11-3220	—	11-3220	11-3219	—	11-3220
RE14-11-24436	14-614624	3–4	QBT4	11-3220	11-3219	11-3220	—	11-3220	11-3219	11-3219	11-3220
RE14-11-24437	14-614625	0–1	SOIL	11-3220	11-3219	11-3220	—	11-3220	11-3219	—	11-3220
RE14-11-24438	14-614625	3–4	QBT4	11-3220	11-3219	11-3220	—	11-3220	11-3219	11-3219	11-3220
RE14-11-24439	14-614626	0–1	SOIL	11-3220	11-3219	11-3220	11-3219	11-3220	11-3219	—	11-3220
RE14-11-24440	14-614626	3–4	SOIL	11-3220	11-3219	11-3220	11-3219	11-3220	11-3219	11-3219	11-3220
RE14-11-24832	14-614642	0–1	QBT4	11-3220	11-3219	11-3220	11-3219	11-3220	11-3219	—	11-3220
RE14-11-24833	14-614642	3–4	QBT4	11-3220	11-3219	11-3220	11-3219	11-3220	11-3219	11-3219	11-3220

*— = Analysis not requested.

Table 6.17-2
Inorganic Chemicals above BVs at AOC C-14-004

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Nickel	Nitrate	Perchlorate	Selenium	Vanadium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**6.58**	**na[b]**	**na**	**0.3**	**17**
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**15.4**	**na**	**na**	**1.52**	**39.6**
Construction Worker SSL[c]				**40700**	**124**	**65.4**	**4350**	**na**	**449[d]**	**34.6[e]**	**12400**	**6190**	**217000**	**800**	**na**	**6190**	**496000**	**217**	**1550**	**1550**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**224000**	**na**	**2920[d]**	**300[f]**	**45400**	**22700**	**795000**	**800**	**na**	**22700**	**1820000**	**795**	**5680**	**5680**
Residential SSL[c]				**78100**	**31.3**	**3.9**	**15600**	**na**	**219[d]**	**23[f]**	**3130**	**1560**	**54800**	**400**	**na**	**1560**	**125000**	**54.8**	**391**	**391**
RE14-11-24431	14-614622	0–1	SOIL	—[g]	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	2	0.0024 (J)	—	—
RE14-11-24432	14-614622	3–4	QBT4	15800	—	3.2	295	2290	9.2	3.8	6.5	0.56 (U)	15800	15.9	2460	7.8	0.2 (J)	0.02	1.3	17.5
RE14-11-24433	14-614623	0–1	SOIL	—	—	—	—	—	—	—	—	0.52 (U)	—	—	—	—	1.2	0.011	—	—
RE14-11-24434	14-614623	3–4	QBT4	12300	—	3.4	82.4	2320	8.4	4.1	6.2	0.56 (U)	—	15.3	1850	6.9	0.071 (J)	0.016	1.4	17.5
RE14-11-24435	14-614624	0–1	SOIL	—	—	—	—	—	—	—	—	0.52 (U)	—	—	—	—	1.2	0.0026 (J)	—	—
RE14-11-24436	14-614624	3–4	QBT4	11600	0.56 (U)	3.4	94	4320	—	—	5.4	0.56 (U)	—	—	2380	6.9	0.15 (J)	0.015	1.6	—
RE14-11-24437	14-614625	0–1	SOIL	—	—	—	—	—	—	—	—	0.53 (U)	—	26.5	—	—	2	—	—	—
RE14-11-24438	14-614625	3–4	QBT4	—	0.52 (U)	—	—	—	—	—	—	0.52 (U)	—	—	—	—	0.6	—	1.5	—
RE14-11-24439	14-614626	0–1	SOIL	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	3.9	—	—	—
RE14-11-24440	14-614626	3–4	SOIL	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—	0.76	—	—	—
RE14-11-24832	14-614642	0–1	QBT4	8530	—	—	75.4	—	—	3.5	7.8	0.54 (U)	—	17.6	—	—	3.7	—	0.97	—
RE14-11-24833	14-614642	3–4	QBT4	—	0.54 (U)	—	52.4	—	—	—	—	0.54 (U)	—	—	—	—	0.28	0.0025 (J)	1.5	—

Notes: Results are in mg/kg. Data qualifiers are defined 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] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.17-3
Organic Chemicals Detected at AOC C-14-004

Sample ID	Location ID	Depth (ft)	Media	Acetone	HMX	TATB
Construction Worker SSL[a]				**263000**	**11900**	**8760**[b,c]
Industrial SSL[a]				**851000**	**34200**	**27000**[b,d]
Residential SSL[a]				**67500**	**3060**	**2200**[b,d]
RE14-11-24431	14-614622	0–1	SOIL	NA[e]	—[f]	0.88 (J-)
RE14-11-24432	14-614622	3–4	QBT4	0.0077 (J)	—	0.079 (J-)
RE14-11-24433	14-614623	0–1	SOIL	NA	0.046 (J-)	1.2 (J-)
RE14-11-24434	14-614623	3–4	QBT4	0.014 (J)	—	0.55 (J-)
RE14-11-24435	14-614624	0–1	SOIL	NA	—	0.51 (J-)
RE14-11-24437	14-614625	0–1	SOIL	NA	—	0.34 (J-)
RE14-11-24438	14-614625	3–4	QBT4	0.0073 (J)	—	—
RE14-11-24439	14-614626	0–1	SOIL	NA	—	0.7 (J-)
RE14-11-24440	14-614626	3–4	SOIL	—	—	0.27 (J-)
RE14-11-24832	14-614642	0–1	QBT4	NA	0.059 (J-)	1.9 (J-)
RE14-11-24833	14-614642	3–4	QBT4	—	—	0.17 (J-)

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

[a] SSLs are from NMED (2009, 108070).

[b] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

[c] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

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

[e] NA = Not analyzed.

[f] — = Not detected.

Table 6.18-1
Samples Collected and Analyses Requested at AOC C-14-005

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Explosive Compounds	TAL Metals	PCBs	Perchlorate	SVOCs	VOCs	Cyanide (Total)
RE14-11-24446	14-614627	0–1	SOIL	11-3190	11-3189	11-3190	—*	11-3190	11-3189	—	11-3190
RE14-11-24447	14-614627	3–4	SOIL	11-3190	11-3189	11-3190	—	11-3190	11-3189	11-3189	11-3190
RE14-11-24448	14-614628	0–1	SOIL	11-3190	11-3189	11-3190	—	11-3190	11-3189	—	11-3190
RE14-11-24449	14-614628	3–4	SOIL	11-3190	11-3189	11-3190	—	11-3190	11-3189	11-3189	11-3190
RE14-11-24450	14-614629	0–1	SOIL	11-3190	11-3189	11-3190	—	11-3190	11-3189	—	11-3190
RE14-11-24451	14-614629	3–4	SOIL	11-3190	11-3189	11-3190	—	11-3190	11-3189	11-3189	11-3190
RE14-11-24452	14-614630	0–1	SOIL	11-3190	11-3189	11-3190	—	11-3190	11-3189	—	11-3190
RE14-11-24453	14-614630	3–4	SOIL	11-3190	11-3189	11-3190	—	11-3190	11-3189	11-3189	11-3190
RE14-11-24454	14-614631	0–1	SOIL	11-3190	11-3189	11-3190	11-3189	11-3190	11-3189	—	11-3190
RE14-11-24455	14-614631	3–4	SOIL	11-3190	11-3189	11-3190	11-3189	11-3190	11-3189	11-3189	11-3190

*— = Analysis not requested.

Table 6.18-2
Inorganic Chemicals above BVs at AOC C-14-005

Sample ID	Location ID	Depth (ft)	Media	Cyanide (Total)	Lead	Mercury	Nitrate	Perchlorate	Selenium
Soil BV[a]				**0.5**	**22.3**	**0.1**	**na[b]**	**na**	**1.52**
Construction Worker SSL[c]				**6190**	**800**	**92.9[d]**	**496000**	**217**	**1550**
Industrial SSL[c]				**22700**	**800**	**310[e]**	**1820000**	**795**	**5680**
Residential SSL[c]				**1560**	**400**	**23[e]**	**125000**	**54.8**	**391**
RE14-11-24446	14-614627	0–1	SOIL	0.54 (U)	—[f]	0.798 (J+)	3.6	—	—
RE14-11-24447	14-614627	3–4	SOIL	0.56 (U)	—	—	0.4	0.0031 (J)	—
RE14-11-24448	14-614628	0–1	SOIL	0.53 (U)	24	1.37 (J+)	3.2	—	—
RE14-11-24449	14-614628	3–4	SOIL	0.55 (U)	—	—	0.26	0.0024 (J)	1.8
RE14-11-24450	14-614629	0–1	SOIL	0.54 (U)	—	0.848 (J+)	2.9	—	—
RE14-11-24451	14-614629	3–4	SOIL	0.56 (U)	—	—	0.35	—	—
RE14-11-24452	14-614630	0–1	SOIL	0.53 (U)	—	0.878 (J+)	2.1	—	—
RE14-11-24453	14-614630	3–4	SOIL	0.56 (U)	—	—	0.32	0.012	—
RE14-11-24454	14-614631	0–1	SOIL	0.53 (U)	—	0.146 (J+)	1.1	—	—
RE14-11-24455	14-614631	3–4	SOIL	0.55 (U)	—	—	0.064 (J)	0.0024 (J)	—

Notes: Results are in mg/kg. Data qualifiers are defined 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 calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.18-3
Organic Chemicals Detected at AOC C-14-005

Sample ID	Location ID	Depth (ft)	Media	Acetone	Fluoranthene	Isopropyltoluene[4-]	TATB
Construction Worker SSL[a]				**263000**	**8910**	**10300**[b]	**8760**[c,d]
Industrial SSL[a]				**851000**	**24400**	**14900**[b]	**27000**[c,e]
Residential SSL[a]				**67500**	**2290**	**3210**[b]	**2200**[c,e]
RE14-11-24446	14-614627	0–1	SOIL	NA[f]	—[g]	NA	0.77 (J)
RE14-11-24450	14-614629	0–1	SOIL	NA	—	NA	0.25 (J)
RE14-11-24452	14-614630	0–1	SOIL	NA	—	NA	0.52 (J)
RE14-11-24454	14-614631	0–1	SOIL	NA	0.041 (J)	NA	0.28 (J)
RE14-11-24455	14-614631	3–4	SOIL	0.076 (J)	—	0.019	—

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

[a] SSLs are from NMED (2009, 108070).

[b] Isopropylbenzene used as a surrogate based on structural similarity.

[c] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

[d] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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.

Table 6.19-1
Samples Collected and Analyses Requested at AOC C-14-007

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Explosive Compounds	TAL Metals	PCBs	Perchlorate	SVOCs	VOCs	Cyanide (Total)
RE14-11-24460	14-614632	0–1	QBT4	11-3408	11-3408	11-3408	—*	11-3408	11-3408	—	11-3408
RE14-11-24461	14-614632	3–4	QBT4	11-3430	11-3429	11-3430	—	11-3430	11-3429	11-3429	11-3430
RE14-11-24462	14-614633	0–1	SOIL	11-3408	11-3408	11-3408	—	11-3408	11-3408	—	11-3408
RE14-11-24463	14-614633	3–4	QBT4	11-3430	11-3429	11-3430	—	11-3430	11-3429	11-3429	11-3430
RE14-11-24464	14-614634	0–1	SOIL	11-3430	11-3429	11-3430	—	11-3430	11-3429	—	11-3430
RE14-11-24465	14-614634	3–4	QBT4	11-3430	11-3429	11-3430	—	11-3430	11-3429	11-3429	11-3430
RE14-11-24466	14-614635	0–1	SOIL	11-3430	11-3429	11-3430	—	11-3430	11-3429	—	11-3430
RE14-11-24467	14-614635	3–4	QBT4	11-3430	11-3429	11-3430	—	11-3430	11-3429	11-3429	11-3430
RE14-11-24468	14-614636	0–1	SOIL	11-3408	11-3408	11-3408	11-3408	11-3408	11-3408	—	11-3408
RE14-11-24469	14-614636	3–4	QBT4	11-3430	11-3429	11-3430	11-3429	11-3430	11-3429	11-3429	11-3430

*— = Analysis not requested.

Table 6.19-2
Inorganic Chemicals above BVs at AOC C-14-007

Sample ID	Location ID	Depth (ft)	Media	Antimony	Arsenic	Barium	Calcium	Chromium	Copper	Cyanide (Total)	Lead	Magnesium	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2, 3, 4 BV[a]				**0.5**	**2.79**	**46**	**2200**	**7.14**	**4.66**	**0.5**	**11.2**	**1690**	**6.58**	**na**[b]	**na**	**0.3**
Soil BV[a]				**0.83**	**8.17**	**295**	**6120**	**19.3**	**14.7**	**0.5**	**22.3**	**4610**	**15.4**	**na**	**na**	**1.52**
Construction Worker SSL[c]				**124**	**65.4**	**4350**	**na**	**449**[d]	**12400**	**6190**	**800**	**na**	**6190**	**496000**	**217**	**1550**
Industrial SSL[c]				**454**	**17.7**	**224000**	**na**	**2920**[d]	**45400**	**22700**	**800**	**na**	**22700**	**1820000**	**795**	**5680**
Residential SSL[c]				**31.3**	**3.9**	**15600**	**na**	**219**[d]	**3130**	**1560**	**400**	**na**	**1560**	**125000**	**54.8**	**391**
RE14-11-24460	14-614632	0–1	QBT4	—[e]	—	52.9	—	—	—	0.56 (U)	15.7	—	—	0.32	—	1.5
RE14-11-24461	14-614632	3–4	QBT4	—	3.4	58.1	4800	49.3	9.7	0.53 (U)	—	1770	16.4	0.076 (J)	0.0052 (J)	2.6
RE14-11-24462	14-614633	0–1	SOIL	—	—	—	—	—	—	—	—	—	—	3.4	—	—
RE14-11-24463	14-614633	3–4	QBT4	—	—	—	—	25.7	4.8	0.55 (U)	—	—	—	0.69	—	2.2
RE14-11-24464	14-614634	0–1	SOIL	—	—	—	—	—	—	0.64 (U)	—	—	—	3.5	—	—
RE14-11-24465	14-614634	3–4	QBT4	—	5.1	—	—	14.4	—	0.51 (U)	—	—	—	—	—	2
RE14-11-24466	14-614635	0–1	SOIL	—	—	—	—	—	—	0.62 (U)	—	—	—	4.7	—	—
RE14-11-24467	14-614635	3–4	QBT4	—	6.3	—	—	28.4	5.9	0.52 (U)	17.7	—	9	0.074 (J)	—	2.2
RE14-11-24468	14-614636	0–1	SOIL	4.9	—	—	—	—	—	0.63 (U)	—	—	—	0.49	—	—
RE14-11-24469	14-614636	3–4	QBT4	—	2.9	—	—	19.4	—	0.51 (U)	—	—	7.8	0.096 (J)	—	2.5

Notes: Results are in mg/kg. Data qualifiers are defined 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 6.19-3
Organic Chemicals Detected at AOC C-14-007

Sample ID	Location ID	Depth (ft)	Media	Benzene	Benzo(b)fluoranthene	Butanone[2-]	Chrysene	Fluoranthene	Isopropyltoluene[4-]	Pyrene	TATB	Toluene
Construction Worker SSL[a]				**471**	**213**	**148000**	**20600**	**8910**	**10300[b]**	**6680**	**8760[c,d]**	**21100**
Industrial SSL[a]				**85.4**	**23.4**	**369000**	**2340**	**24400**	**14900[b]**	**18300**	**27000[c,e]**	**57900**
Residential SSL[a]				**15.5**	**6.21**	**39600**	**621**	**2290**	**3210[b]**	**1720**	**2200[c,e]**	**5570**
RE14-11-24461	14-614632	3–4	QBT4	—[f]	—	—	—	—	0.00067 (J)	—	—	—
RE14-11-24462	14-614633	0–1	SOIL	NA[g]	—	NA	—	—	NA	—	0.25 (J)	NA
RE14-11-24463	14-614633	3–4	QBT4	—	—	—	—	—	—	—	—	0.0015 (J)
RE14-11-24464	14-614634	0–1	SOIL	NA	—	NA	—	—	NA	—	2.8 (J)	NA
RE14-11-24466	14-614635	0–1	SOIL	NA	0.074 (J)	NA	0.048 (J)	0.055 (J)	NA	0.048 (J)	2.6 (J)	NA
RE14-11-24467	14-614635	3–4	QBT4	0.0003 (J)	—	0.0058 (J)	—	—	0.0014 (J)	—	—	—
RE14-11-24468	14-614636	0–1	SOIL	NA	—	NA	—	—	NA	—	0.36 (J)	NA

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

[a] SSLs are from NMED (2009, 108070).

[b] Isopropylbenzene used as a surrogate based on structural similarity.

[c] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

[d] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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.

[g] NA = Not analyzed.

Table 6.20-1
Samples Collected and Analyses Requested at AOC C-14-009

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Explosive Compounds	TAL Metals	PCBs	Perchlorate	SVOCs	VOCs	Cyanide (Total)
RE14-11-24417	14-614615	0–1	SOIL	11-3112	11-3111	11-3112	—*	11-3112	11-3111	—	11-3112
RE14-11-24418	14-614615	3–4	QBT4	11-3112	11-3111	11-3112	—	11-3112	11-3111	11-3111	11-3112
RE14-11-24419	14-614616	0–1	QBT4	11-3112	11-3111	11-3112	—	11-3112	11-3111	—	11-3112
RE14-11-24420	14-614616	3–4	QBT4	11-3112	11-3111	11-3112	—	11-3112	11-3111	11-3111	11-3112
RE14-11-24421	14-614617	0–1	QBT4	11-3112	11-3111	11-3112	—	11-3112	11-3111	—	11-3112
RE14-11-24422	14-614617	3–4	QBT4	11-3112	11-3111	11-3112	—	11-3112	11-3111	11-3111	11-3112
RE14-11-24423	14-614618	0–1	SOIL	11-3112	11-3111	11-3112	—	11-3112	11-3111	—	11-3112
RE14-11-24424	14-614618	3–4	QBT4	11-3112	11-3111	11-3112	—	11-3112	11-3111	11-3111	11-3112
RE14-11-24425	14-614619	0–1	QBT4	11-3112	11-3111	11-3112	11-3111	11-3112	11-3111	—	11-3112
RE14-11-24426	14-614619	3–4	QBT4	11-3112	11-3111	11-3112	11-3111	11-3112	11-3111	11-3111	11-3112

*— = Analysis not requested.

Table 6.20-2
Inorganic Chemicals above BVs at AOC C-14-009

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Barium	Cobalt	Copper	Cyanide (Total)	Lead	Manganese	Nitrate	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**46**	**3.14**	**4.66**	**0.5**	**11.2**	**482**	**na[b]**	**0.3**
Soil BV[a]				**29200**	**0.83**	**295**	**8.64**	**14.7**	**0.5**	**22.3**	**671**	**na**	**1.52**
Construction Worker SSL[c]				**40700**	**124**	**4350**	**34.6[d]**	**12400**	**6190**	**800**	**463**	**496000**	**1550**
Industrial SSL[c]				**1130000**	**454**	**224000**	**300[e]**	**45400**	**22700**	**800**	**145000**	**1820000**	**5680**
Residential SSL[c]				**78100**	**31.3**	**15600**	**23[e]**	**3130**	**1560**	**400**	**10700**	**125000**	**391**
RE14-11-24417	14-614615	0–1	SOIL	—[f]	—	—	—	—	0.54 (UJ)	30.1	—	2.8	—
RE14-11-24418	14-614615	3–4	QBT4	—	—	59	—	—	0.52 (UJ)	—	—	0.22	1.1
RE14-11-24419	14-614616	0–1	QBT4	—	—	79.9	—	5.5 (J)	0.57 (UJ)	42.2	—	2.8	0.58
RE14-11-24420	14-614616	3–4	QBT4	—	—	79.2	—	—	0.53 (UJ)	66.7	598	0.12 (J)	1.1
RE14-11-24421	14-614617	0–1	QBT4	—	0.53 (U)	69.7	—	—	0.53 (UJ)	—	—	3.8	0.82
RE14-11-24422	14-614617	3–4	QBT4	—	—	50.7	—	—	0.53 (UJ)	—	—	0.33	1.3
RE14-11-24423	14-614618	0–1	SOIL	—	—	—	—	—	0.53 (UJ)	—	—	1.4	—
RE14-11-24424	14-614618	3–4	QBT4	—	—	—	—	—	0.51 (UJ)	—	—	0.18 (J)	0.8
RE14-11-24425	14-614619	0–1	QBT4	7550	—	99.6	3.8	—	0.52 (UJ)	12.3	—	1.1	0.89
RE14-11-24426	14-614619	3–4	QBT4	—	0.51 (U)	—	—	—	0.51 (UJ)	—	—	0.19 (J)	1.3

Notes: Results are in mg/kg. Data qualifiers are defined 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 calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters 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 6.20-3
Organic Chemicals Detected at AOC C-14-009

Sample ID	Location ID	Depth (ft)	Media	Acetone	Chloroform	Methylene Chloride	TATB
Construction Worker SSL[a]				**263000**	**671**	**10600**	**8760**[b,c]
Industrial SSL[a]				**851000**	**31.9**	**1090**	**27000**[b,d]
Residential SSL[a]				**67500**	**5.72**	**199**	**2200**[b,d]
RE14-11-24418	14-614615	3–4	QBT4	0.0088 (J)	—[e]	—	—
RE14-11-24419	14-614616	0–1	QBT4	NA[f]	NA	NA	0.57 (J)
RE14-11-24420	14-614616	3–4	QBT4	—	—	0.002 (J)	—
RE14-11-24422	14-614617	3–4	QBT4	—	0.00045 (J)	0.0043 (J)	—
RE14-11-24424	14-614618	3–4	QBT4	—	—	0.0027 (J)	—
RE14-11-24426	14-614619	3–4	QBT4	—	—	0.0027 (J)	—

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

[a] SSLs are from NMED (2009, 108070).

[b] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

[c] SSLs calculated using toxicity value from EPA regional screening tables (http://www.epa.gov.earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

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

[e] — = Not detected.

[f] NA = Not analyzed.

Table 8.1-1
Summary of Investigation Results and Recommendations

Consolidated Unit	SWMU/AOC	Site Description	Extent Defined?	Potential Unacceptable Risk/Dose?	Recommendations
	AOC 14-001(a)	Pull box	Yes	No	Corrective actions complete without controls
	AOC 14-001(b)	Pull box	Yes	No	Corrective actions complete without controls
	AOC 14-001(c)	Pull box	Yes	No	Corrective actions complete without controls
	AOC 14-001(d)	Pull box	Yes	No	Corrective actions complete without controls
	AOC 14-001(e)	Pull box	Yes	No	Corrective actions complete without controls
	AOC 14-001(g)	Firing site	n/a*	n/a	Delayed investigation
14-002(a)-99	AOC 14-001(f)	Bullet test facility	n/a	n/a	Deferred
	SWMU 14-002(a)	Former firing site	n/a	n/a	Deferred
	SWMU 14-002(b)	Former firing site	n/a	n/a	Deferred
	SWMU 14-002(f)	Former structure	n/a	n/a	Delayed investigation
	SWMU 14-009	Surface disposal area	No	n/a	Additional extent sampling; Removal of uranium-238 above construction worker SAL
	SWMU 14-010	Former sump	No	n/a	Additional extent sampling
	AOC C-14-008	Former magazine	No	n/a	Additional extent sampling
14-002(c)-99	SWMU 14-002(c)	Decommissioned firing site	No	n/a	Additional extent sampling
	SWMU 14-002(d)	X-unit chamber	n/a	n/a	Deferred
	SWMU 14-002(e)	X-unit chamber	n/a	n/a	Deferred
	SWMU 14-003	Former burning area	Yes	No	Corrective actions complete without controls
	AOC 14-004(a)	Storage area	n/a	n/a	Delayed investigation
	SWMU 14-004(b)	Satellite accumulation area	n/a	n/a	NFA
	AOC 14-004(c)	Storage area	n/a	n/a	NFA
	SWMU 14-005	Incinerator	n/a	n/a	Subject to RCRA Closure
	SWMU 14-006	Decommissioned sump and outfall	No	n/a	Additional extent sampling; Removal of benzo(a)pyrene above industrial SSL
	SWMU 14-007	Decommissioned septic system	No	n/a	Additional extent sampling
	AOC 14-008	Landfill and surface disposal	n/a	n/a	NFA

Table 8.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Extent Defined?	Potential Unacceptable Risk/Dose?	Recommendations
	AOC C-14-001	Former magazine	Yes	No	Corrective actions complete without controls
	AOC C-14-002	Former building	n/a	n/a	Delayed investigation
	AOC C-14-003	Former building	n/a	n/a	Delayed investigation
	AOC C-14-004	Former building	No	n/a	Additional extent sampling
	AOC C-14-005	Former building	No	n/a	Additional extent sampling
	AOC C-14-007	Former building	No	n/a	Additional extent sampling
	AOC C-14-009	Former magazine	No	n/a	Additional extent sampling

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

2-ADNT	amino-4,6-dinitrotoluene(2-)
4-ADNT	amino-2,6-dinitrotoluene(4-)
AK	acceptable knowledge
ALARA	as low as reasonably achievable
amsl	above mean sea level
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
DAF	dilution attenuation factor
DL	detection limit
DOE	Department of Energy (U.S.)
dpm	disintegration(s) per minute
Eh	oxidation-reduction potential
EP	Environmental Programs [Directorate]
EPA	Environmental Protection Agency (U.S.)
EPC	exposure point concentration
EQL	estimated quantitation limit
ESL	ecological screening level
FIP	field implementation plan
FV	fallout value
GNSS	Global Navigation Satellite System
HE	high explosives
HI	hazard index
HIR	historical investigation report
HMX	tetranitro-1,3,5,7-tetrazocine(1,3,5,7-)
HQ	hazard quotient
HR	home range
HWFP	Hazardous Waste Facility Permit

ICS	interference check sample
ICV	initial calibration verification
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
LANL	Los Alamos National Laboratory
LCS	laboratory control sample
LOAEL	lowest observed adverse effect level
MDC	minimum detectable concentration
MDL	method detection limit
mm Hg	millimeters of mercury
MS	matrix spike
MSD	matrix spike duplicate
MSW	municipal solid waste
ND	not detected
NFA	no further action
NMED	New Mexico Environment Department
NOAEL	no observed adverse effect level
%R	percent recovery
%RSD	percent relative standard deviation
PAUF	population area use factor
PCB	polychlorinated biphenyl
PETN	pentaerythritol tetranitrate
PID	photoionization detector
PRG	preliminary remediation goal
QA	quality assurance
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RESRAD	residual radioactive (a computer model)
RCRA	Resource Conservation and Recovery Act
RCT	radiation control technician
RDA	recommended daily allowance
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RfD	reference dose

RFI	RCRA facility investigation
RL	reporting limit
RME	reasonable maximum exposure
RPD	relative percent difference
RPF	Records Processing Facility
RRF	relative response factor
SAL	screening action level
SCL	sample collection log
SF	slope factor
SMA	site monitoring area
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
SWSC	Sanitary Wastewater Systems Consolidation
T&E	threatened and endangered
TA	technical area
TATB	triaminotrinitrobenzene
TAL	target analyte list
TCDD	tetrachlorodibenzo-p-dioxin(2,3,7,8-)
TEF	toxicity equivalency factor
TNT	trinitrotoluene(2,4,6-) (dynamite)
TRV	toxicity reference value
UAL	upper acceptance limit
UCL	upper confidence limit
VCA	voluntary corrective action
VOC	volatile organic compound
WCSF	waste characterization strategy form

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 2011 investigation of the Technical Area 14 (TA-14) portion of the Cañon de Valle Aggregate Area at Los Alamos National Laboratory (LANL or the 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 the most current version of approved subcontractor procedures that are technically equivalent to Laboratory standard operating procedures (SOPs) listed in Table B-1.0-2, available at http://www.lanl.gov/environment/all/qa.shtml.

B-2.0 EXPLORATORY DRILLING CHARACTERIZATION

No exploratory drilling characterization was conducted during the 2011 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 3.2.2 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 using a MiniRAE 2000 photoionization detector (PID) equipped with an 11.7-electronvolt lamp. Screening was performed in accordance with the manufacturer's specifications and SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector. Screening measurements were recorded on the field sample collection logs (SCLs)/ chain-of-custody (COC) forms, provided on DVD in Appendix D. 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 SCL/COC forms and are provided in Appendix D on DVD. The screening results are presented in Table 3.2-2 of the investigation report.

B-3.3 Field Screening for High Explosives

Before they were collected, all samples were field screened for high explosives (HE) using an HE spot test kit that detects most of the common HE. The detection limit of the test is approximately 100 to

200 ppm. The test is used strictly for qualitative analysis and can be performed on pure materials as well as contaminated soil, solvents, and equipment. The test consists of three reagents that are sequentially dropped on a small amount of sample. The spot test is performed by placing a small amount of sample on a piece of filter paper. A few drops of the first reagent are added to the paper, and the sample is observed for color. After the first reagent is dropped, a drop of the second and then the third reagent are added and the sample is again observed for color. No color change was observed, and all HE spot tests returned negative results during the TA-14 investigation. HE spot test results were recorded on the SCL/COC forms provided on DVD in Appendix D.

B-4.0 FIELD INSTRUMENT CALIBRATION AND OPERATIONAL CHECK

An instrument calibration and/or functional check were completed daily. Several environmental factors affected the instruments' integrity, including air temperature, atmospheric pressure, wind speed, and humidity. A daily operational check of the PID was conducted by the site-safety officer. The RCT calibrated the Eberline E-600 instrument according to the manufacturer's specifications and requirements.

B-4.1 MiniRAE 2000 Instrument Operational Check

The MiniRAE 2000 PID was checked daily both to ambient air and a standard reference gas (100 ppm isobutylene). The ambient-air check determined the zero point of the instrument sensor calibration curve in ambient air. The check with the standard reference gas determined a second point of the sensor calibration curve. Each calibration was within 10% of 100 ppm isobutylene, qualifying the instrument for use.

The following information was recorded daily on daily operational check 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 instrument operational check

All daily operational checks for the MiniRAE 2000 PID met the manufacturer's specifications for standard reference gas calibration. The daily operational check results were recorded in the field logbook.

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 and the applicable radiation detection instrument manual. Calibration results were recorded on the radiological survey forms.

B-5.0 SURFACE AND SUBSURFACE SAMPLING

This section summarizes the methods used to collect surface and subsurface samples, including soil, tuff, and sediment samples, according to the field implementation plan (FIP) (LANL 2011, 207481).

B-5.1 Surface Sampling Methods

Surface samples were collected 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 Sampling, 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. Samples for volatile organic compound (VOC) analysis were collected immediately to minimize the loss of subsurface VOCs during the sample collection process. Containers for VOC samples were filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. Table B-1.0-1 provides additional details on collection of samples for VOC analysis. The description is specific to the sampling method rather than to the media (e.g., soil samples are collected using the spade-and-scoop method in the same manner as sediment samples). The remaining 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 they were transported to the SMO. Samples were managed in accordance with an approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and WES-EDA-QP-219, 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

Boreholes were not drilled to collect subsurface samples at any location. At all locations, samples were collected at the depths specified in the FIP using hand augers, occasionally assisted by power auger where necessary. Therefore, no boreholes logs were generated.

B-5.3 Subsurface Tuff Sampling Methods

Subsurface samples were collected in accordance with an approved subcontractor procedures technically equivalent to SOP-06.10, Hand Auger Sampling.

Subsurface samples were collected using the hand auger method, assisted by a power auger where necessary. Samples for VOC analysis were collected immediately to minimize the loss of subsurface VOCs during the sample collection process. Containers for VOC samples were filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. Table B-1.0-1 provides additional details on collection of samples for VOC analysis. The description is specific to the sampling method rather than to the media (e.g., soil samples are collected using the hand auger method in the same manner as sediment samples). The remaining 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 they were transported to the SMO. Samples were managed in accordance with an approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and WES-EDA-QP-219, 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-5.4 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 inorganic chemicals (target analyte list metals, cyanide, nitrate, and perchlorate) and were collected from sampling equipment at a frequency of at least 1 rinsate sample for every 10 solid samples.

Field trip blanks were collected at a frequency of one per day when samples were collected for VOCs. 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/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 containers were removed from the site. The samples were transported to the SMO for processing and shipment to off-site contract analytical laboratories. The SMO personnel reviewed and approved the SCLs/COC forms and accepted custody of the samples.

B-5.6 Borehole Abandonment

No boreholes were drilled during the 2011 investigation. Hand-auger sampling locations were backfilled with cuttings. Power-auger was used where necessary. The cuttings from the power-auger sampling locations were managed as investigation-derived waste (IDW), as discussed in Appendix E. All power-auger sampling locations 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.

B-5.7 Decontamination of Sampling Equipment

All sampling equipment that came (or could have come) in contact with sample material was decontaminated after each sample was retrieved. 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.

B-5.8 Site Demobilization and Restoration

Before sampling equipment was removed from the site, a Laboratory RCT screened the equipment for radioactivity to ensure all equipment was clean of site contamination. All staging areas were dismantled and returned to preinvestigation conditions. All disturbed areas were recontoured.

B-6.0 GEODETIC SURVEYING

Geodetic surveys of all sampling locations were performed using a Trimble R8 Global Navigation Satellite System (GNSS) 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 Trimble R8 GNSS instrument referenced from Laboratory control points is accurate to 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 regulations, U.S. Department of Energy orders, and Laboratory implementation requirements. IDW was also managed in accordance with the approved waste characterization strategy form (WCSF) and the IDW management appendix of the approved investigation work plan (LANL 2006, 091698; NMED 2007, 095478). Details of IDW management for the TA-14 investigation are presented in Appendix E.

B-8.0 DEVIATIONS FROM THE FIP

After the Cañon de Valle Aggregate Area investigation work plan (LANL 2006, 091698) was approved in 2007 (NMED 2007, 095478), the Laboratory's Environmental Programs (EP) Directorate, in cooperation with and with the consent of the New Mexico Environment Department (NMED), revised and improved investigation sampling for sites regulated by the Compliance Order on Consent. A FIP for the TA-14 sites

(LANL 2011, 207481) was developed in 2011 to incorporate current strategies of collecting field samples and also to incorporate the modifications requested by NMED in its approval with modification of the work plan in a letter issued on February 9, 2007 (NMED 2007, 095478). Table 3.0-1 of the investigation report is a crosswalk that presents the sampling activities implemented in this report compared with the sampling activities proposed in the 2006 work plan (LANL 2006, 091698). In addition, deviations occurred while field activities were conducted as defined in the FIP (LANL 2011, 207481). The deviations did not adversely affect the completion or the results of the investigation. Specific deviations are described below.

- Sampling was proposed at Area of Concern (AOC) 14-004(a) in the FIP (LANL 2011, 207481, p. 5). However, during field activities, the storage magazine (structure 14-22) was found to be in use and the floor is concrete instead of an earthen floor as originally believed. Investigation of AOC 14-004(a) will be delayed until the decommissioning of the magazine (structure 14-22).
- The septic tank at Solid Waste Management Unit 14-007 was proposed to be removed in the FIP (LANL 2011, 207481, p. 6). Because of the TA-14 facility HE safety concerns associated with removing the tank, the septic tank was filled with concrete during field activities, and samples were collected next to the septic tank.
- Sampling was proposed at AOC C-14-003 in the FIP (LANL 2011, 207481, pp. 6–7). However, a 1946 aerial photo was found during the investigation, and the site boundary was subsequently modified based on this new information (section 6.16.4). The revised site boundary is partially covered by the berm area north of the active storage magazine (structure 14-22) [AOC 14-004(a)]. Investigation at AOC C-14-003 will be delayed until the decommissioning of the AOC 14-004(a) magazine.

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 EP 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), September 2006. "Investigation Work Plan for Cañon de Valle Aggregate Area," Los Alamos National Laboratory document LA-UR-06-4960, Los Alamos, New Mexico. (LANL 2006, 091698)

LANL (Los Alamos National Laboratory), April 2011. "Field Implementation Plan for Cañon de Valle Aggregate Area Investigation, TA-14," Los Alamos National Laboratory document LA-UR-11-6344, Los Alamos, New Mexico. (LANL 2011, 207481)

NMED (New Mexico Environment Department), February 9, 2007. "Approval with Modifications for the Investigation Work Plan for Cañon de Valle Aggregate Area," 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 2007, 095478)

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. Samples for VOC analysis were transferred immediately into sample containers. Containers for VOC analysis were filled as completely as possible and sealed with Teflon-lined caps. The remaining sample material 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 it 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), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth was reached during sampling, the auger was decontaminated before the hole was advanced through the sampling depth. Samples for VOC analysis were transferred immediately into sample containers. Containers for VOC analysis were filled as completely as possible and sealed with Teflon-lined caps. The remaining sample material was placed in a clean stainless-steel bowl for transfer into various sample containers.
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 a standard form generated by the SMO. These included the SCLs/COC form and sample container labels. SCL/COC forms 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 and verified the samples were not left unattended. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around each sample container.
Field QC 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 daily 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 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 R8 GNSS. The survey data conformed to Laboratory Information Architecture project standards IA-CB02, GIS Horizontal 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 and strategy form that documents the site history, field activities, and characterization approach for each waste stream managed. 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 the containers from deteriorating. A waste storage area was established before waste was generated. Waste storage areas were located in controlled areas of the Laboratory to prevent unauthorized personnel from inadvertently adding or managing wastes. 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 E.

Table B-1.0-2
SOPs Used for Investigation Activities Conducted at TA-14

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
WES-EDA-QP-219, 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 Sampling
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

Analytical Program

C-1.0 INTRODUCTION

This appendix discusses the analytical methods and data-quality review for samples collected during investigations of the Technical Area 14 (TA-14) portion of the Cañon de Valle 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 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 include method blanks, matrix spikes (MSs), laboratory control samples (LCSs), internal standards (IS), 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 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-5169, Routine Validation of Dioxin Furan Analytical Data (EPA Method 1618 and SW-846 EPA Method 8290)
- 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 D (on DVD included with this document). The analytical data, instrument printouts, and data validation reports are also provided in Appendix D.

C-2.0 ANALYTICAL DATA ORGANIZATION

Decision-level historical data evaluated in this investigation report were collected during Resource Conservation and Recovery Act facility investigations and voluntary corrective actions. These data are determined to be of sufficient quality for decision-making purposes and have been reviewed and revalidated to current QA standards.

C-3.0 INORGANIC CHEMICAL ANALYSES

A total of 267 samples (plus 29 field duplicates) collected at TA-14, within the Cañon de Valle Aggregate Area, were analyzed for inorganic chemicals. A total of 267 samples (plus 29 field duplicates) were analyzed for target analyte list (TAL) metals; 255 samples (plus 26 field duplicates) were analyzed for nitrate; 255 samples (plus 26 field duplicates) were analyzed for perchlorate; 255 samples (plus 26 field duplicates) were analyzed for total cyanide; and 12 samples (plus 3 field duplicates) were analyzed for total uranium. The analytical methods used for inorganic chemicals are listed in Table C-1.0-1.

Tables in the investigation report summarize the samples collected and the analyses requested for the investigation of the 18 sites investigated at TA-14. All the analytical results are presented in Appendix D (on DVD included with this document).

C-3.1 Inorganic Chemical QA/QC Samples

QA/QC samples are used to measure 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, this investigation included analyses of LCSs, method blanks, MSs, laboratory duplicate samples, interference check samples (ICSs), and serial dilution samples. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 049738; 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 inorganic chemicals in soil or tuff, LCS percent recoveries (%R) should fall within the control limits of 75% to 125% (LANL 1995, 049738; LANL 2008, 109962).

The 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 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% to 125%, inclusive, for all spiked analytes (LANL 1995, 049738; 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 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% to 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%.

C-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 this data.

A total of 56 nitrate, 34 perchlorate, 556 TAL metal, and 9 total cyanide results were qualified as estimated (J) because the analytical laboratory qualified the detected result as estimated.

C-3.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples analyzed for inorganic chemicals (see Appendix D on DVD).

C-3.2.2 Sample Documentation

All samples analyzed for inorganic chemicals were properly documented on SCL/COC forms in the field (see Appendix D on DVD).

C-3.2.3 Sample Dilutions

Some samples were diluted for inorganic chemical analyses. No qualifiers were applied to any inorganic chemical sampling results because of dilutions.

C-3.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for inorganic chemicals.

C-3.2.5 Holding Times

Eighteen total cyanide results were qualified as estimated not detected (UJ) because the extraction holding time was exceeded by 2 times the acceptable holding time.

C-3.2.6 ICVs and CCVs

A total of 136 TAL metal results were qualified as not detected (U) because the sample result was less than or equal to the 5 times the concentration of the related analyte in the ICV/CCV.

C-3.2.7 Interference Check Sample and/or Serial Dilutions

Interference check and serial dilution criteria were met for all samples analyzed for inorganic chemicals.

C-3.2.8 Laboratory Duplicate Samples

A total of 124 TAL metal 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 greater than 35% for soil samples

C-3.2.9 Blanks

A total of 106 TAL metal results were qualified as estimated (J) because the analyte was detected in the method blank but was greater than 5 times the RL.

One total cyanide, 103 TAL metal, and 2 total uranium 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.

One total cyanide, 11 nitrate, and 223 TAL metal results were qualified as not detected (U) because the sample result was less than or equal to the 5 times the concentration of the related analyte in the trip blank or equipment rinsate blank.

C-3.2.10 MS Samples

A total of 217 TAL metal results were qualified as estimated and biased low (J-) because the associated MS recovery was below the lower acceptance limit (LAL) but greater than 10%.

A total of 125 TAL metal results were qualified as estimated and biased high (J+) because the associated MS recovery was above the upper acceptance limit (UAL).

Six TAL metal results were qualified as estimated not detected (UJ) because the associated MS recovery was below the LAL but greater than 10%.

Six TAL metal results were qualified as estimated not detected (UJ) because the associated MS recovery was above the UAL.

C-3.2.11 LCS Recoveries

No qualifiers were applied to any inorganic chemical results because of LCS recovery issues.

C-3.2.12 Detection Limits

Seven TAL metal results were qualified as estimated (J) because the results were between the estimated detection limit and the MDL.

C-3.2.13 Rejected Results

No inorganic chemical data were rejected. The results of the qualified data were used as reported and do not affect the usability of the sampling results.

C-4.0 ORGANIC CHEMICAL ANALYSES

A total of 283 samples (plus 30 field duplicates) collected at TA-14 were analyzed for organic chemicals. A total of 148 samples (plus 11 field duplicates) were analyzed for volatile organic chemicals (VOCs); 255 samples (plus 26 field duplicates) were analyzed for semivolatile organic chemicals (SVOCs); 78 samples (plus 24 field duplicates) were analyzed for polychlorinated biphenyls (PCBs); 273 samples (plus 29 field duplicates) were analyzed for explosives compounds; and 26 samples (plus 3 field duplicates) were analyzed for dioxins/furans. All QC procedures were followed as required by the analytical laboratory SOWs (LANL 1995, 049738; LANL 2008, 109962). The analytical methods used for organic chemicals are listed in Table C-1.0-1.

Tables in the investigation report summarize the samples collected and the analyses requested for the TA-14 sites investigated. All organic chemical results are provided on DVD in Appendix D.

C-4.1 Organic Chemical QA/QC Samples

QA/QC samples are used to measure 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 organic chemical analyses, this investigation included calibration verifications and the analysis of LCSs, method blanks, MSs, surrogates, and ISs. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 049738; 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. Initial calibration verifies the accuracy of the calibration curve as well as the individual calibration standards used to perform the calibration. Continuing calibration ensures that the initial calibration is still holding and correct as the instrument is used to process samples. 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 be 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 normally is not 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 may occur during analysis. ISs are used as the basis for quantitation of target analytes. The %R for ISs should be within the range of 50%–200%.

C-4.2 Data-Quality Results for Organic Chemicals

The majority of the analytical results for organic chemicals were either not assigned a qualifier or qualified as not detected (U) because the analytes were not detected by the respective analytical methods. These data do not have any quality issues associated with the values presented.

A total of 72 dioxin/furan, 13 HE, 101 SVOC, and 44 VOC results were qualified as estimated (J) because the analytical laboratory qualified the detected result as estimated.

Thirteen dioxin/furan results were qualified as not detected (U) because the project chemist identified quality deficiencies in the reported data that required further qualification.

Six HE results were qualified as estimated (J) because the contract-required detection limit check standard sample did not pass the method acceptance criteria.

A total of 92 HE results were qualified as estimated not detected (UJ) because the contract-required detection limit check standard sample did not pass the method acceptance criteria.

A total of 112 HE results were qualified as estimated not detected (UJ) because the required contract-required detection limit check standard sample information was missing.

C-4.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples analyzed for organic chemicals (see Appendix D on DVD).

C-4.2.2 Sample Documentation

All samples analyzed for organic chemicals were properly documented on the SCL in the field (see Appendix D on DVD).

C-4.2.3 Sample Dilutions

Some samples were diluted for organic chemical analyses. No qualifiers were applied to any organic chemical sampling results because of dilutions.

C-4.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for organic chemicals.

C-4.2.5 Holding Times

Fourteen HE results were qualified as estimated and biased low (J-) because the extraction holding time was exceeded by less than 2 times the applicable holding time requirement.

A total of 242 HE and 302 SVOC results were qualified as estimated not detected (UJ) because the extraction holding time was exceeded by less than 2 times the applicable holding time requirement.

C-4.2.6 ICVs and CCVs

Twenty VOC results were qualified as estimated (J) because the affected analytes were analyzed with an initial calibration curve that exceeded the percent relative standard deviation (%RSD) criteria, and/or the associated multipoint calibration correlation coefficient was less than 0.995.

One VOC and 69 HE results were qualified as estimated (J) because the affected analytes were analyzed with a relative response factor (RRF) of less than 0.05 in the initial calibration and/or CCV.

One SVOC and nine HE results were qualified as estimated (J) because the ICV and/or CCV were recovered outside the method-specific limits.

A total of 175 VOC results were qualified as estimated not detected (UJ) because the affected analytes were analyzed with an initial calibration curve that exceeded the %RSD criteria and/or the associated multipoint calibration correlation coefficient was less than 0.995.

A total of 866 HE and 140 VOC results were qualified as estimated not detected (UJ) because the affected analytes were analyzed with an RRF of less than 0.05 in the initial calibration and/or CCV.

A total of 34 HE, 42 PCB, 250 SVOC, and 103 VOC results were qualified as estimated not detected (UJ) because the ICV and/or CCV were recovered outside the method-specific limits.

C-4.2.7 Surrogate Recoveries

Surrogate recovery criteria were met for all samples analyzed for organic chemicals.

C-4.2.8 IS Responses

Eight VOC results were qualified as estimated (J) because the quantitating IS area count was below 10% of the expected value.

One HE result was qualified as estimated and biased low (J-) because the IS area count for the quantitating IS was greater than 130% of the average of that obtained from the calibration standards.

Two SVOC results were qualified as not detected (U) because the mass spectrum did not meet specifications.

Four HE results were qualified as estimated not detected (UJ) because the IS area count for the quantitating IS was below 70% but above 25% of the average obtained from the calibration standards.

A total of 46 HE results were qualified as estimated not detected (UJ) because the IS area count for the quantitative IS was above 130% of the average of that obtained from the calibration standards.

C-4.2.9 Blanks

Three dioxin/furan and two VOC results were qualified as estimated (J) because the sample result was greater than 5 times the amount in the method blank.

Twelve dioxin/furan and 97 VOC results were qualified as not detected (U) because the associated sample concentration was less than or equal to 5 times the amount in the method blank.

Two VOC 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 trip blank or equipment rinsate blank.

C-4.2.10 MS Samples

Twenty HE results were qualified as estimated (J) because the MS/matrix spike duplicate (MSD) %R was above 10% but below 70%.

Six HE results were qualified as estimated (J) because the MS/MSD RPD was above 30%.

Eleven HE results were qualified as estimated and biased high (J+) because the MS/MSD %R was above 130%.

A total of 44 HE results were qualified as estimated not detected (UJ) because the MS/MSD %R was above 10% but below 70%.

A total of 47 HE results were qualified as estimated not detected (UJ) because the MS/MSD RPD was greater than 30%.

C-4.2.11 Laboratory Duplicate Samples

Laboratory duplicates collected for organic chemical analyses indicated acceptable precision for all samples.

C-4.2.12 LCS Recoveries

Seventeen SVOC results were qualified as estimated not detected (UJ) because the LCS %R was less than the LAL but greater than 10%.

C-4.2.13 Rejected Data

Five dioxin/furan results were qualified as rejected (R) because the IS retention time and qualitative criteria for target compound identification were not met.

Sixteen HE results were qualified as rejected (R) because the MS/MSD %R was below 10%.

A total of 24 HE results were qualified as rejected (R) because the required contract-required detection limit check standard sample information was missing.

Four HE results were qualified as rejected (R) because the affected results were not analyzed with a valid 5-point calibration curve and/or a standard at the RL.

Eight HE results were qualified as rejected (R) because the affected analytes were analyzed with an RRF of less than 0.05 in the initial calibration and/or CCV.

A total of 52 VOC results were qualified as rejected (R) because the quantitating IS area count was less than 10% of the expected value.

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 sites. The results of other qualified data were used as reported and do not affect the usability of the data.

C-5.0 RADIONUCLIDE ANALYSES

A total of 199 samples (plus 20 field duplicates) collected at TA-14 were analyzed for radionuclides. A total of 193 samples (plus 20 field duplicates) were analyzed for gamma-emitting radionuclides, 193 samples (plus 20 field duplicates) were analyzed for strontium-90, and 199 samples (plus 20 field duplicates) were analyzed for isotopic uranium. The analytical methods used for radionuclides are listed in Table C-1.0-1.

Tables in the investigation report summarize the samples collected and the analyses requested for the TA-14 sites investigated within the Cañon de Valle Aggregate Area. All radionuclide results are provided on DVD in Appendix D.

C-5.1 Radionuclide QA/QC Samples

To assess the accuracy and precision of radionuclide analyses, this investigation included analyses of LCSs, method blanks, MS samples, laboratory duplicate samples, and tracers. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 049738; 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% and 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 radionuclide 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% to 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 2008, 109962).

C-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. These data do not have any quality issues associated with the values presented.

All procedures were followed as required by the analytical services SOWs (LANL 1995, 049738; LANL 2008, 109962). Some sampling results were qualified as not detected (U) because the associated sample concentration was less than or equal to the MDC. Some sampling results were qualified as not detected (U) because the associated sample concentration was less than or equal to 3 times the total propagated uncertainty. This data qualification is related only to the detection status, not to the quality of the data.

C-5.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples (see Appendix D on DVD).

C-5.2.2 Sample Documentation

All samples were properly documented on the SCL/COC forms in the field (see Appendix D on DVD).

C-5.2.3 Sample Dilutions

Some samples were diluted for radionuclide analyses. No qualifiers were applied to any radionuclide sampling results because of dilutions.

C-5.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for radionuclides.

C-5.2.5 Holding Times

Holding-time criteria were met for all samples analyzed for radionuclides.

C-5.2.6 Method Blanks

Method blank criteria were met for all samples analyzed for radionuclides.

C-5.2.7 MS Samples

MS criteria were met for all samples analyzed for radionuclides.

C-5.2.8 Tracer Recoveries

A total of 23 isotopic uranium results were qualified as estimated and biased high (J+) because the tracer %R value was greater than the UAL.

C-5.2.9 LCS Recoveries

LCS recovery criteria were met for all samples analyzed for radionuclides.

C-5.2.10 Laboratory Duplicate Samples Recoveries

Twelve isotopic uranium results were qualified as estimated (J) because the associated duplicate sample had a duplicate error ratio or relative error ratio greater than the analytical laboratory acceptance limits.

C-5.2.11 Rejected Data

No radionuclide data were rejected. The results of the qualified data were used as reported and do not affect the usability of the sampling results.

C-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), 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 C-1.0-1
Inorganic Chemical, Organic Chemical, and Radionuclide Analytical Methods for Samples Collected in the Cañon de Valle Aggregate Area, TA-14

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, 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, uranium, vanadium, and zinc
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	PCBs
EPA SW-846:8240 EPA SW-846:8260 EPA SW-846:8260B	Gas chromatography mass spectrometry	VOCs
EPA SW-846:8270C	Gas chromatography mass spectrometry	SVOCs
EPA SW-846:8290	High-resolution gas chromatography/high-resolution mass spectrometry	Dioxins/furans
EPA SW-846: 8321A _MOD	High performance liquid chromatography	Explosive compounds
Radionuclides		
EPA 901.1	Gamma spectroscopy	Cesium-134, cesium-137, cobalt-60, and sodium-22
HASL Method 300:ISOPU HASL Method 300:ISOU	Chemical separation alpha spectrometry	Isotopic uranium
EPA 905.0	Gas proportional counting	Strontium-90

Appendix D

Analytical Suites and Results and Analytical Reports
(on DVD included with this document)

Appendix E

Investigation-Derived Waste Management

E-1.0 INTRODUCTION

This appendix contains the waste management records for the investigation-derived waste (IDW) generated during the field activities of the investigation of the Technical Area 14 (TA-14) portion of the Cañon de Valle Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). IDW generated during the field investigation was managed in accordance with Standard Operating Procedure (SOP) 5238, Characterization and Management of Environmental Program Waste. This procedure incorporates the requirements of applicable U.S. Environmental Protection Agency and New Mexico Environment Department 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. All available waste documentation, including WCSFs, waste profile forms, and land application packages, are provided in Attachment E-1 (on CD).

The selection of waste containers was based on 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 annual Los Alamos National Laboratory Hazardous Waste Minimization Report.

E-2.0 WASTE STREAMS

The IDW streams generated and managed during the investigation of the TA-14 sites within the Cañon de Valle Aggregate Area are described below and are summarized in Table E-2.0-1. The waste numbers correspond with those identified in the WCSF.

- *WCSF Waste Stream #1: Municipal Solid Waste (MSW)*—MSW consisted of noncontact trash and debris such as sample marking flags, wooden stakes, and pallets. Approximately 0.3 yd^3 of MSW was generated. This waste was determined to be nonhazardous and nonradioactive and was stored in plastic-lined trash cans and disposed of at the Los Alamos County, New Mexico, landfill.
- *WCSF Waste Stream #2: Drill Cuttings*—Drill cuttings from mechanized power-auguring sampling consisted of sediment, soil, and tuff removed during investigation activities. Approximately 0.66 yd^3 of drill cuttings was generated during this investigation and stored in 55-gal. drums. The cuttings were characterized per the WCSF, met the criteria in ENV-RCRA-QP-11.2, Land Application of Drill Cuttings, and were land applied at the point of generation.

- *WCSF Waste Stream #3: Contact Waste IDW*—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 0.13 yd^3 of contact waste was generated and was recycled through the Laboratory's Green Is Clean program.
- *WCSF Waste Streams #4 and #5*—No decontamination fluids or petroleum-contaminated soil was generated.

Table E-2.0-1
Summary of IDW Generation and Management

WCSF Waste Stream No.	Waste Stream	Waste Type	Volume	Characterization Method	On-Site Management	Disposition
1	MSW	MSW	0.3 yd^3	AK	Plastic bags	Disposal path: Los Alamos County, NM, landfill
2	Drill cuttings	Land applied	0.66 yd^3	Direct container sampling	55-gal. drum	Land application
3	Contact waste	Industrial	0.13 yd^3	AK and analytical results of site characterization samples	5 gal. poly container	Recycled through Green Is Clean program

Attachment E-1

Waste Documentation
(on CD included with this document)

Appendix F

Box Plots and Statistical Results

F-1.0 BOX PLOTS FOR SWMU 14-009

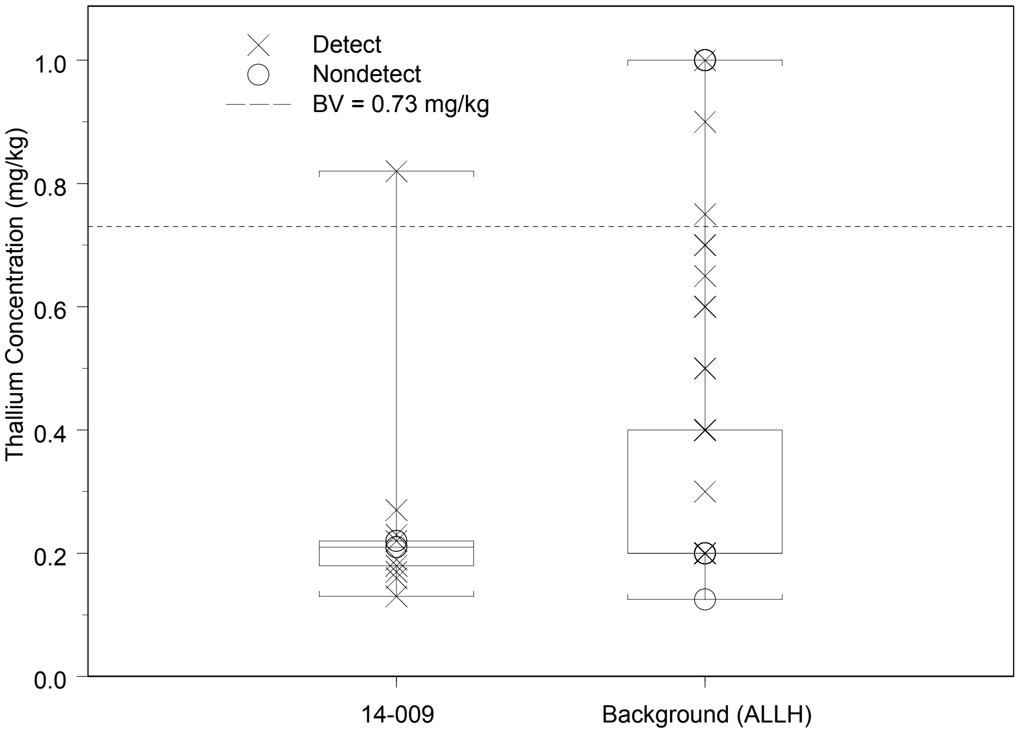


Figure F-1.0-1 Box plot of thallium in soil at SWMU 14-009

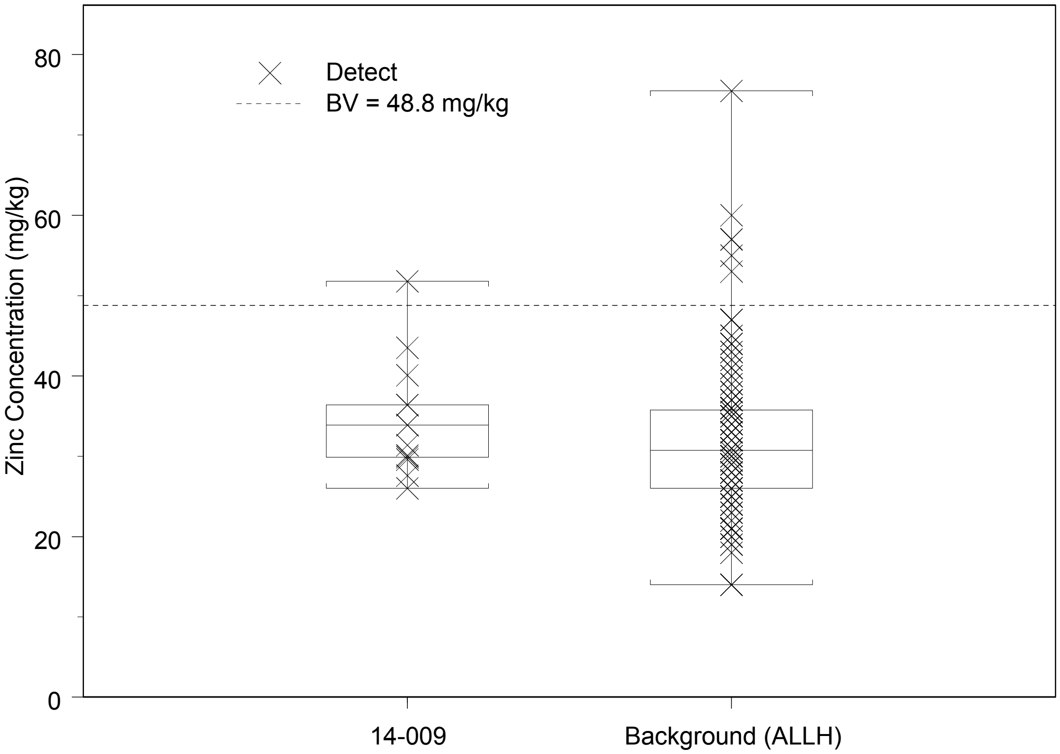


Figure F-1.0-2 Box plot of zinc in soil at SWMU 14-009

F-2.0 BOX PLOTS FOR SWMU 14-003

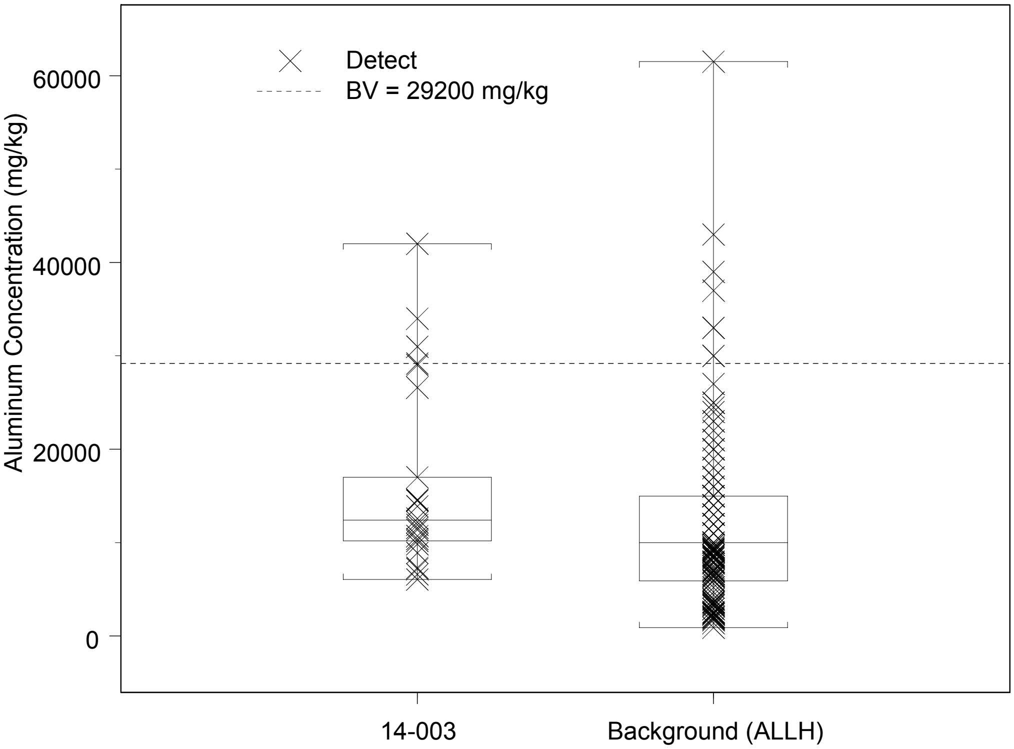


Figure F-2.0-1 Box plot of aluminum in soil at SWMU 14-003

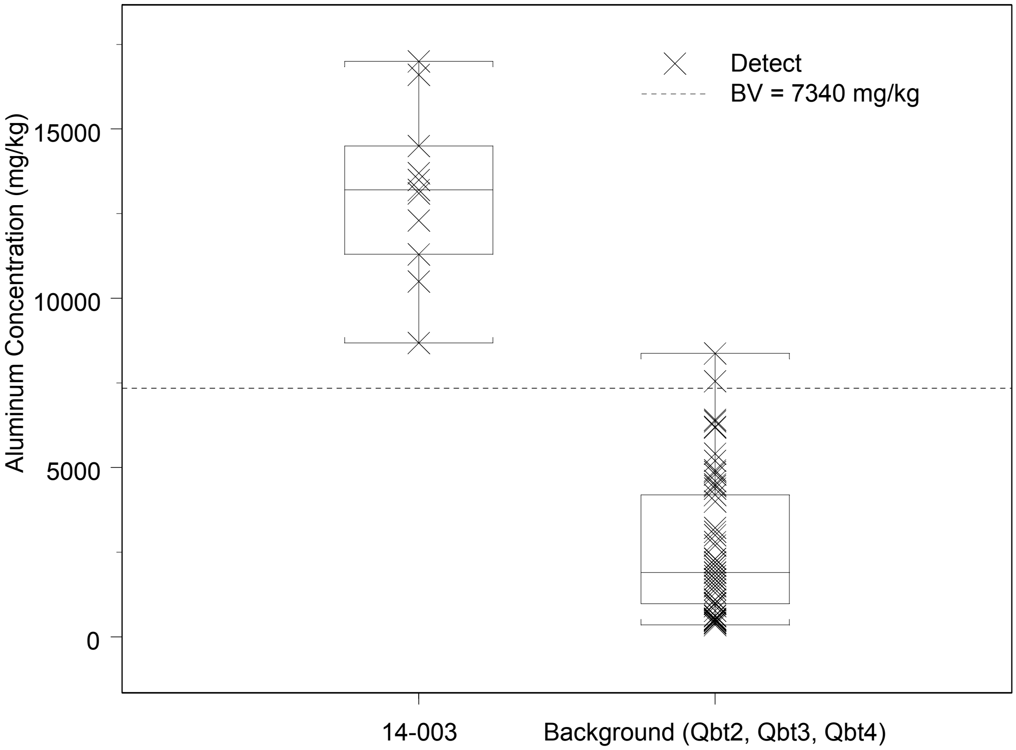


Figure F-2.0-2 Box plot of aluminum in Qbt 4 at SWMU 14-003

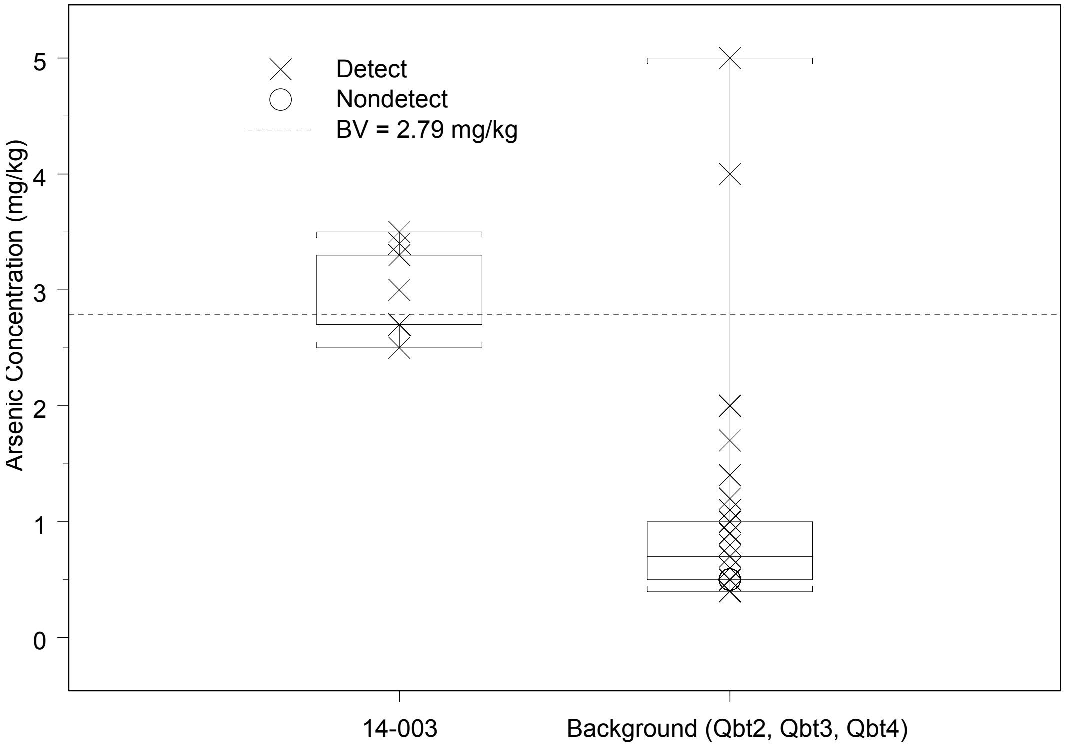


Figure F-2.0-3 **Box plot of arsenic in Qbt 4 at SWMU 14-003**

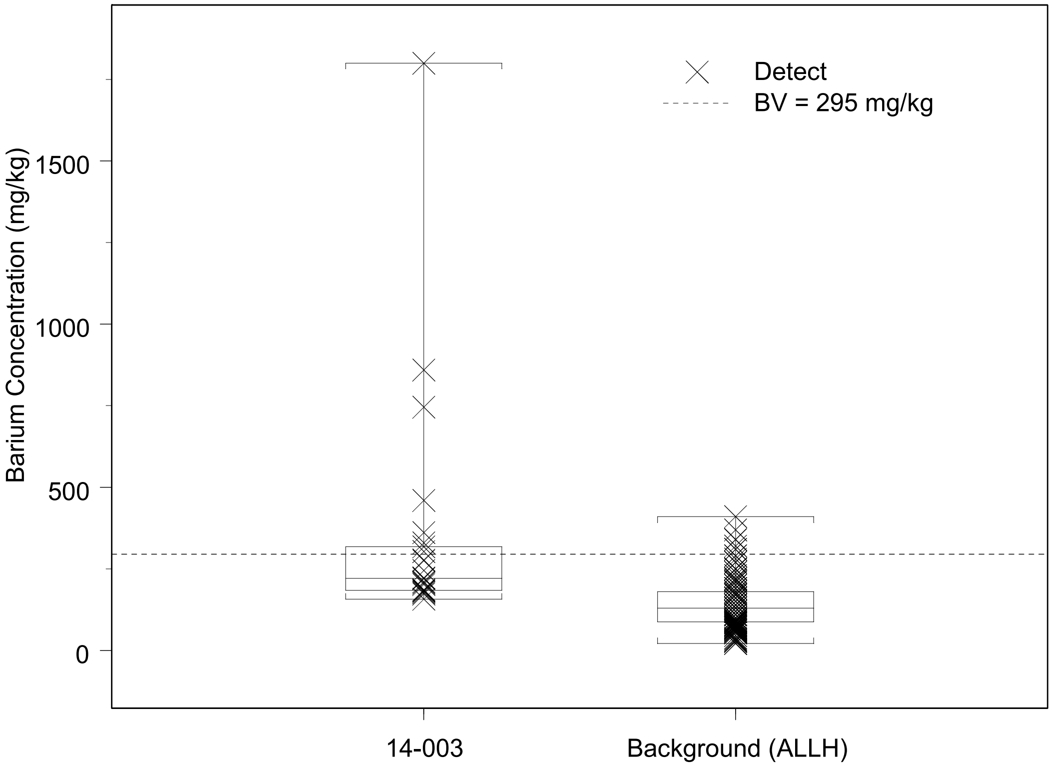


Figure F-2.0-4 **Box plot of barium in soil at SWMU 14-003**

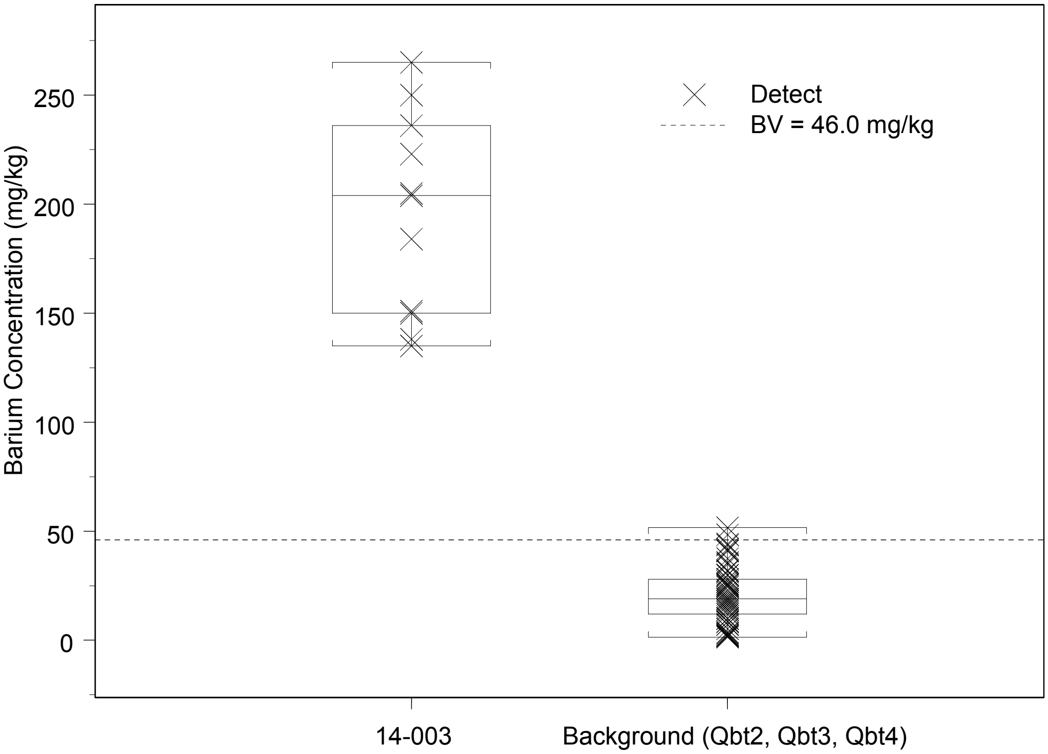


Figure F-2.0-5 Box plot of barium in Qbt 4 at SWMU 14-003

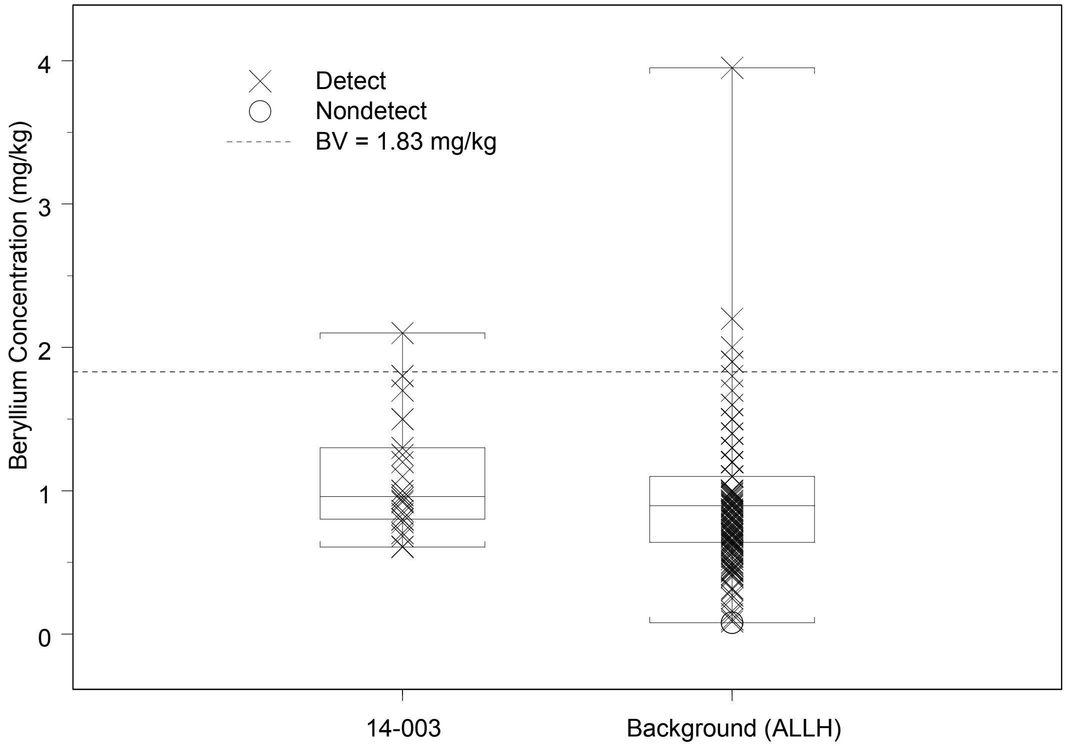


Figure F-2.0-6 Box plot of beryllium in soil at SWMU 14-003

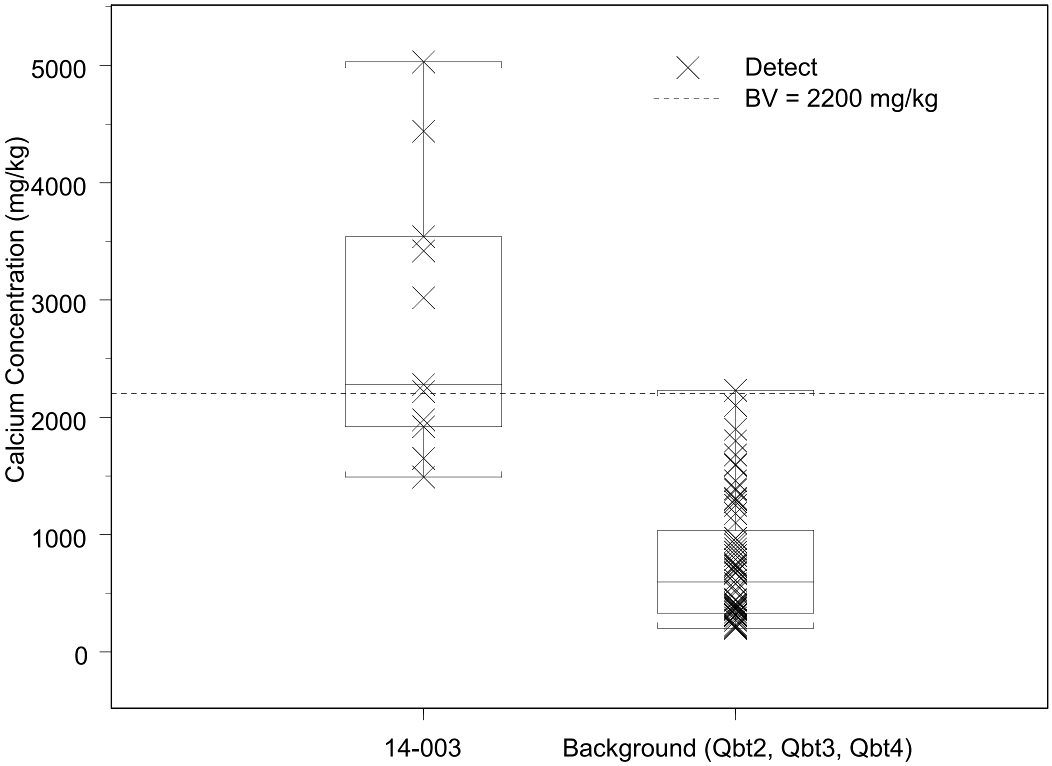


Figure F-2.0-7 Box plot of calcium in Qbt 4 at SWMU 14-003

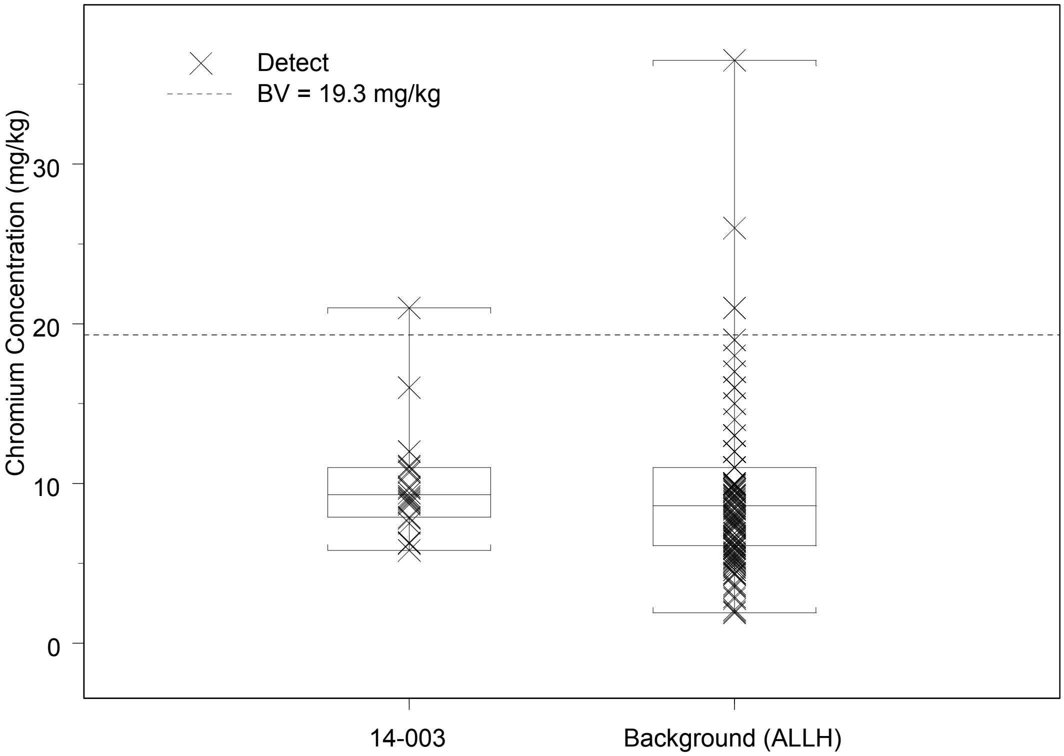


Figure F-2.0-8 Box plot of chromium in soil at SWMU 14-003

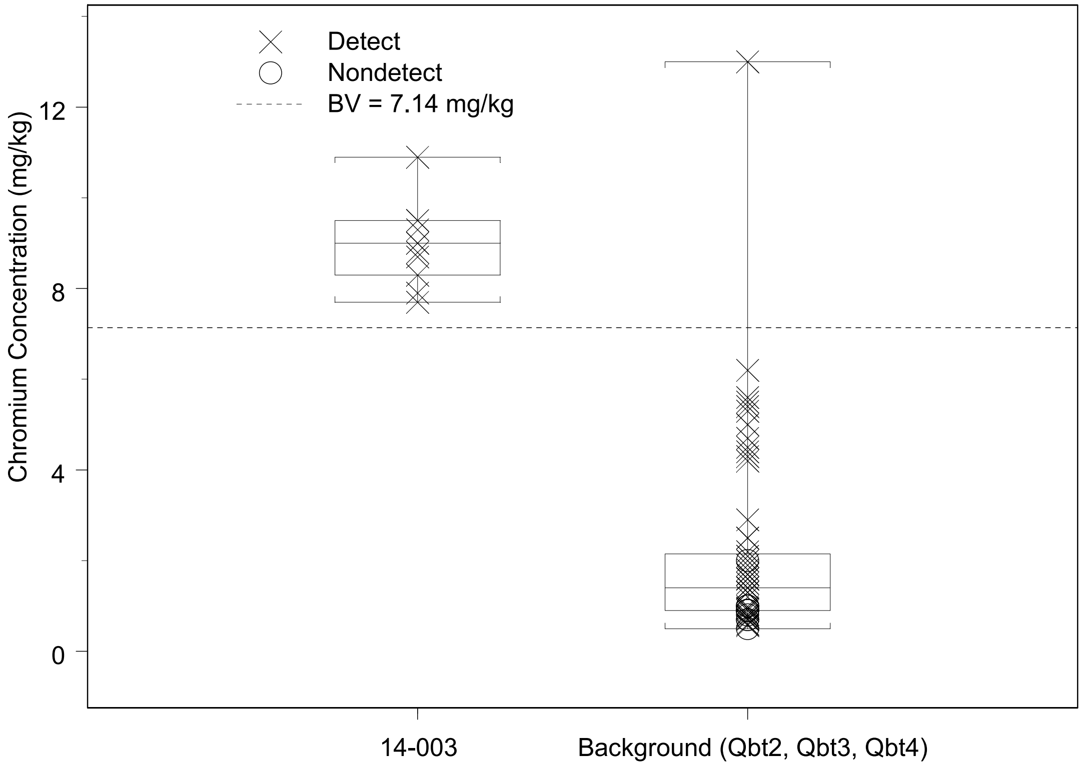


Figure F-2.0-9 Box plot of chromium in Qbt 4 at SWMU 14-003

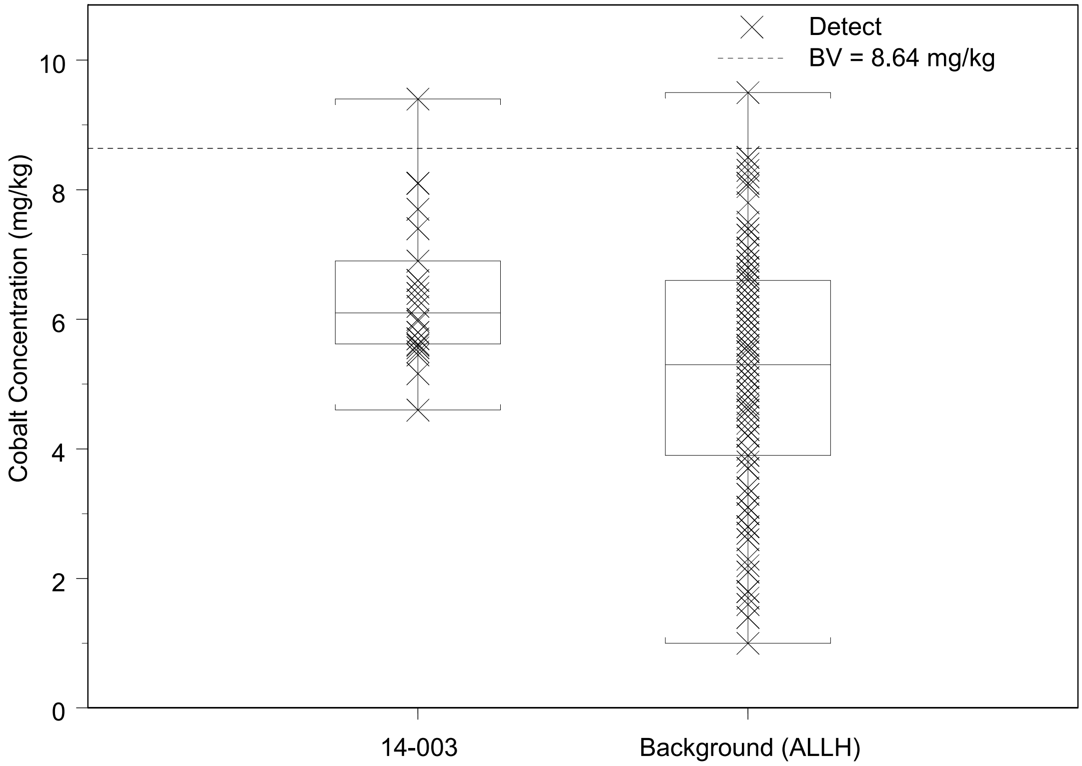


Figure F-2.0-10 Box plot of cobalt in soil at SWMU 14-003

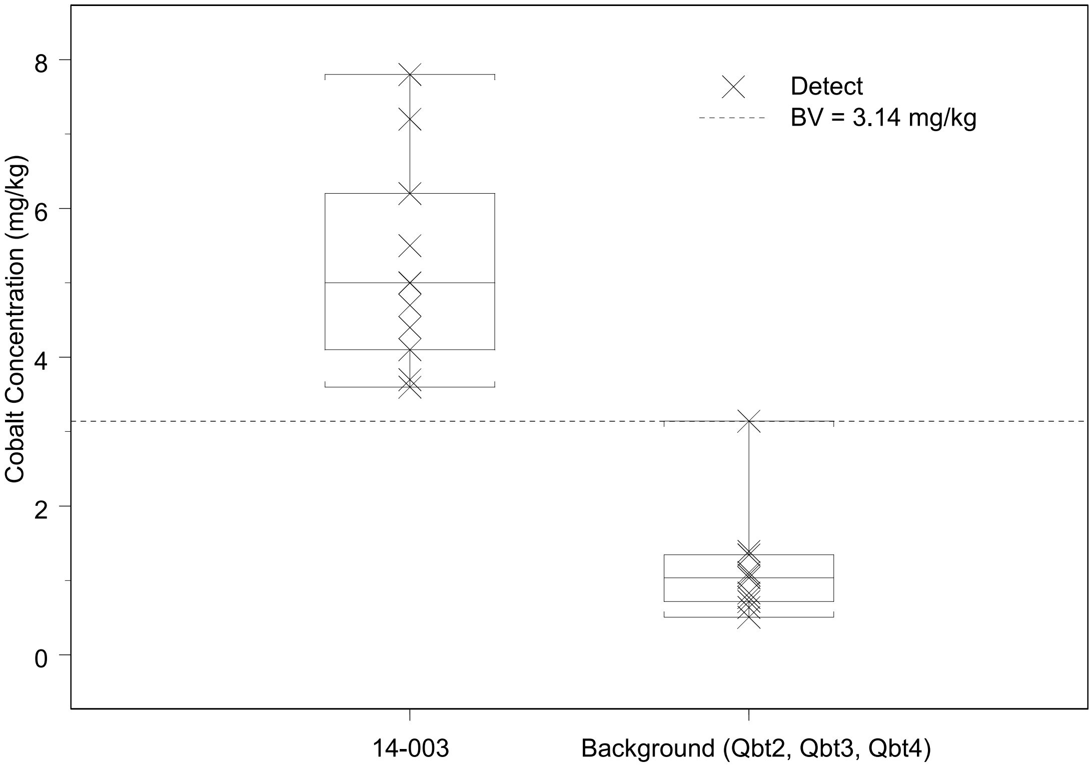


Figure F-2.0-11 Box plot of cobalt in Qbt 4 at SWMU 14-003

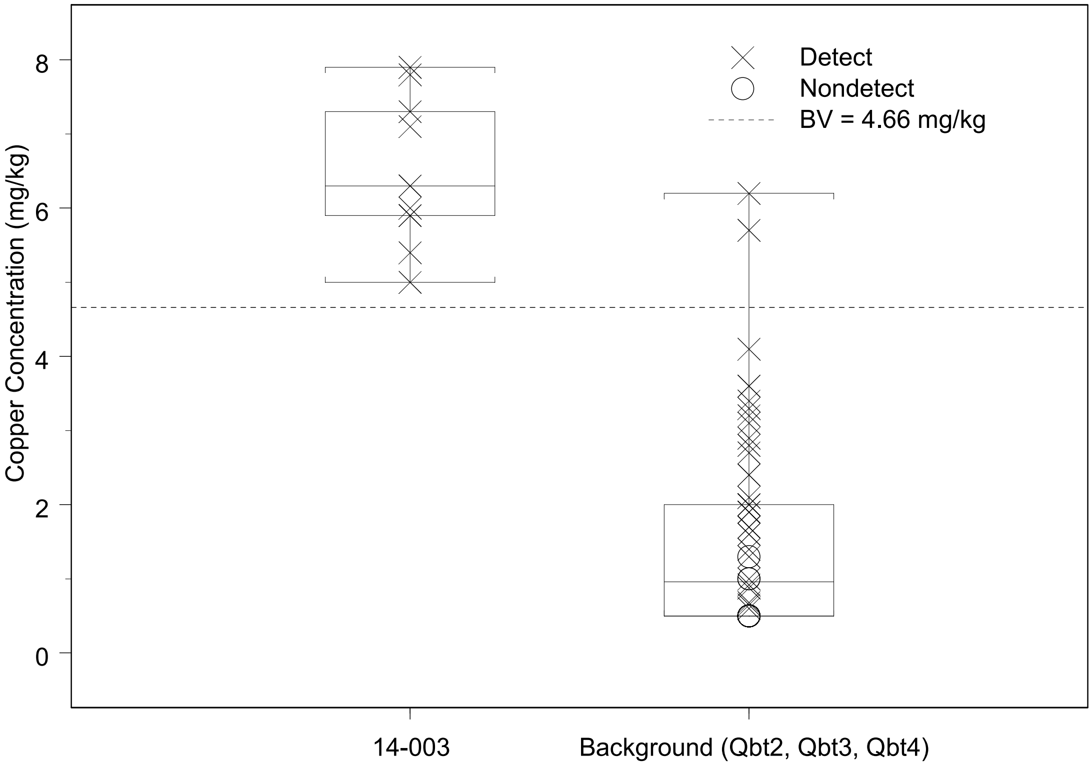


Figure F-2.0-12 Box plot of copper in Qbt 4 at SWMU 14-003

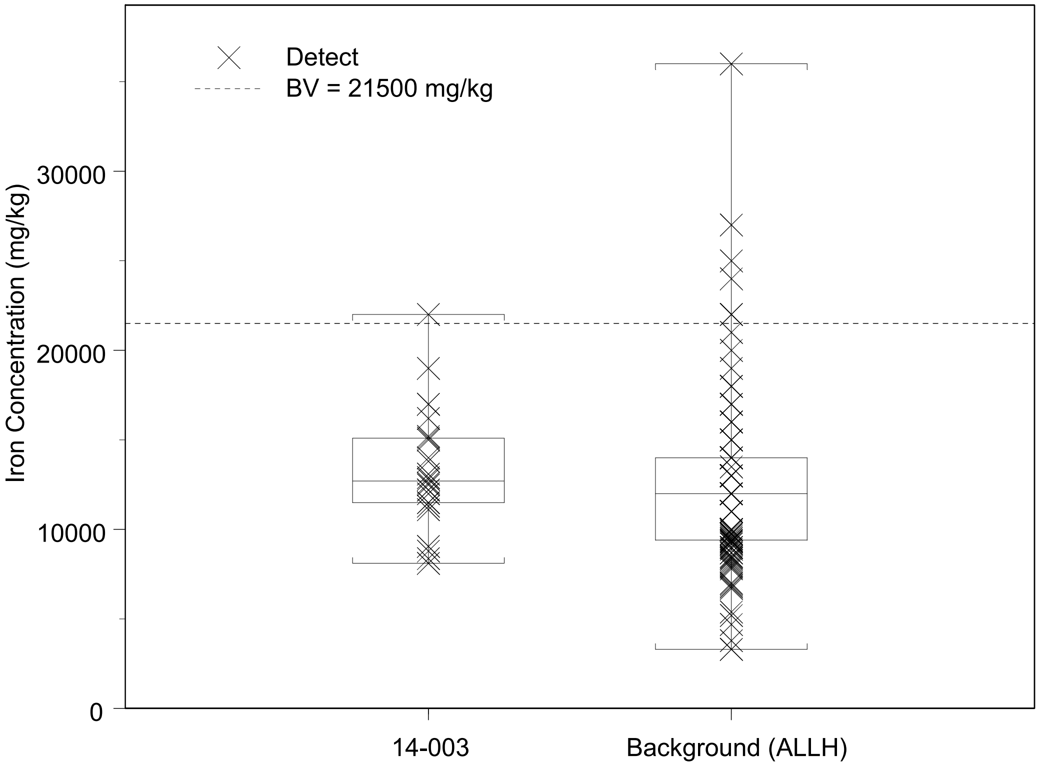


Figure F-2.0-13 Box plot of iron in soil at SWMU 14-003

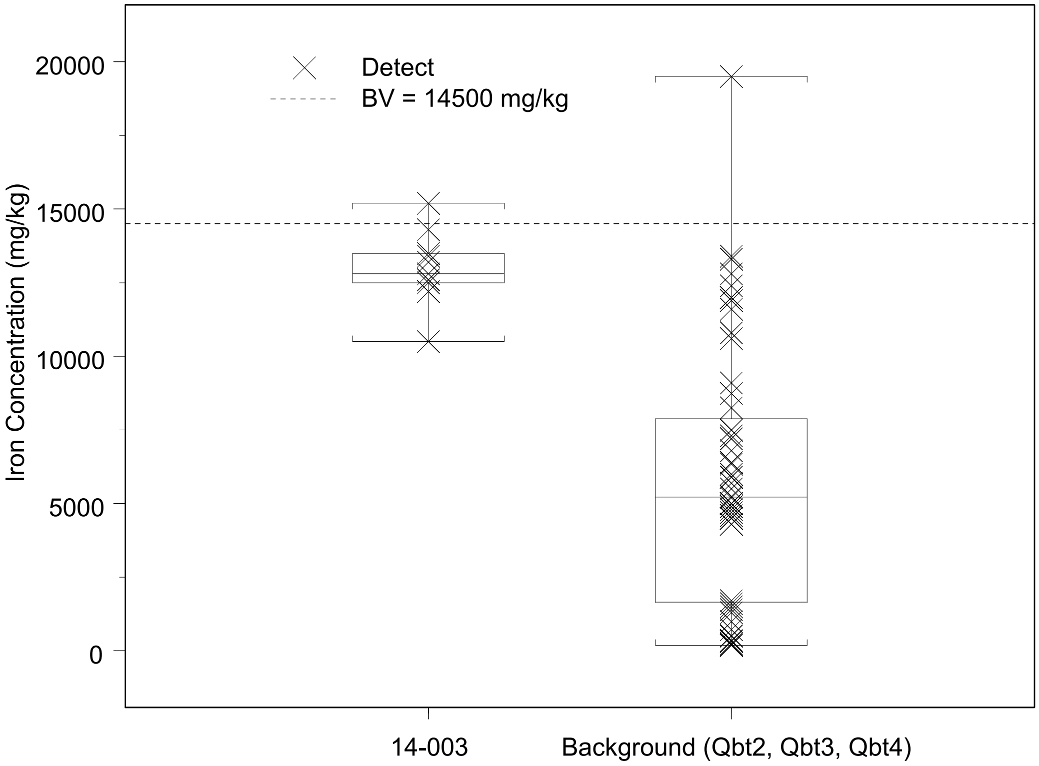


Figure F-2.0-14 Box plot of iron in Qbt 4 at SWMU 14-003

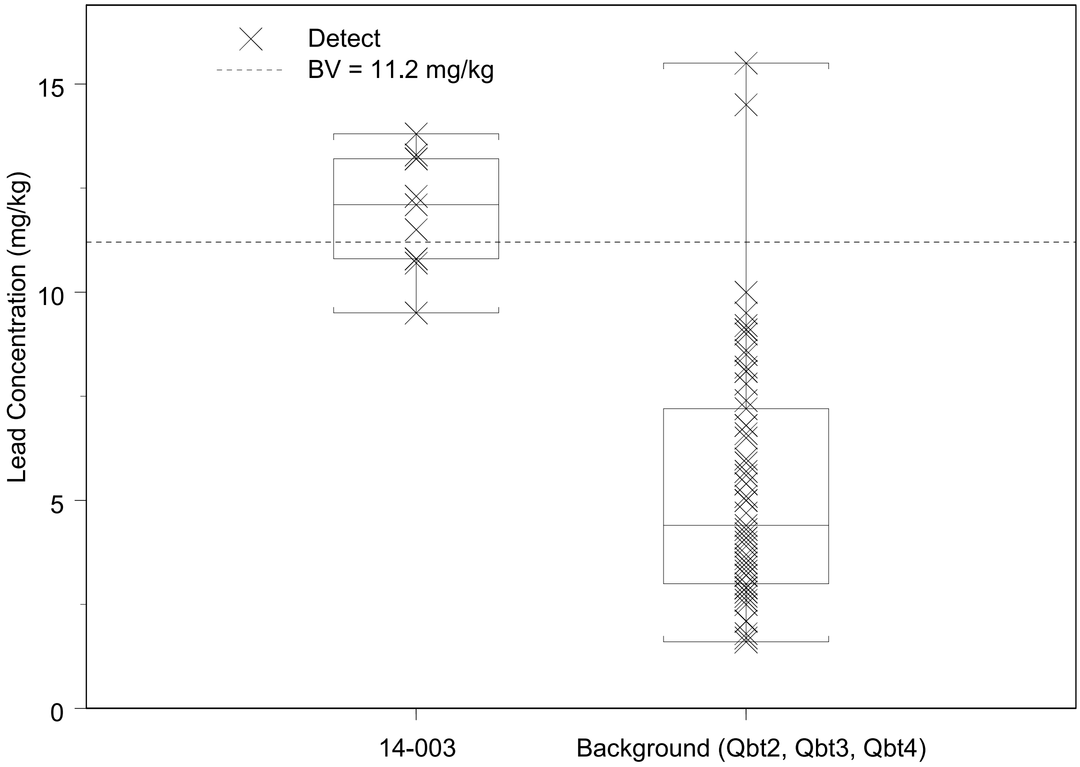


Figure F-2.0-15 Box plot of lead in Qbt 4 at SWMU 14-003

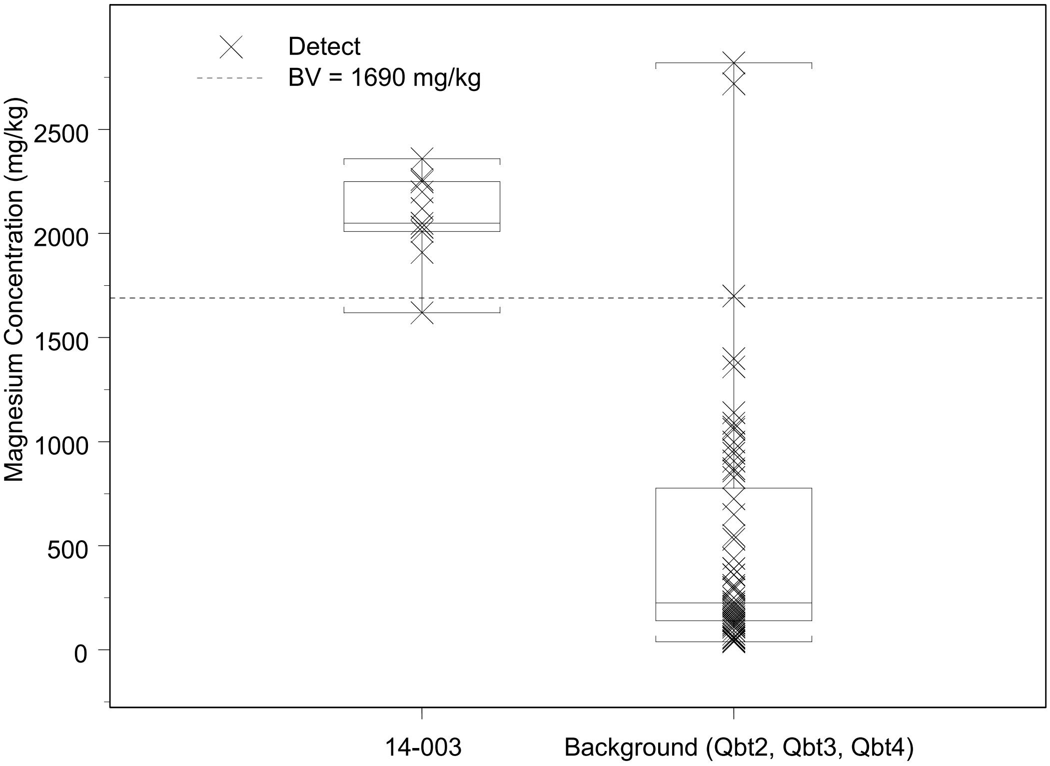


Figure F-2.0-16 Box plot of magnesium in Qbt 4 at SWMU 14-003

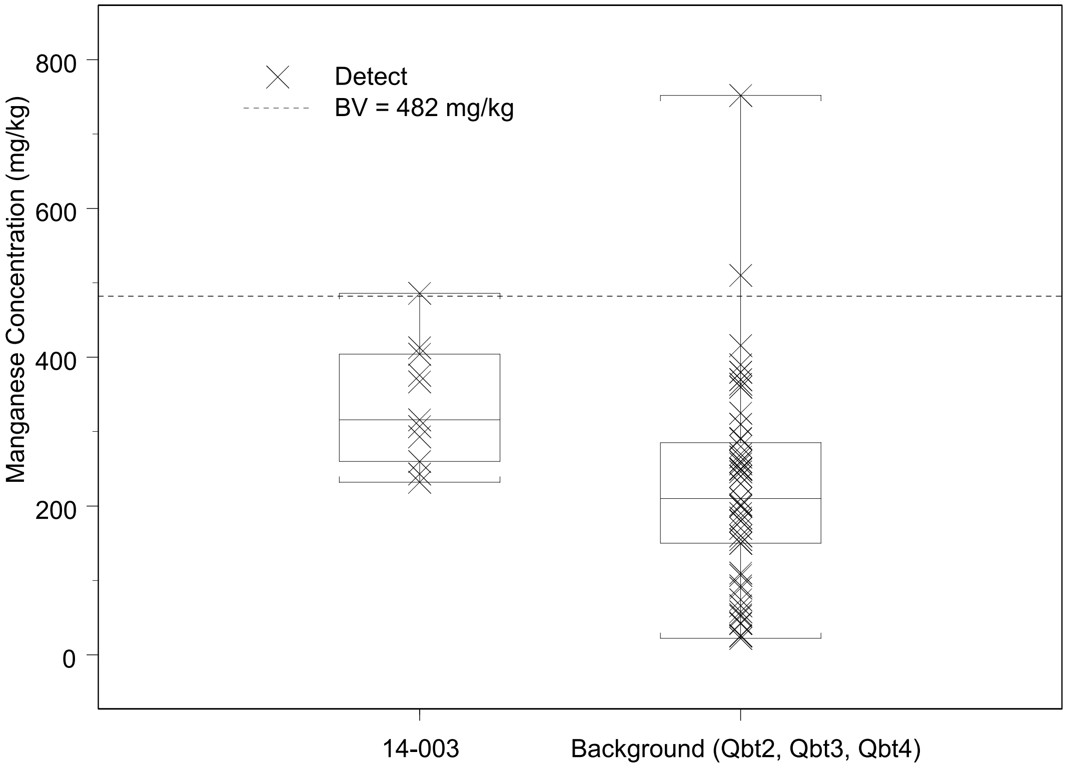


Figure F-2.0-17 Box plot of manganese in Qbt 4 at SWMU 14-003

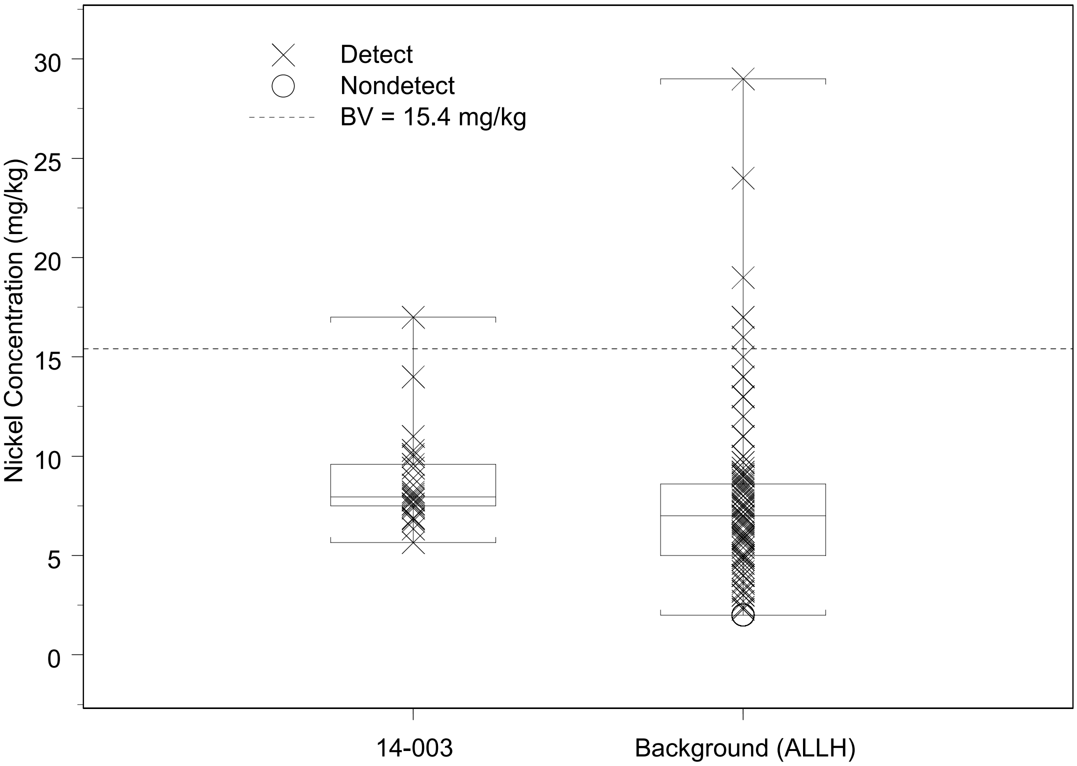


Figure F-2.0-18 Box plot of nickel in soil at SWMU 14-003

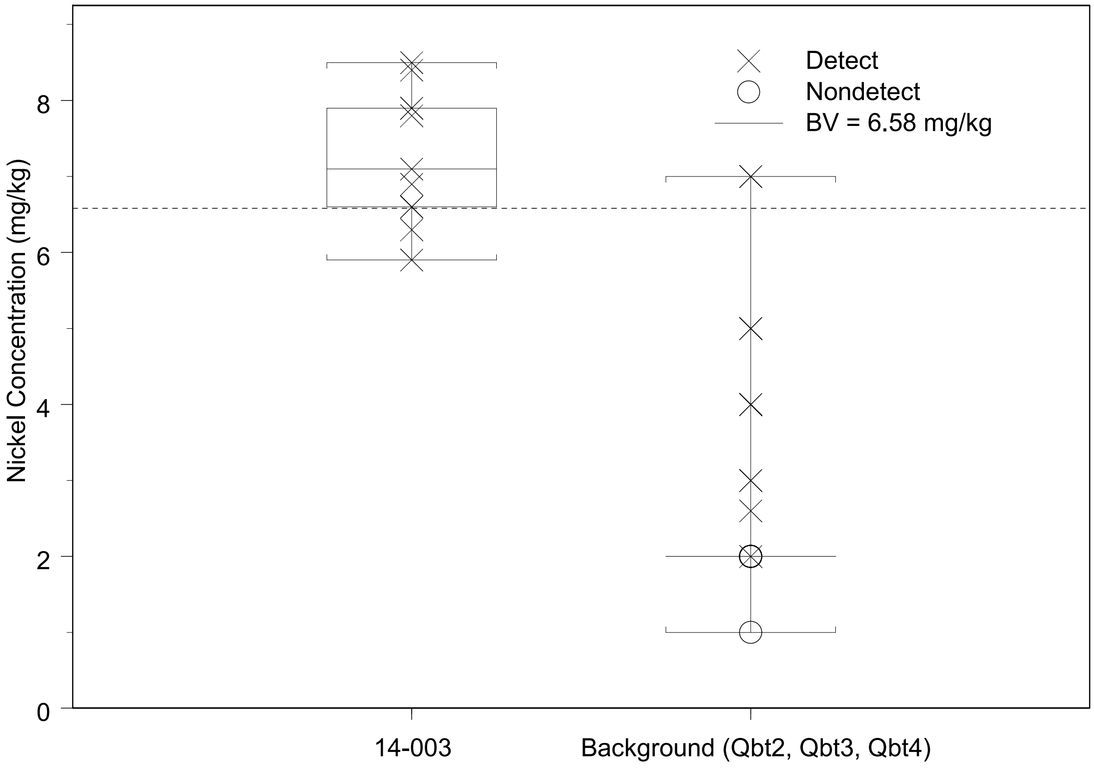


Figure F-2.0-19 Box plot of nickel in Qbt 4 at SWMU 14-003

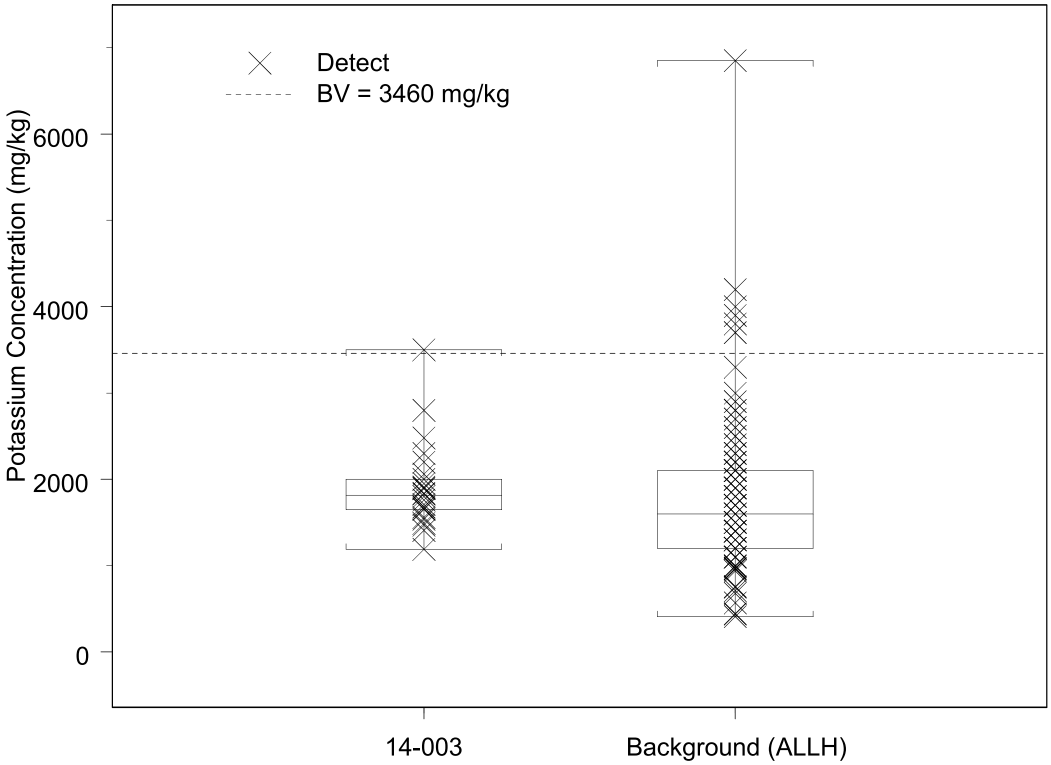


Figure F-2.0-20 Box plot of potassium in soil at SWMU 14-003

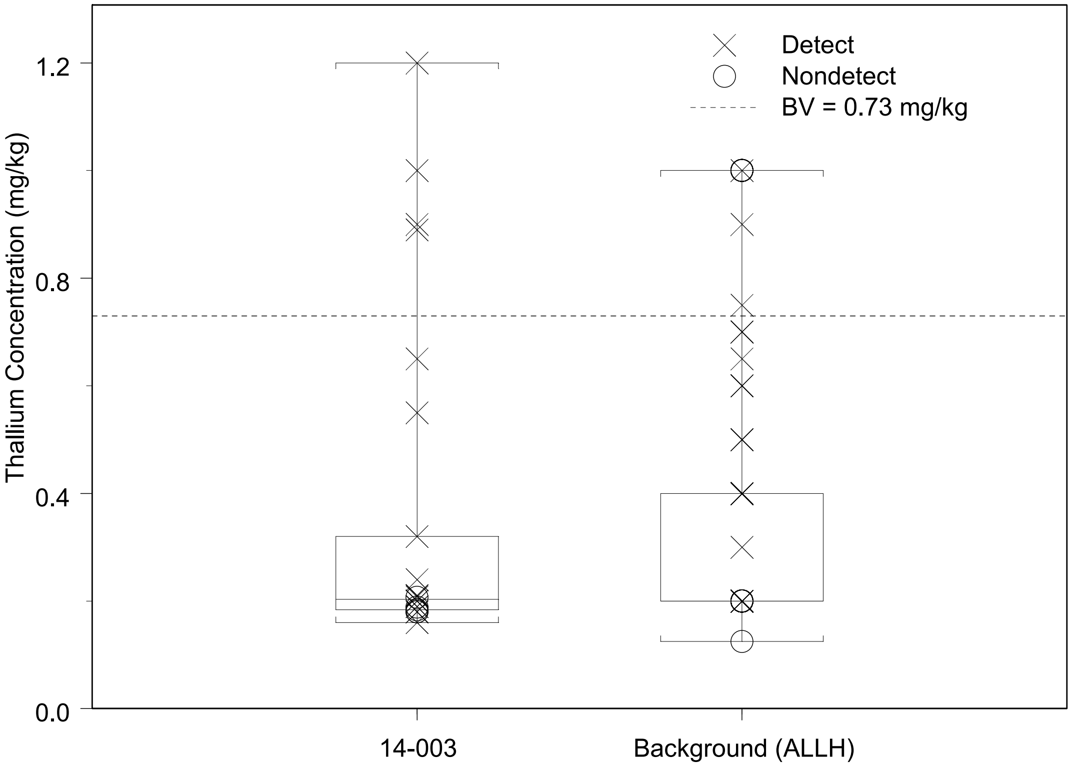


Figure F-2.0-21 Box plot of thallium in soil at SWMU 14-003

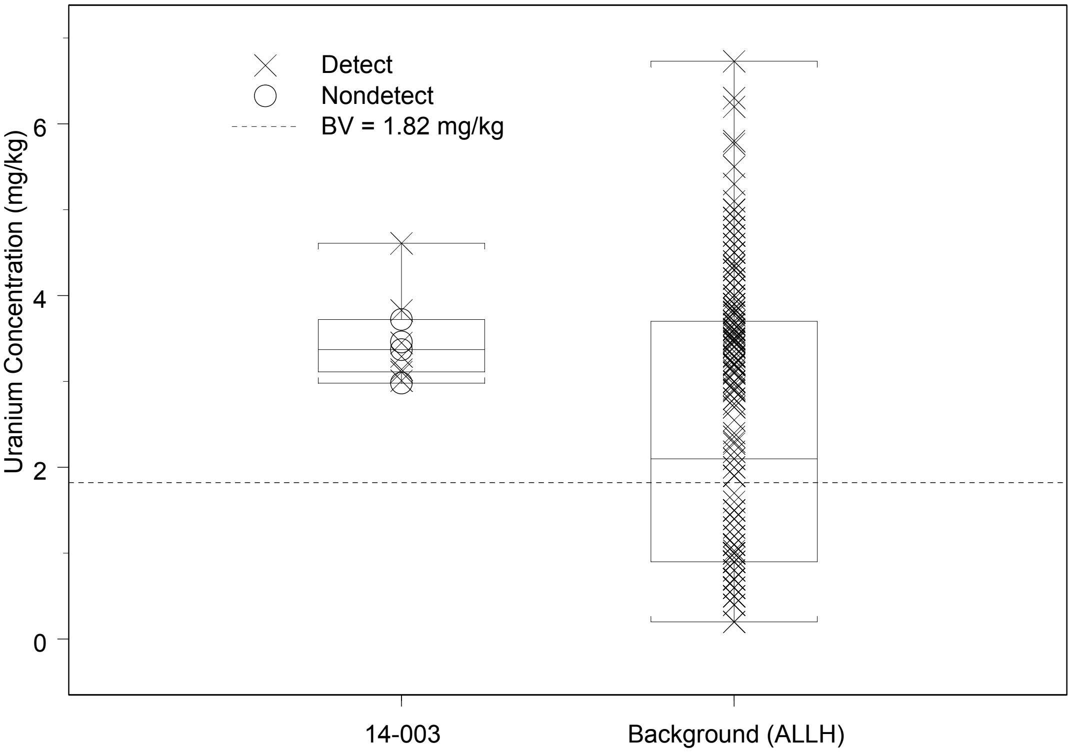


Figure F-2.0-22 Box plot of uranium in soil at SWMU 14-003

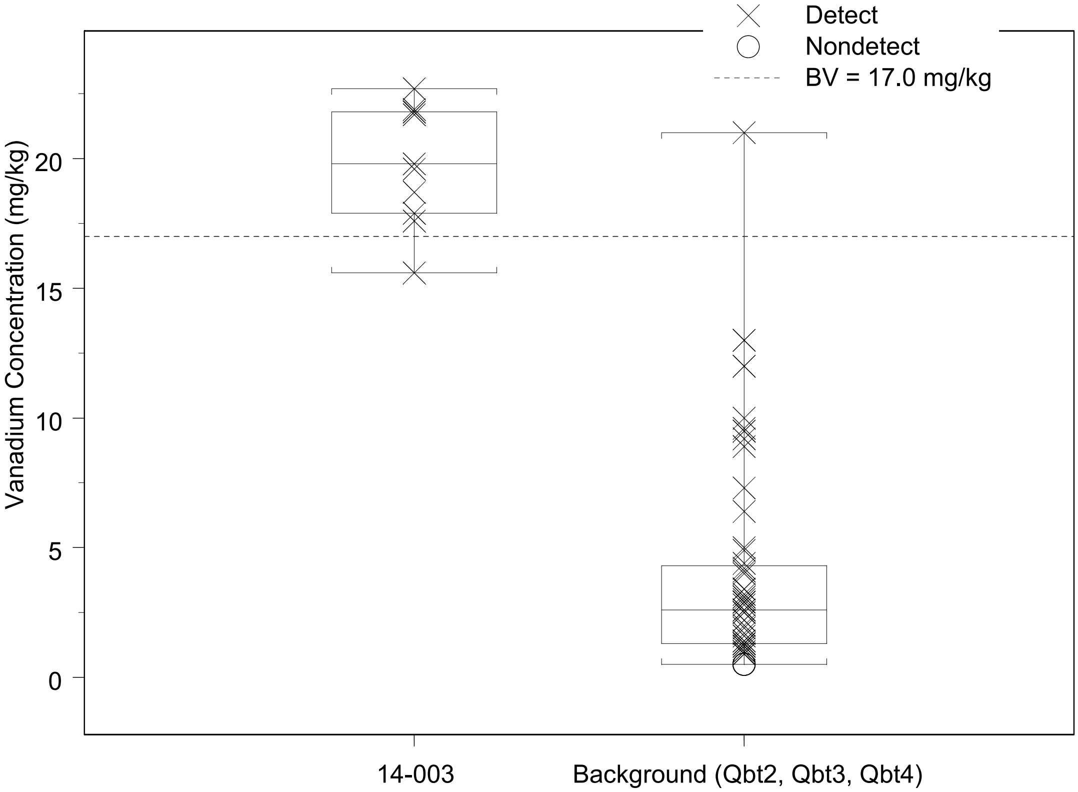


Figure F-2.0-23 Box plot of vanadium in Qbt 4 at SWMU 14-003

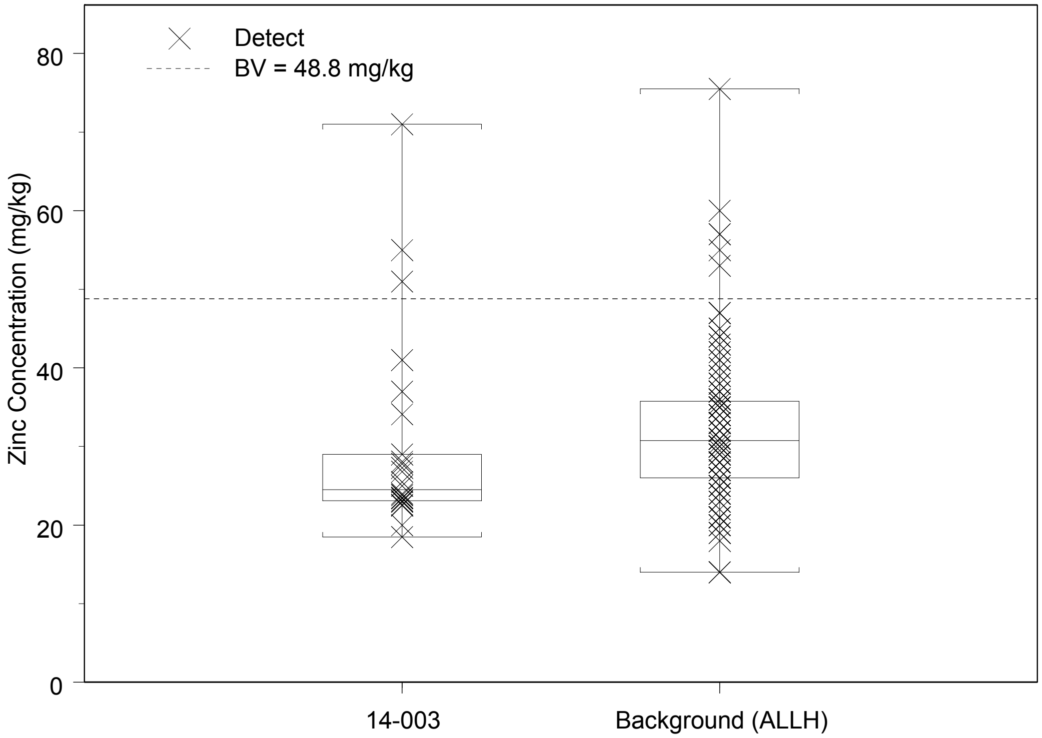


Figure F-2.0-24 Box plot of zinc in soil at SWMU 14-003

F-3.0 BOX PLOTS FOR SWMU 14-007

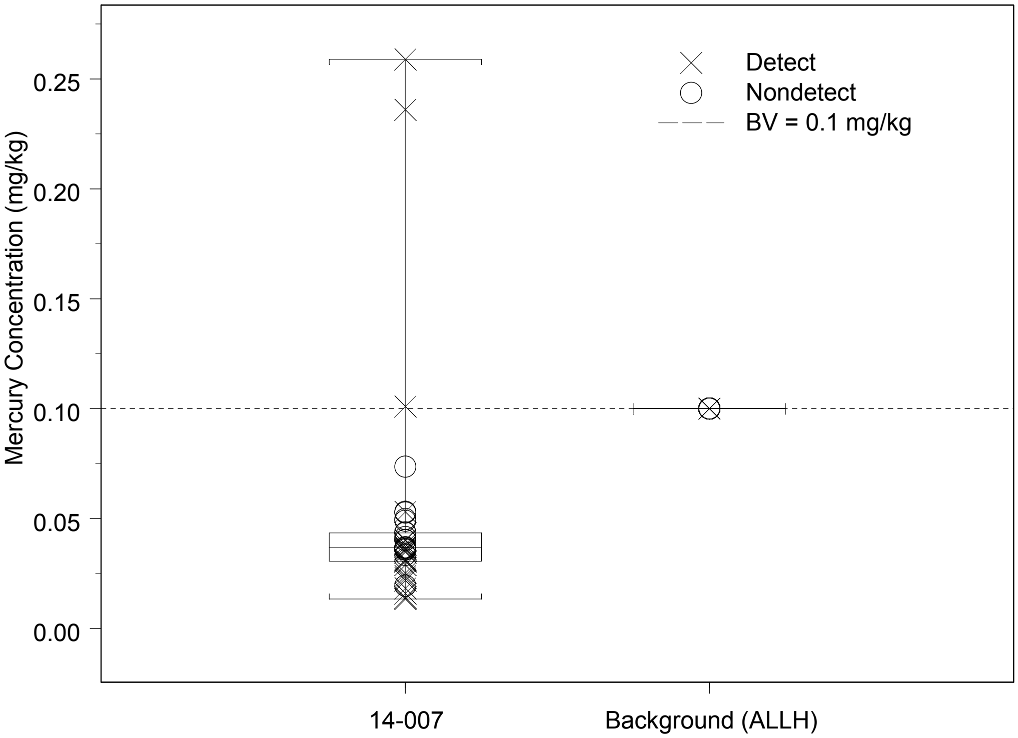


Figure F-3.0-1 Box plot of mercury in soil at SWMU14-007

F-4.0 BOX PLOTS FOR AOC C-14-009

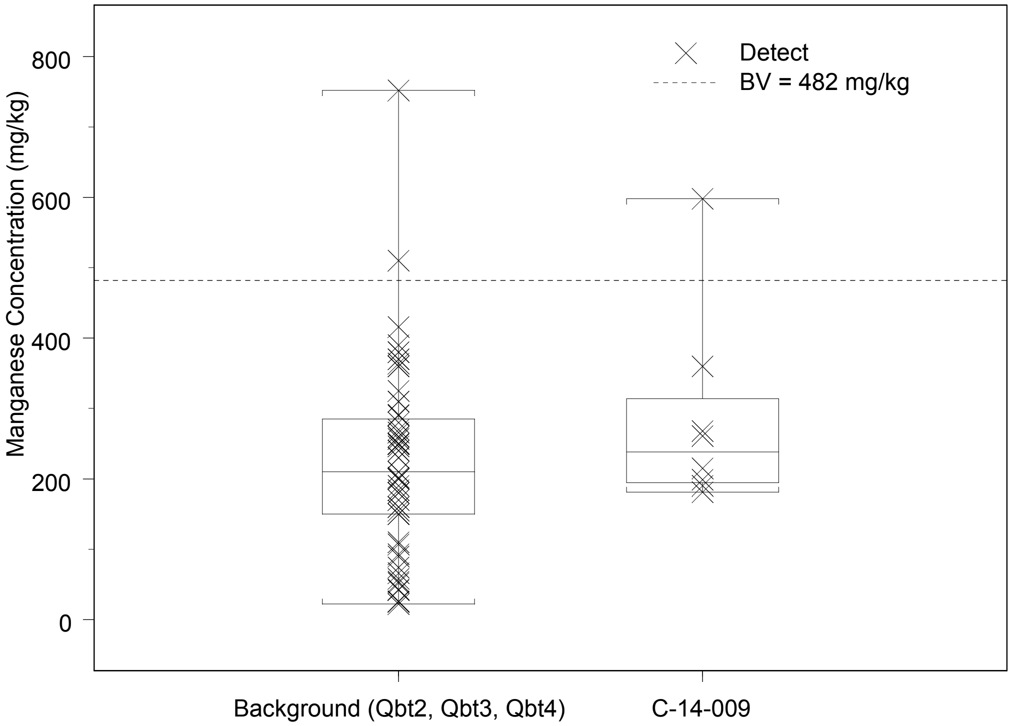


Figure F-4.0-1 Box plot of manganese in Qbt 4 at AOC C-14-009

Table F-1
Results of Statistical Tests for Inorganic Chemicals at SWMU 14-009

Analyte	Media	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Thallium	Soil	1.85E-01	9.34E-01	n/a*	No
Zinc	Soil	1.39E-01	5.43E-01	n/a	No

*n/a = Not applicable.

Table F-2
Results of Statistical Tests for Inorganic Chemicals at SWMU 14-003

Analyte	Media	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Aluminum	Soil	1.52E-02	—[a]	n/a[b]	Yes
	Qbt 4	1.40E-07	—	n/a	Yes
Arsenic	Qbt 4	5.35E-05	—	n/a	Yes
Barium	Soil	2.39E-09	—	n/a	Yes
	Qbt 4	1.38E-07	—	n/a	Yes
Beryllium	Soil	1.92E-01	4.84E-02	n/a	Yes
Calcium	Qbt 4	5.22E-07	—	n/a	Yes
Chromium	Soil	1.28E-01	3.46E-01	n/a	No
	Qbt 4	3.90E-07	—	n/a	Yes
Cobalt	Soil	1.68E-03	—	n/a	Yes
	Qbt 4	7.07E-05	—	n/a	Yes
Copper	Qbt 4	8.16E-08	—	n/a	Yes
Iron	Soil	7.66E-02	1.31E-01	n/a	No
	Qbt 4	4.91E-06	—	n/a	Yes
Lead	Qbt 4	9.15E-07	—	n/a	Yes
Magnesium	Qbt 4	8.29E-07	—	n/a	Yes
Manganese	Qbt 4	1.38E-03	—	n/a	Yes
Nickel	Soil	1.83E-02	—	n/a	Yes
	Qbt 4	n/a	8.71E-11	—	Yes
Potassium	Soil	7.24E-02	6.30E-01	n/a	No
Thallium	Soil	1.82E-14	—	n/a	Yes
Uranium	Soil	3.26E-02	—	n/a	Yes
Vanadium	Qbt 4	9.44E-07	—	n/a	Yes
Zinc	Soil	1.71E-02	—	n/a	No[c]

[a] — = Test not performed because the first test indicated site samples are significantly different than background.

[b] n/a = Not applicable.

[c] Statistically lower than background.

Table F-3
Results of Statistical Tests for Inorganic Chemicals at SWMU 14-007

Analyte	Media	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Mercury	Soil	n/a*	1.39E-01	1.39E-01	No

*n/a = Not applicable.

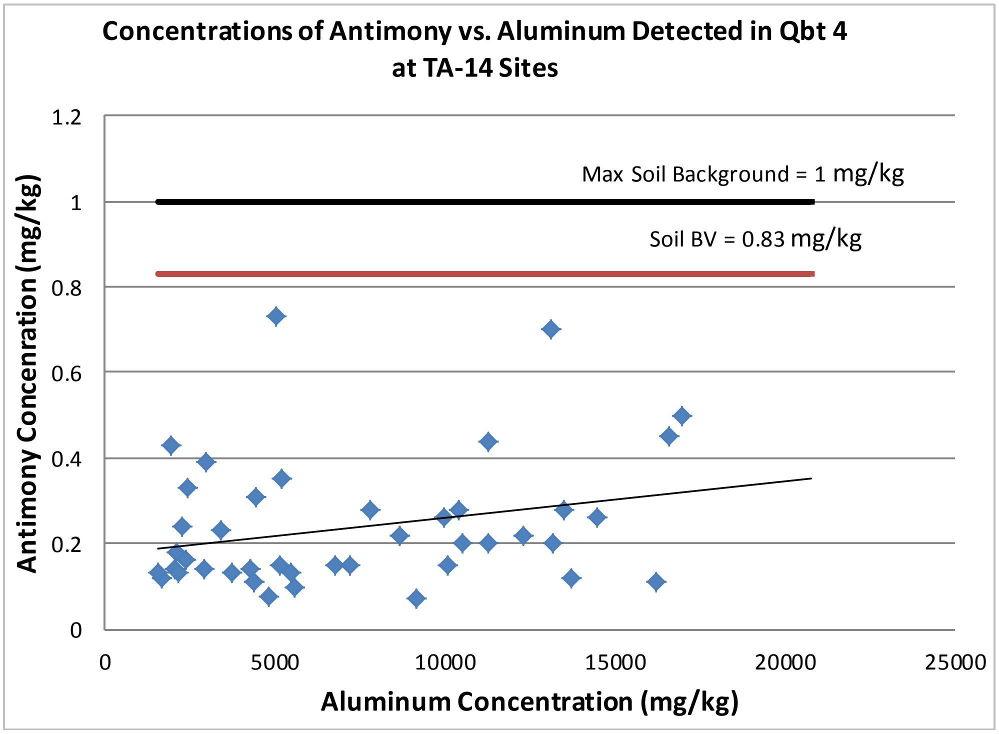
Table F-4
Results of Statistical Tests for Inorganic Chemicals at AOC C-14-009

Analyte	Media	Gehan Test p-Value	Quantile Test p-Value	Slippage p-value	Retain as COPC?
Manganese	Qbt 4	2.78E-01	8.19E-01	n/a*	No

*n/a = Not applicable.

Appendix G

Comparisons of Weathered Qbt 4
with Soil Background at Technical Area 14



Note: The concentration of 23.8 mg/kg detected at SWMU 14-009 is not plotted in order to clearly present other data points.

Figure G-1 Scatter plot of antimony in weathered Qbt 4 at TA-14

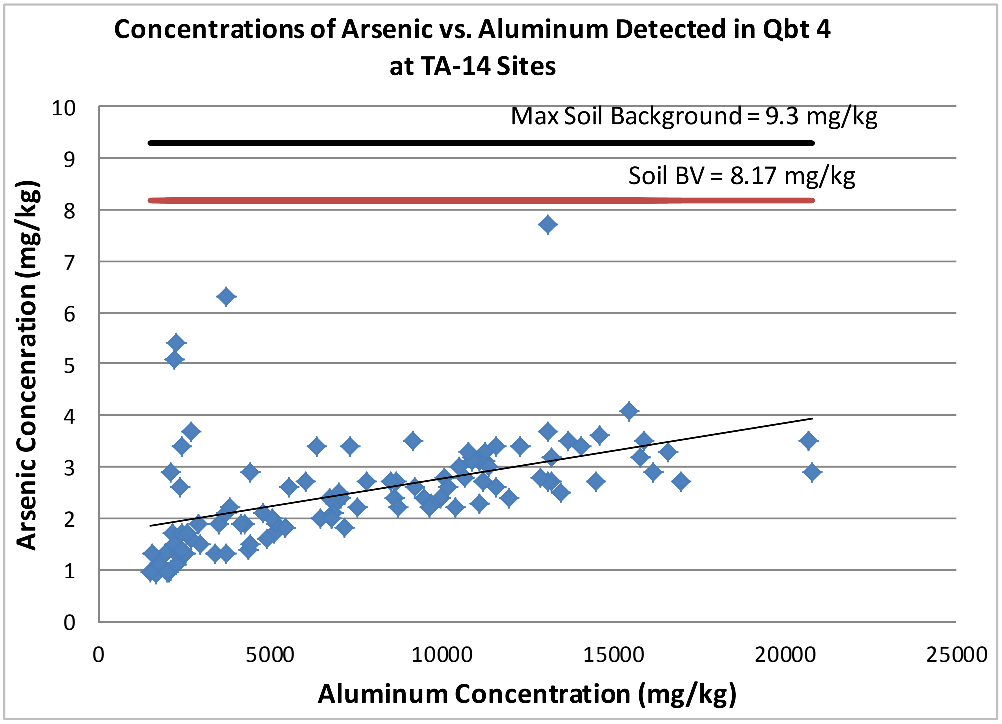


Figure G-2 Scatter plot of arsenic in weathered Qbt 4 at TA-14

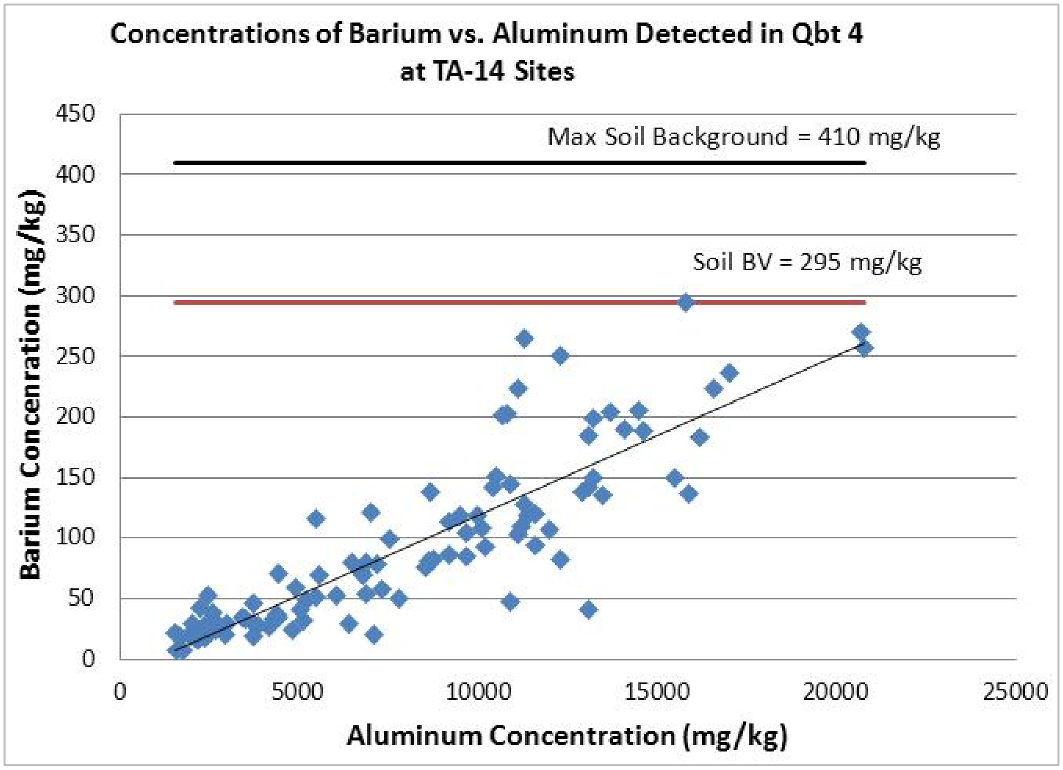


Figure G-3 Scatter plot of barium in weathered Qbt 4 at TA-14

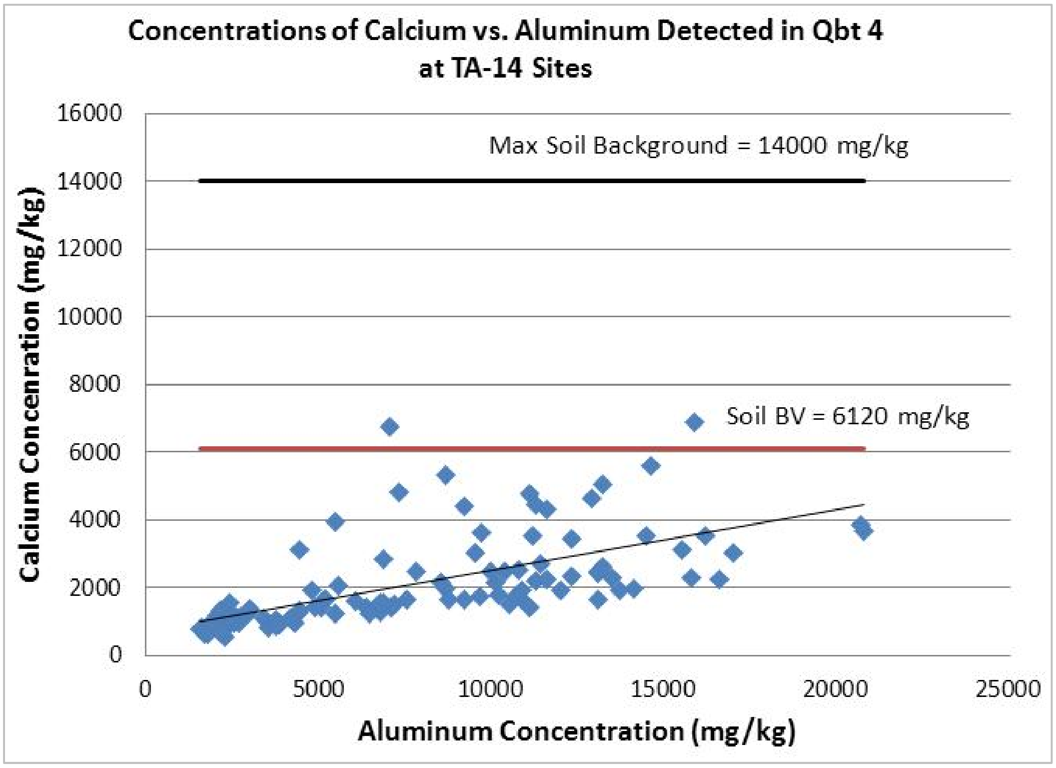


Figure G-4 Scatter plot of calcium in weathered Qbt 4 at TA-14

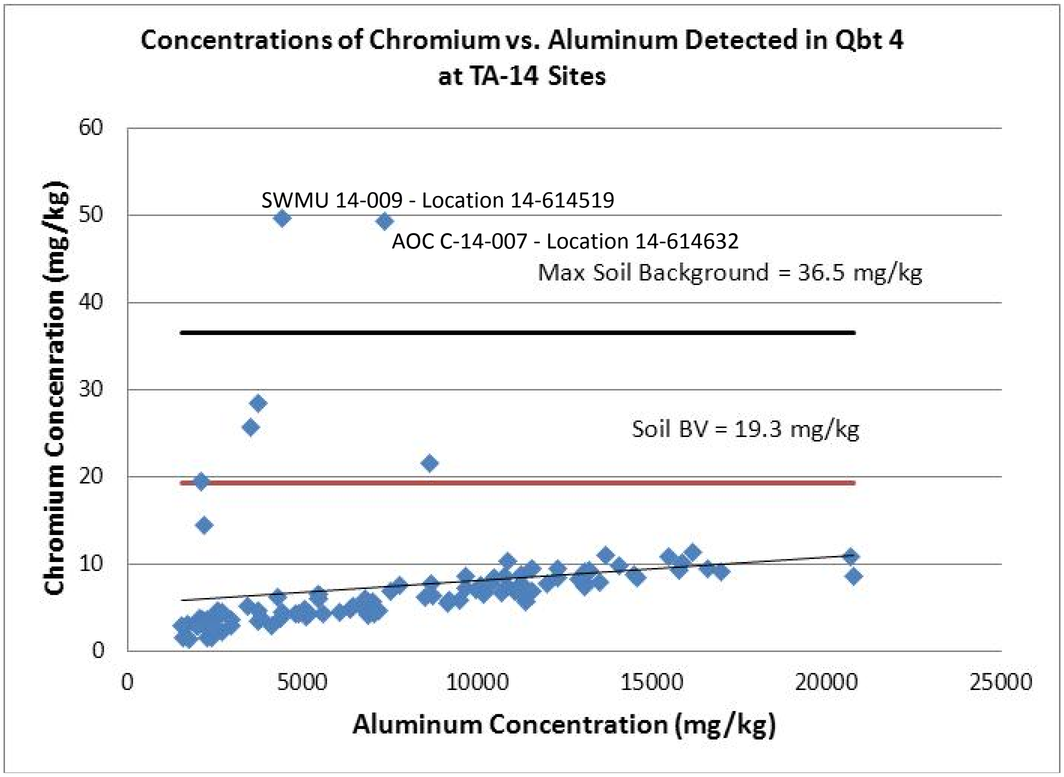


Figure G-5 Scatter plot of chromium in weathered Qbt 4 at TA-14

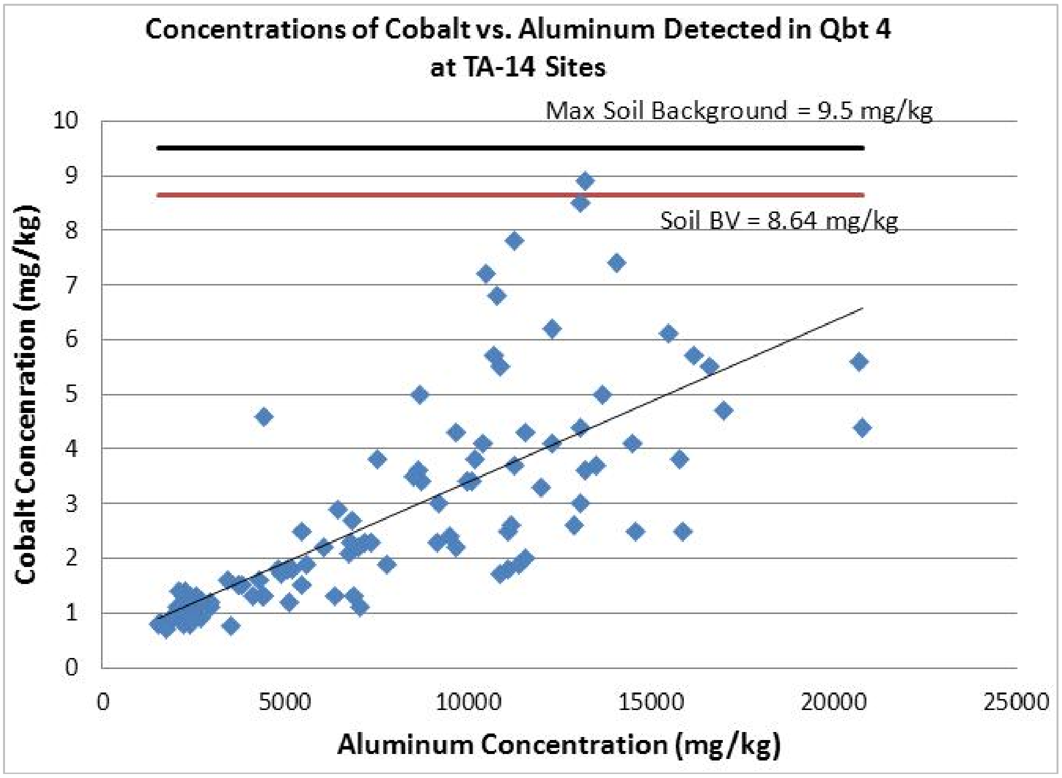
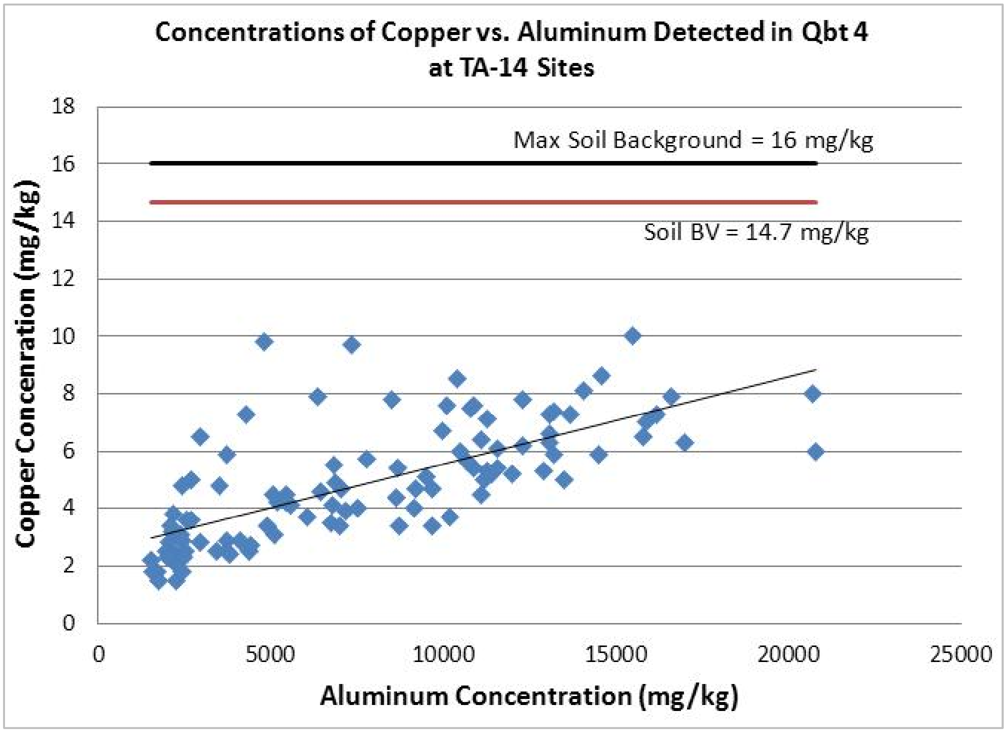


Figure G-6 Scatter plot of cobalt in weathered Qbt 4 at TA-14



Note: The concentration of 73 mg/kg detected at SWMU 14-009 is not plotted in order to clearly present other data points.

Figure G-7 **Scatter plot of copper in weathered Qbt 4 at TA-14**

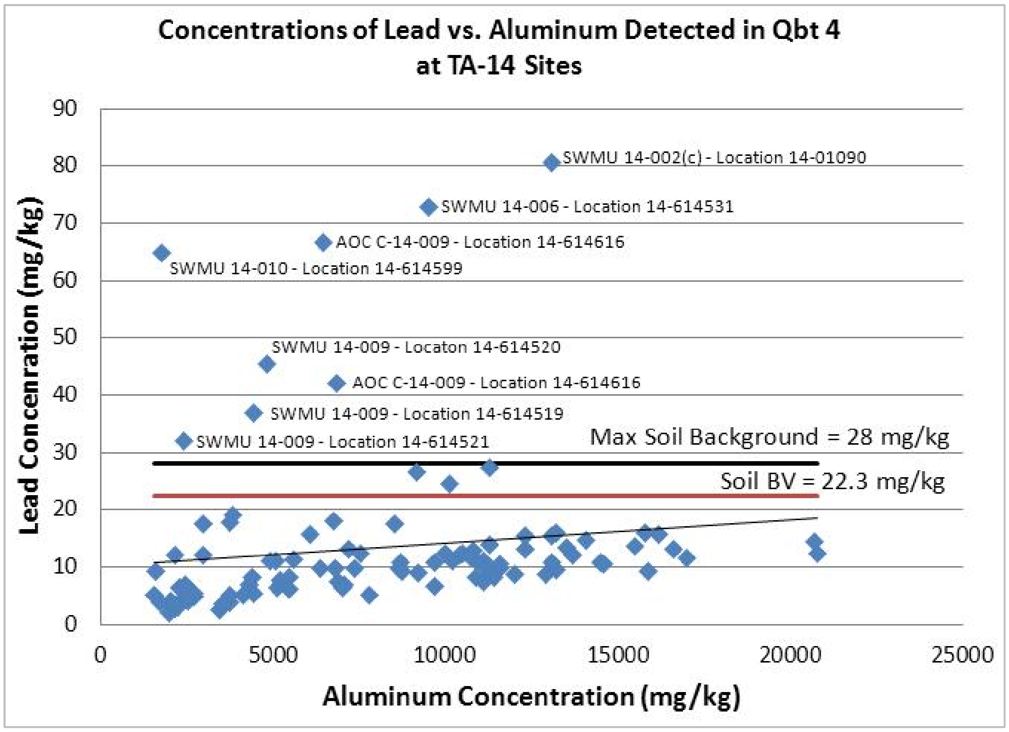


Figure G-8 **Scatter plot of lead in weathered Qbt 4 at TA-14**

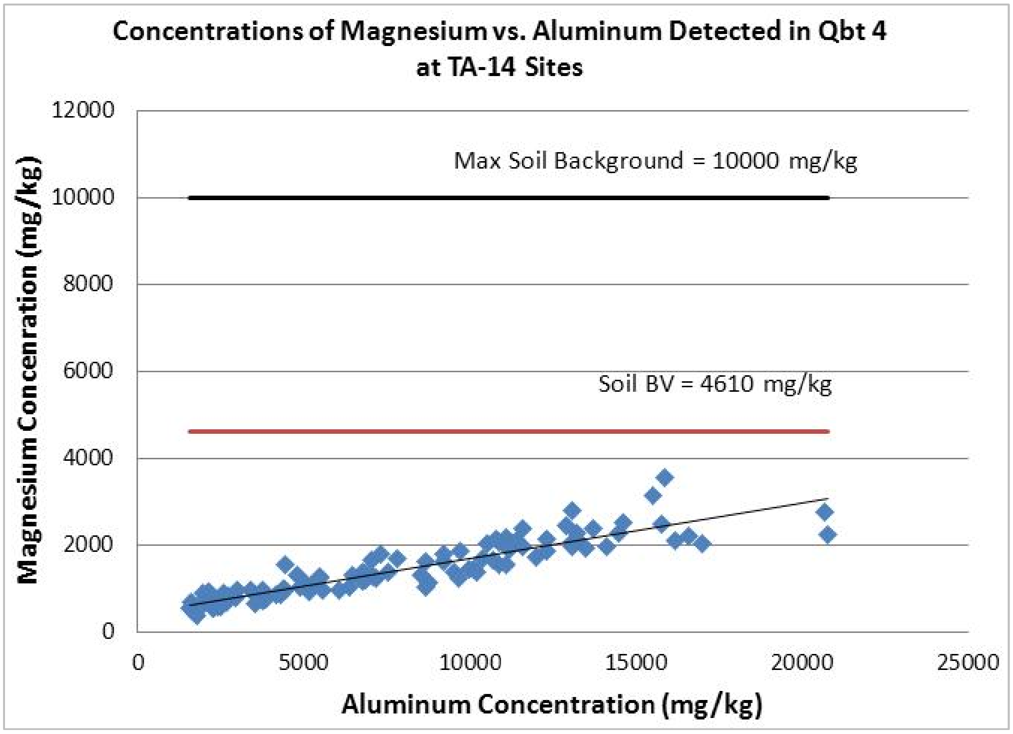
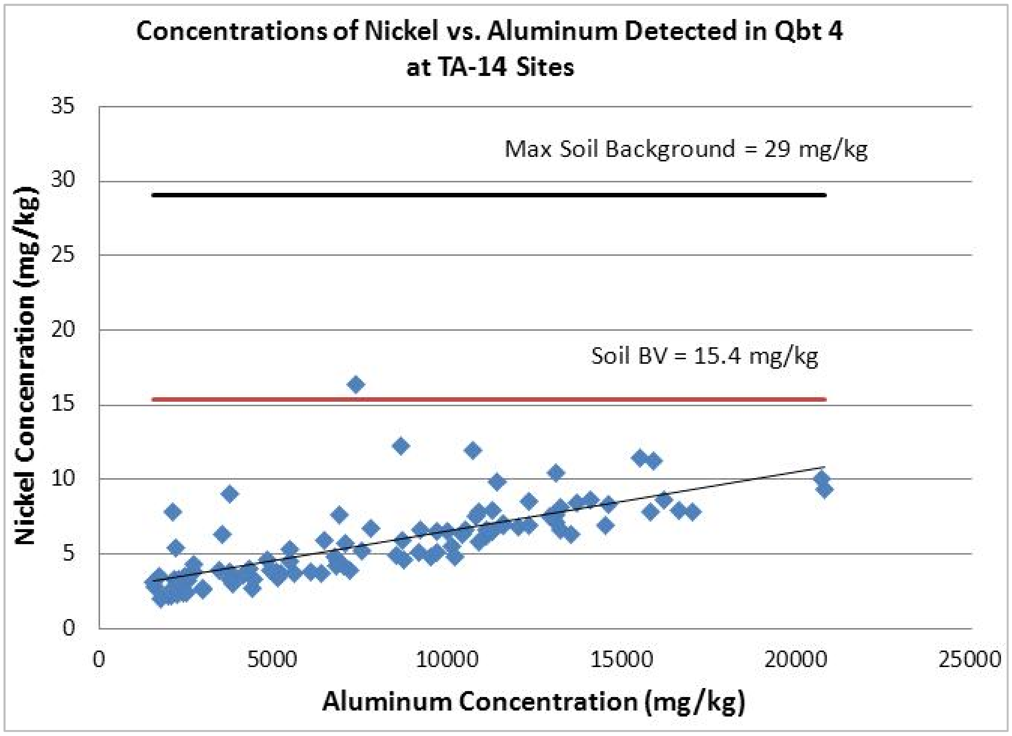


Figure G-9 Scatter plot of magnesium in weathered Qbt 4 at TA-14



Note: The concentration of 50.6 mg/kg detected at SWMU 14-009 is not plotted in order to clearly present other data points.

Figure G-10 Scatter plot of nickel in weathered Qbt 4 at TA-14

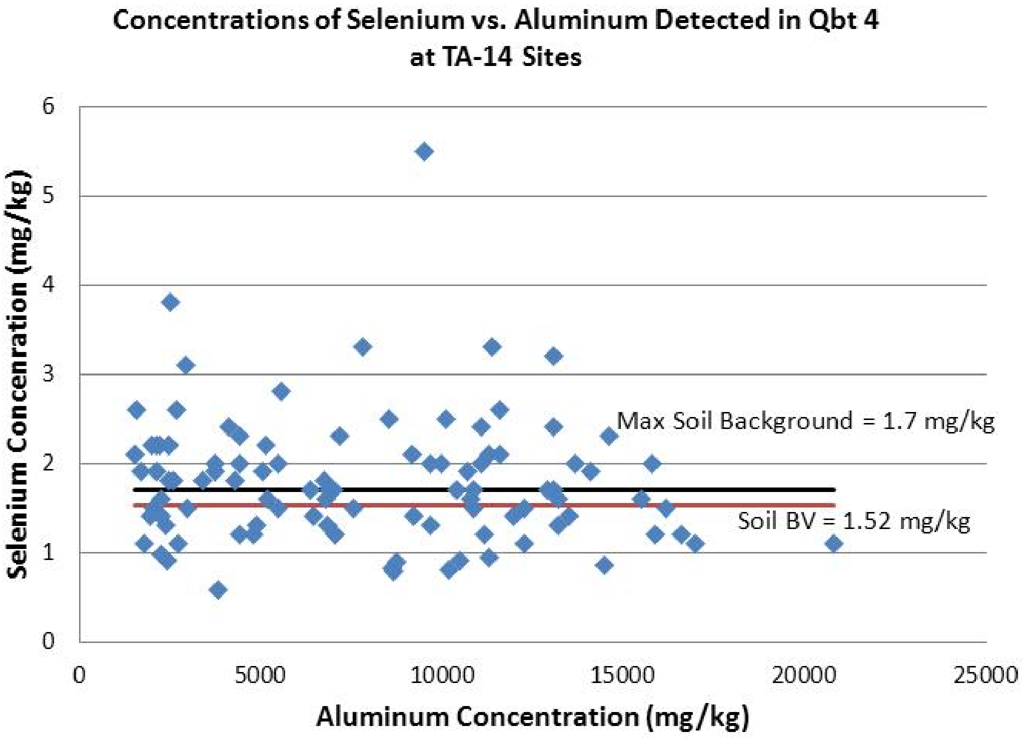


Figure G-11 **Scatter plot of selenium with aluminum in Qbt 4 at TA-14**

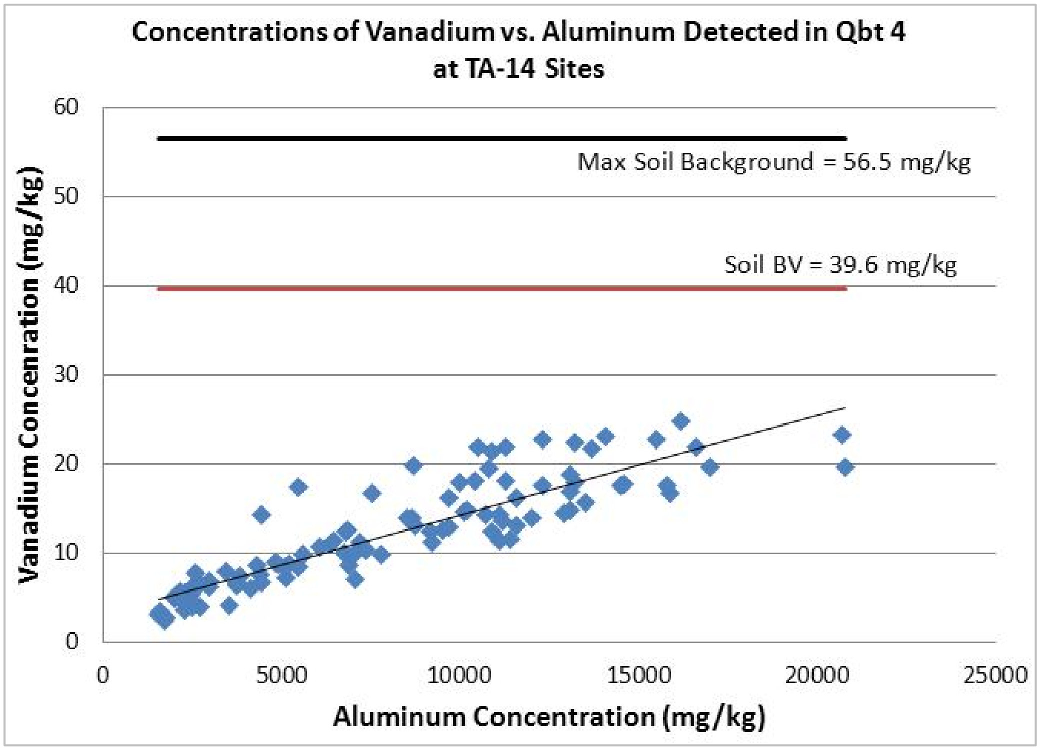


Figure G-12 **Scatter plot of vanadium in weathered Qbt 4 at TA-14**

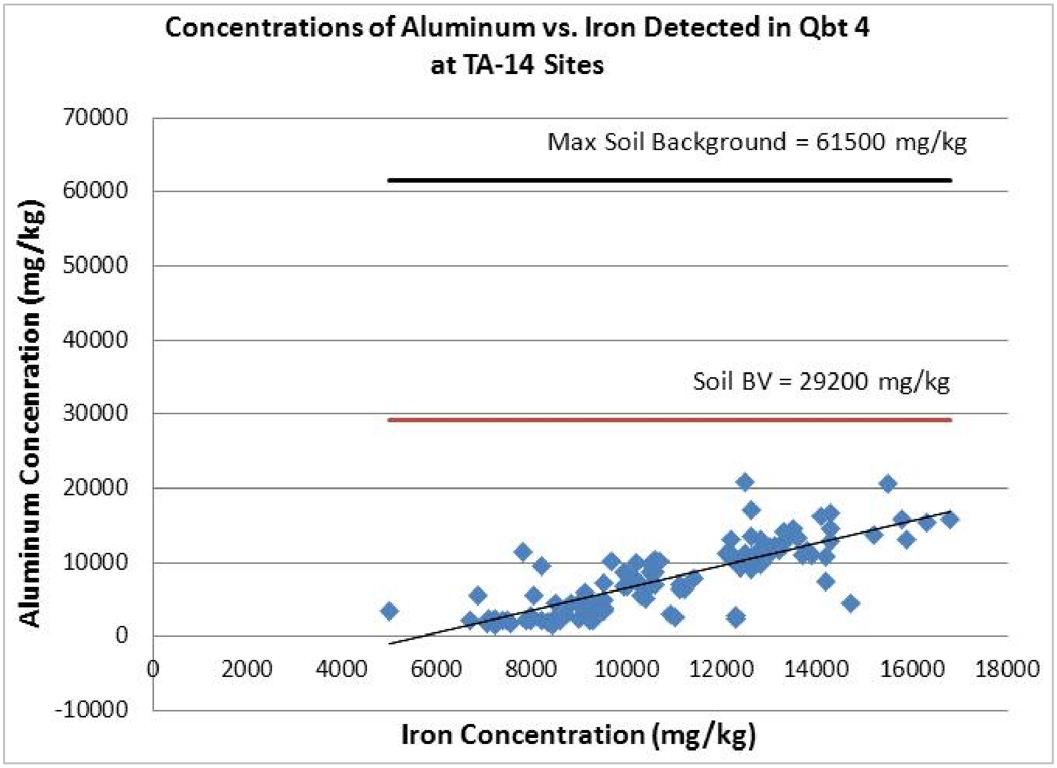


Figure G-13 Scatter plot of aluminum in weathered Qbt 4 at TA-14

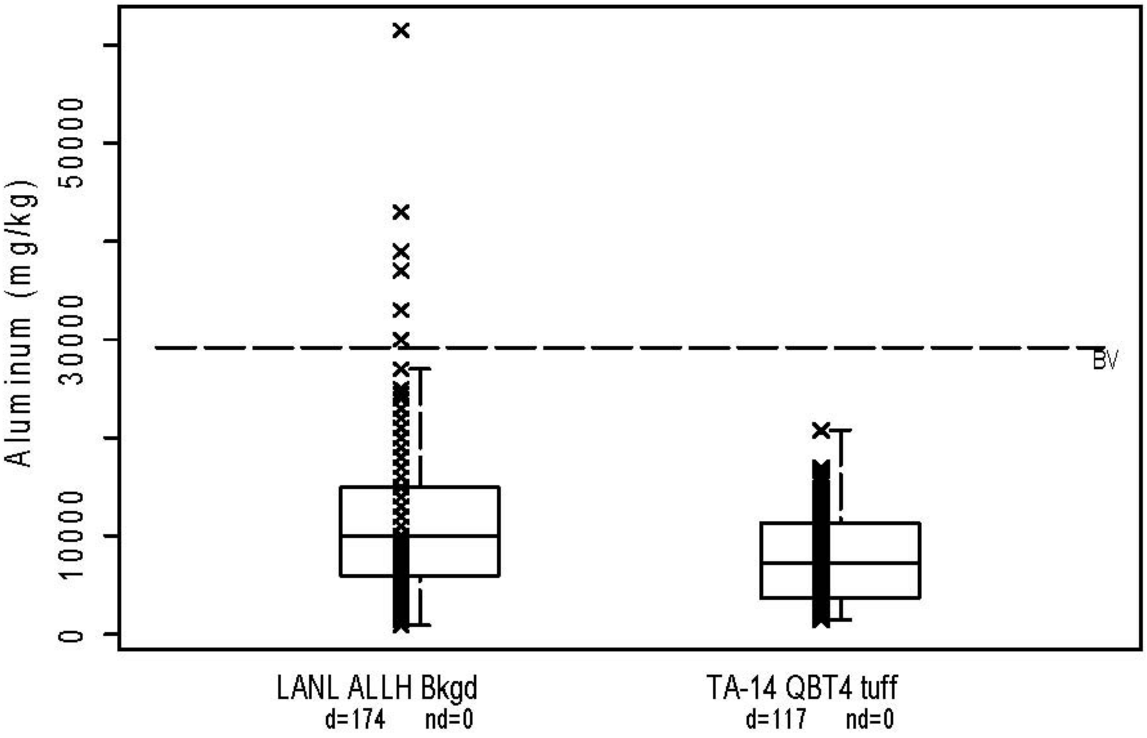


Figure G-14 Box plot of LANL soil background and weathered Qbt 4, aluminum

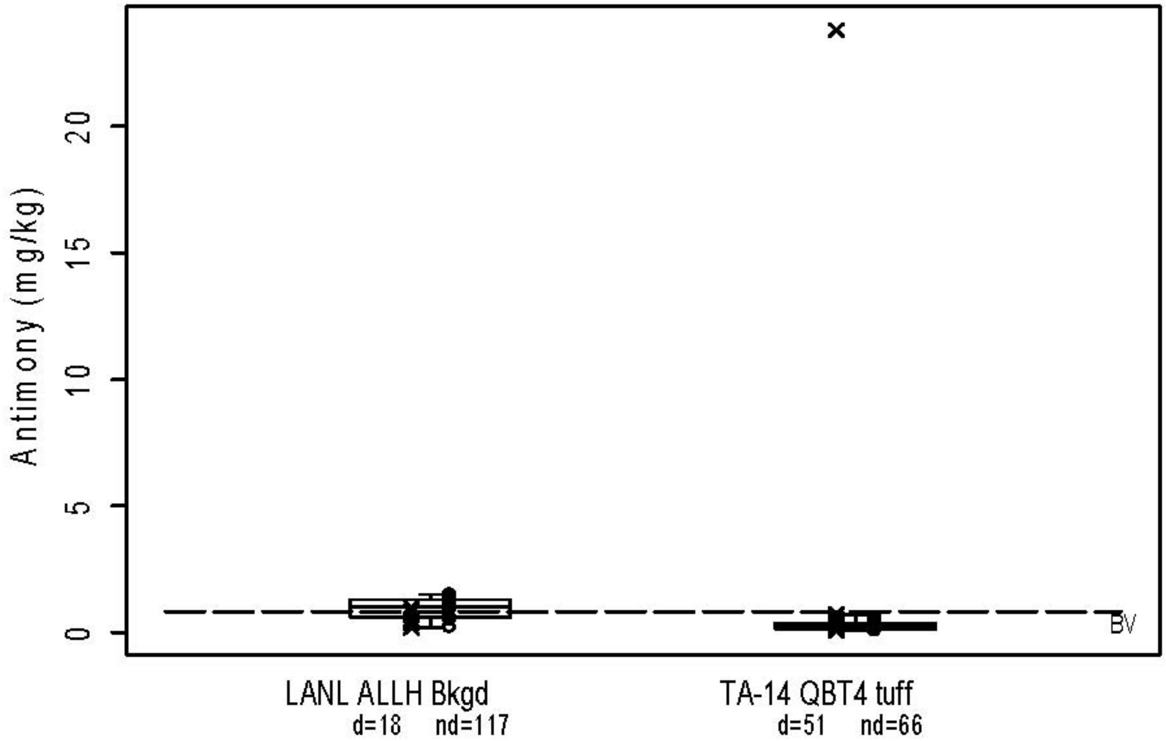


Figure G-15 Box plot of LANL soil background and weathered Qbt 4, antimony

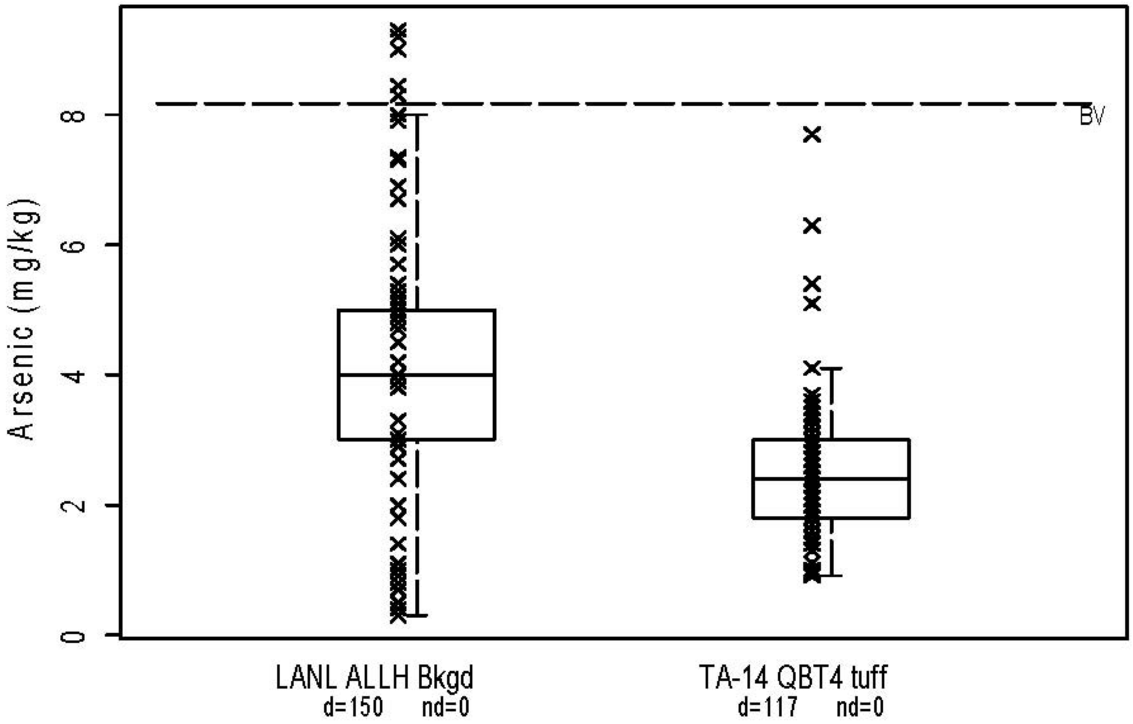


Figure G-16 Box plot of LANL soil background and weathered Qbt 4, arsenic

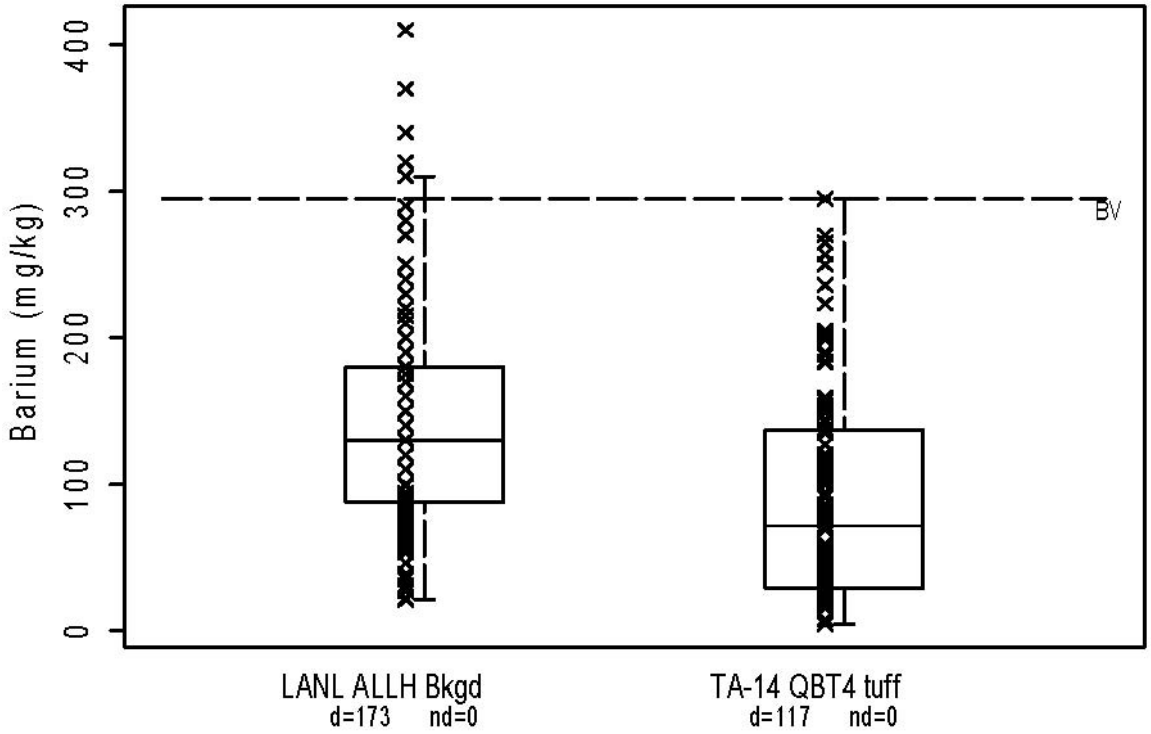


Figure G-17 Box plot of LANL soil background and weathered Qbt 4, barium

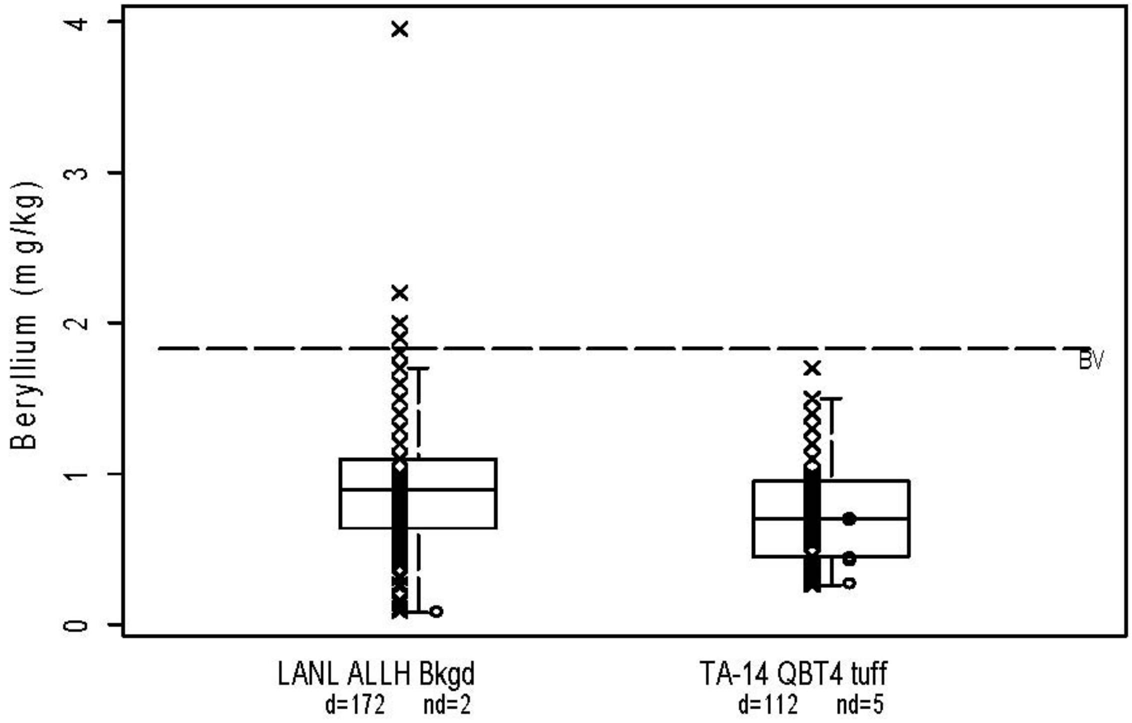


Figure G-18 Box plot of LANL soil background and weathered Qbt 4, beryllium

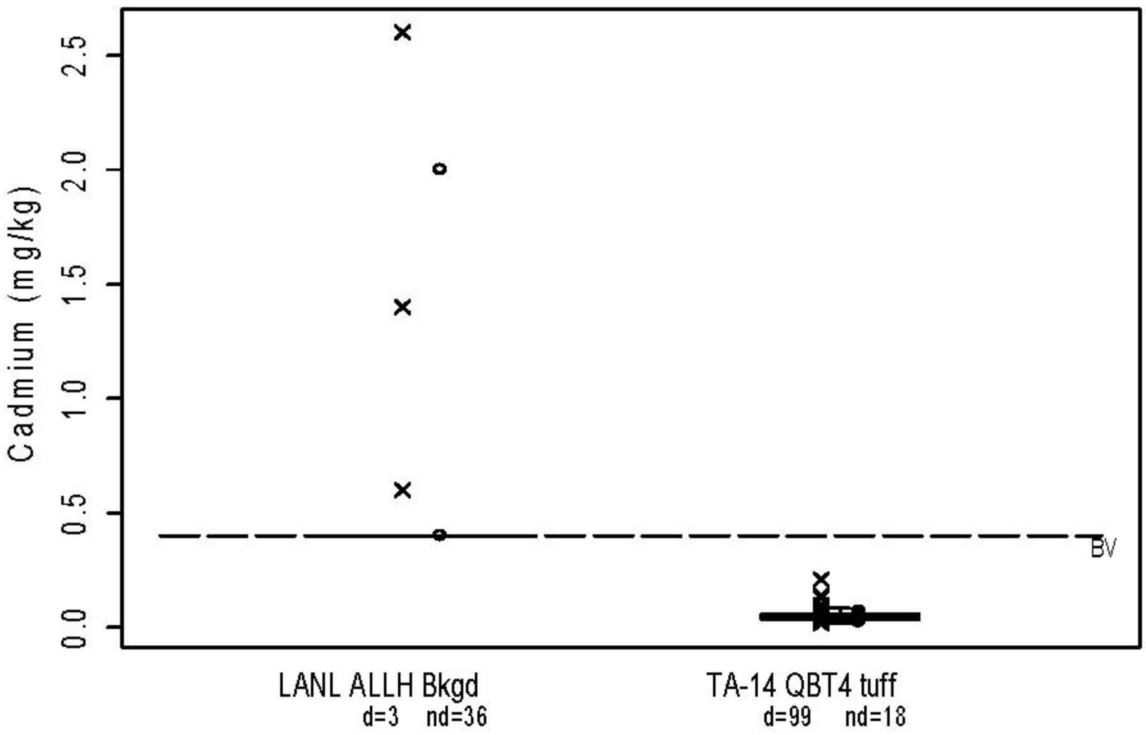


Figure G-19 Box plot of LANL soil background and weathered Qbt 4, cadmium

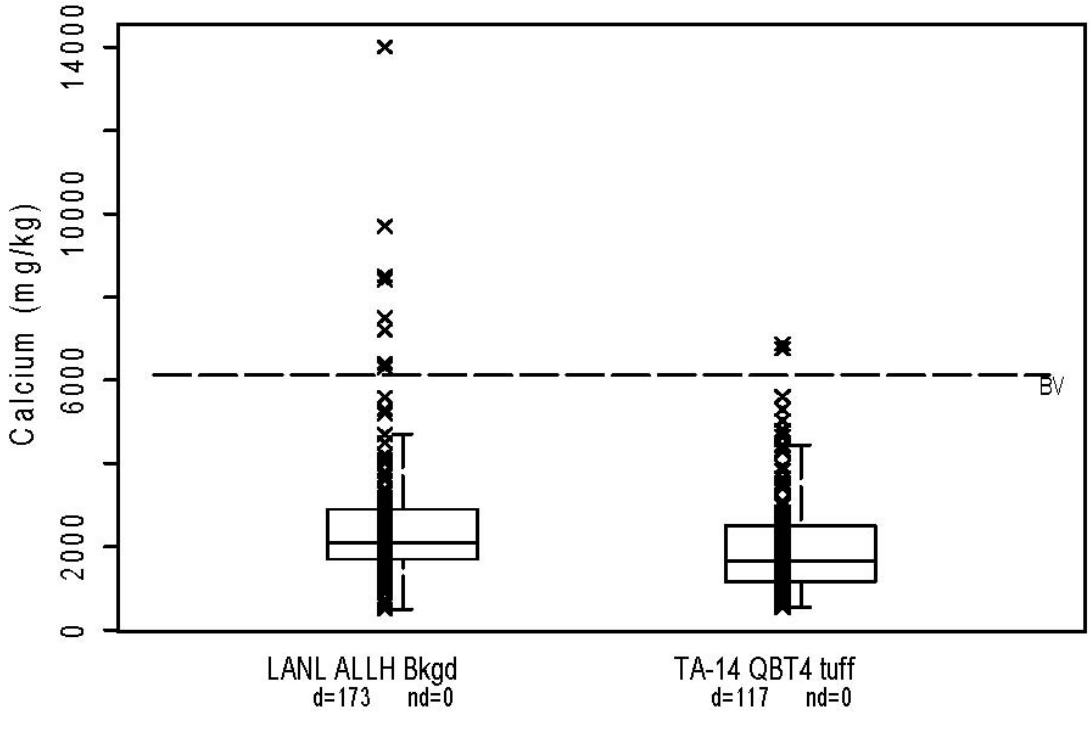


Figure G-20 Box plot of LANL soil background and weathered Qbt 4, calcium

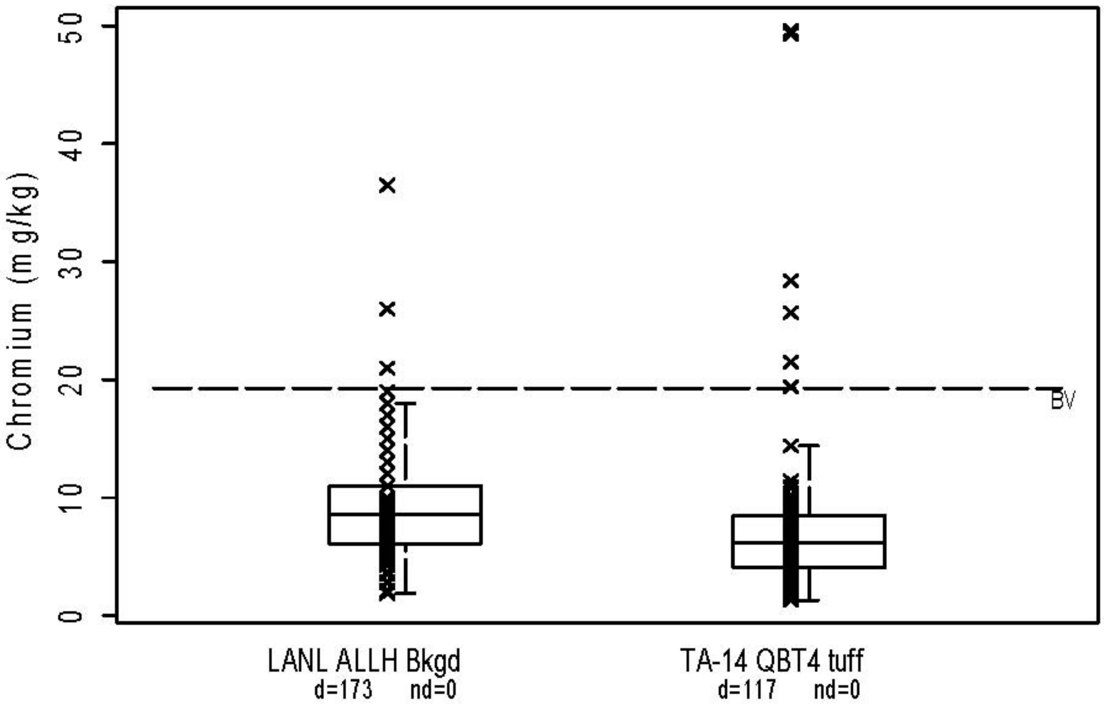


Figure G-21 **Box plot of LANL soil background and weathered Qbt 4, chromium**

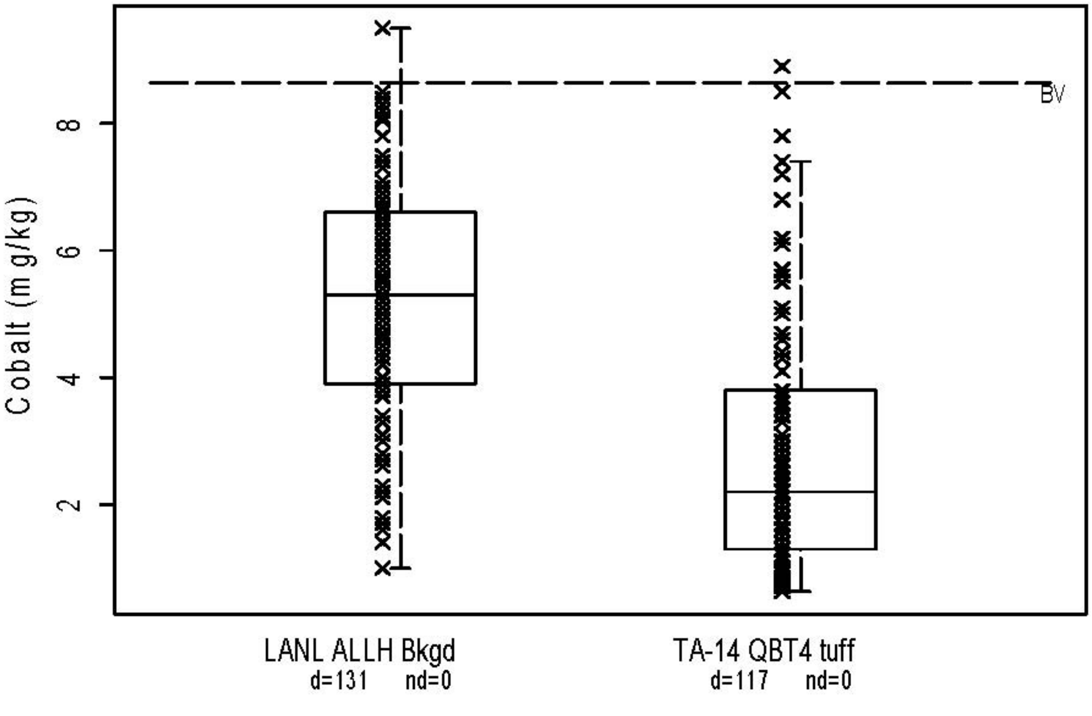


Figure G-22 **Box plot of LANL soil background and weathered Qbt 4, cobalt**

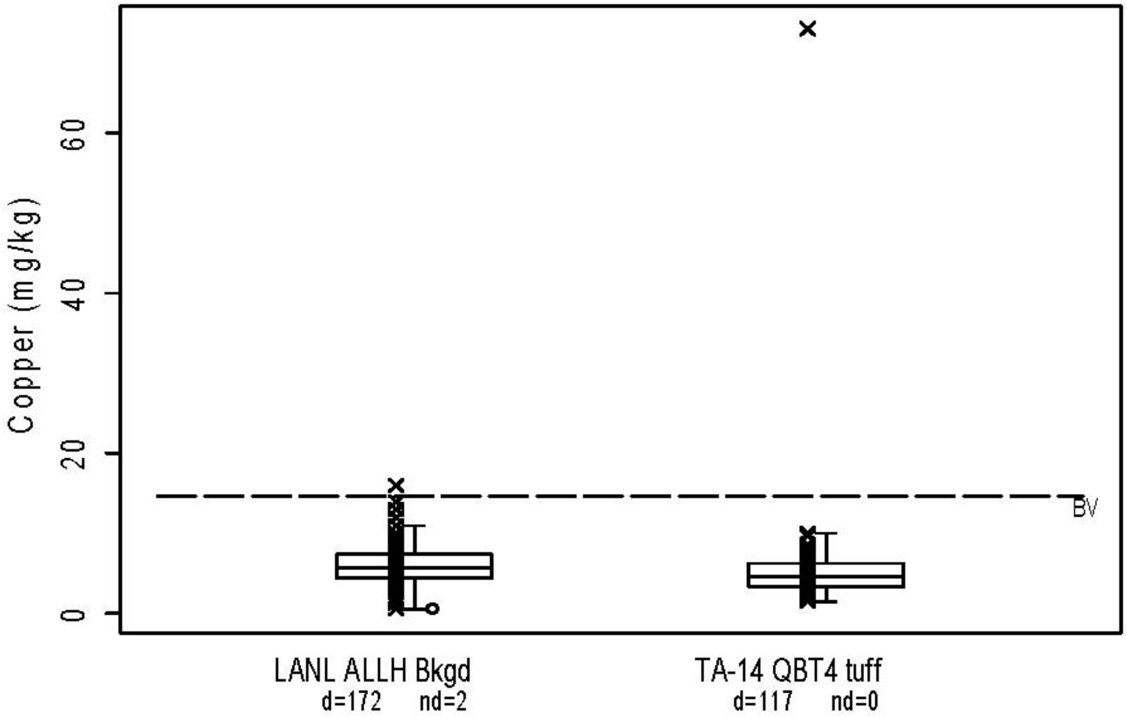


Figure G-23 Box plot of LANL soil background and weathered Qbt 4, copper

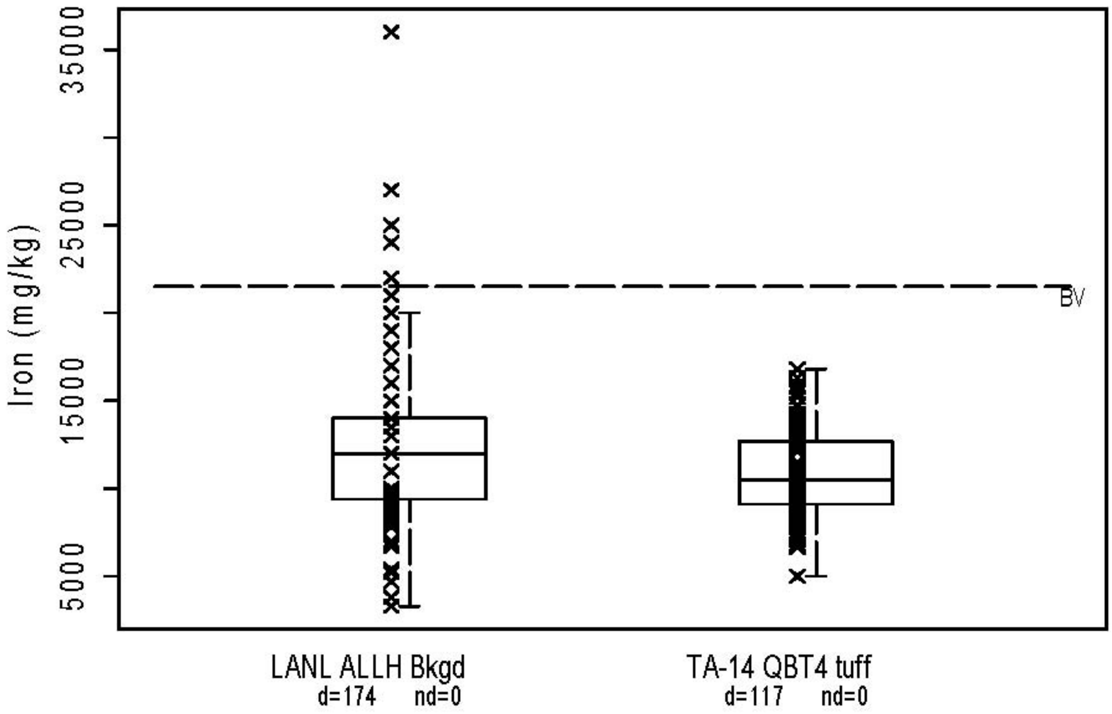


Figure G-24 Box plot of LANL soil background and weathered Qbt 4, iron

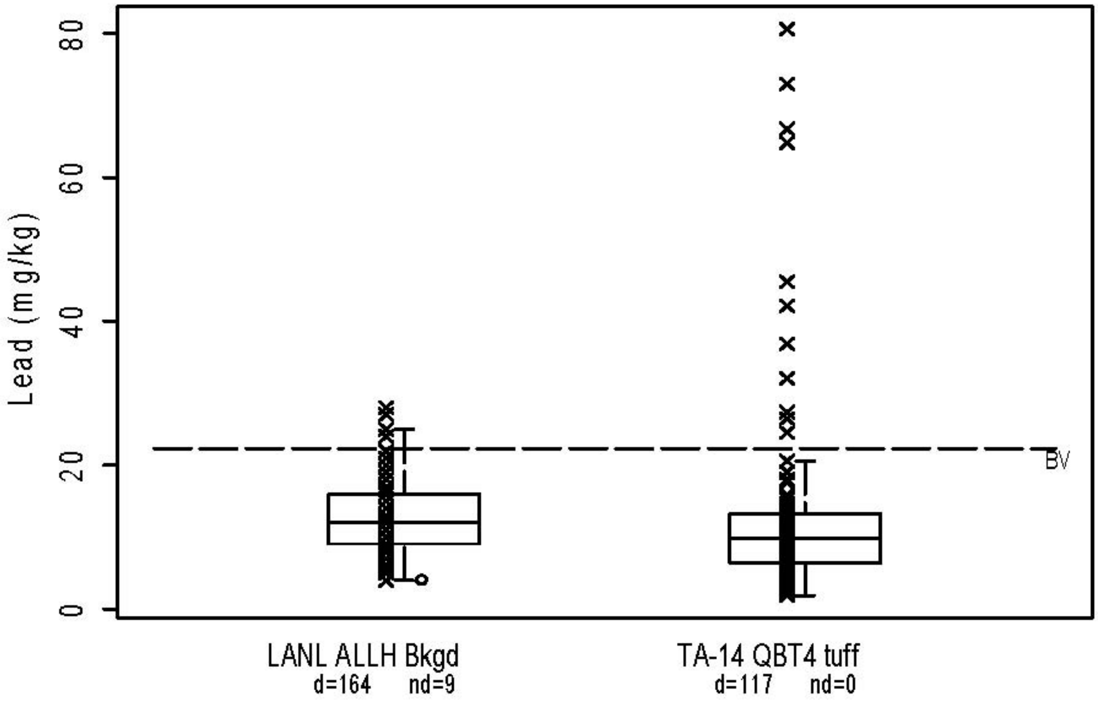


Figure G-25 Box plot of LANL soil background and weathered Qbt 4, lead

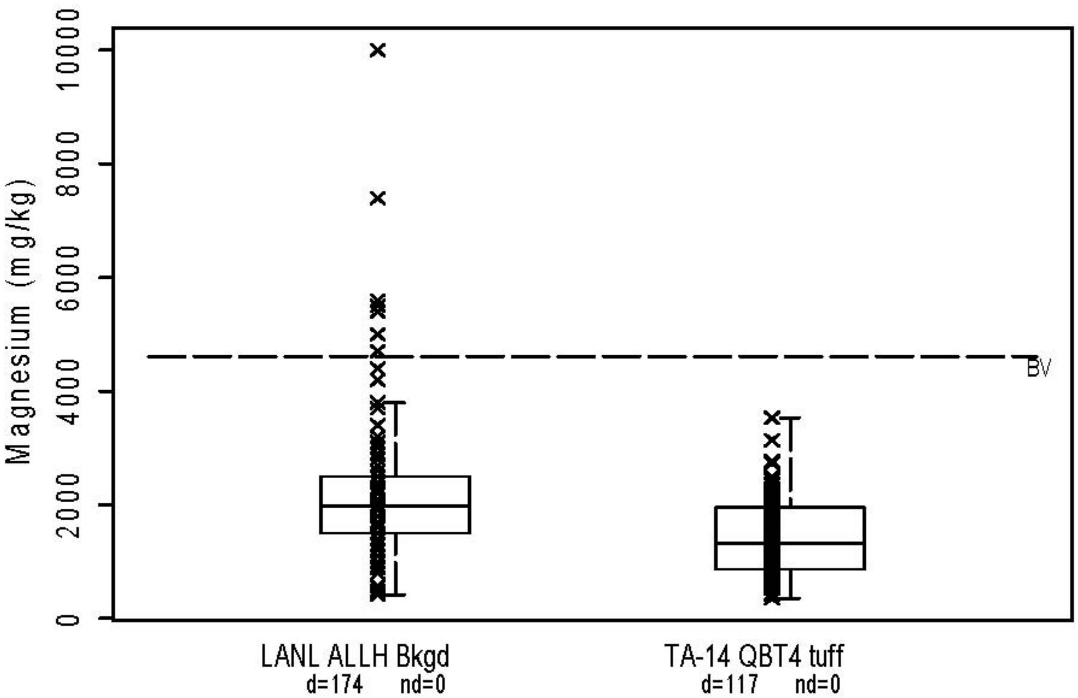


Figure G-26 Box plot of LANL soil background and weathered Qbt 4, magnesium

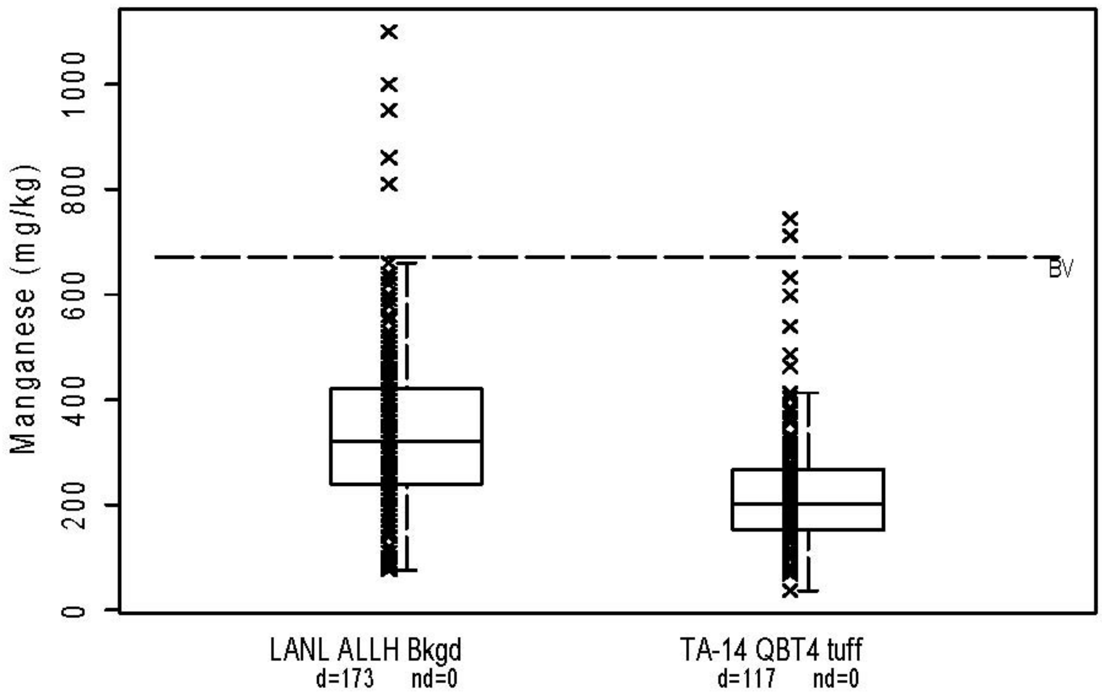


Figure G-27 Box plot of LANL soil background and weathered Qbt 4, manganese

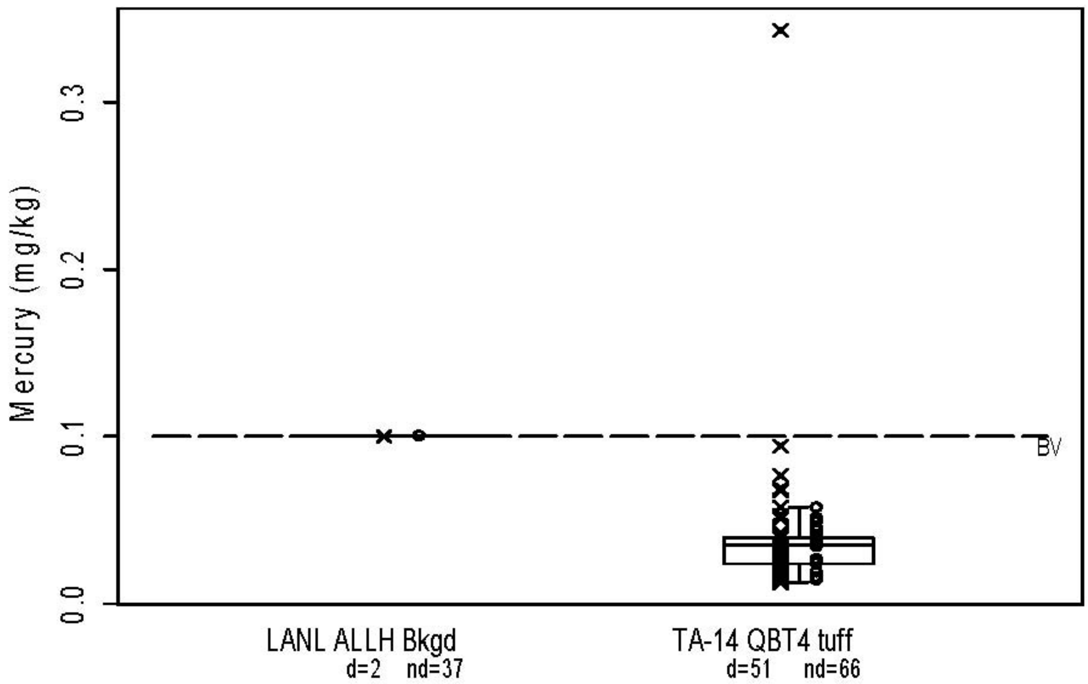


Figure G-28 Box plot of LANL soil background and weathered Qbt 4, mercury

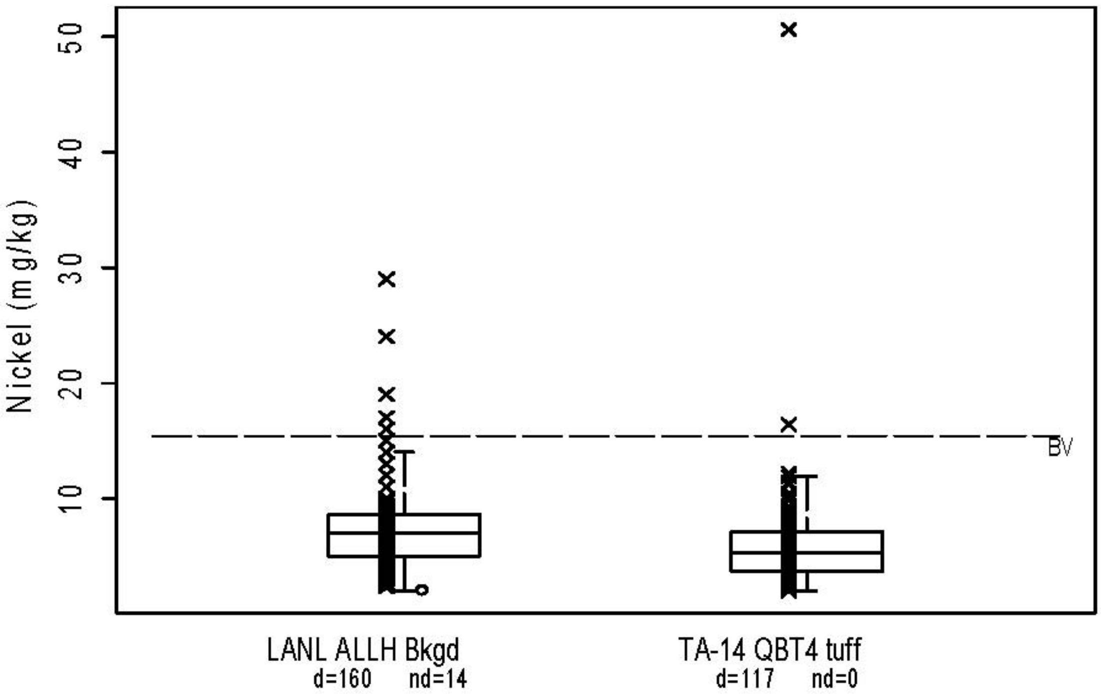


Figure G-29 Box plot of LANL soil background and weathered Qbt 4, nickel

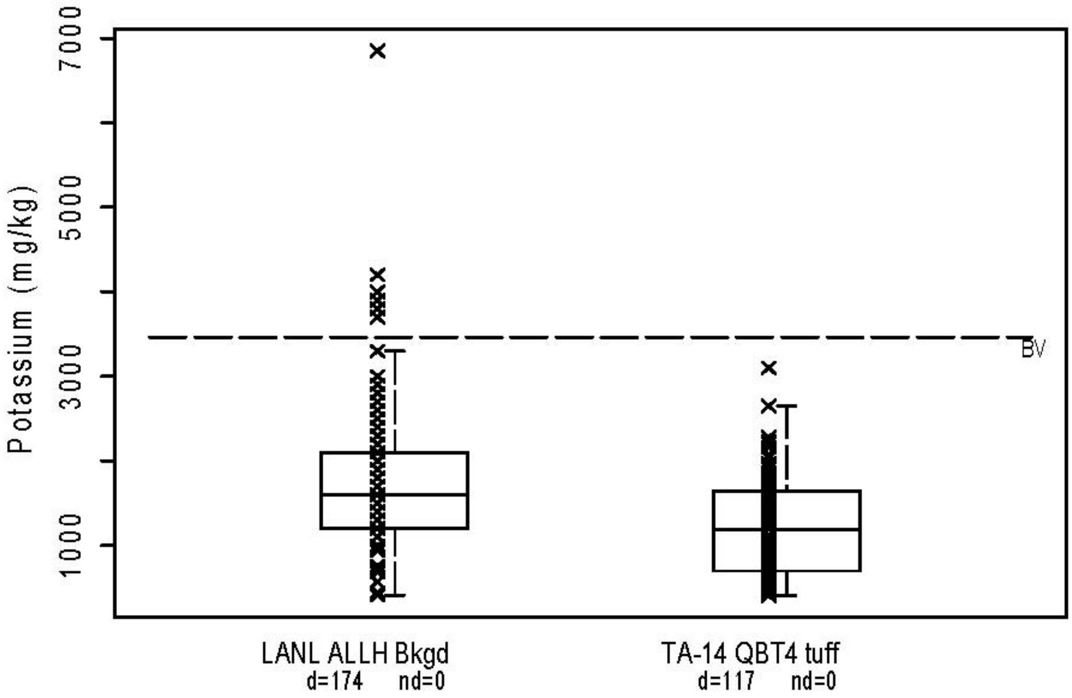


Figure G-30 Box plot of LANL soil background and weathered Qbt 4, potassium

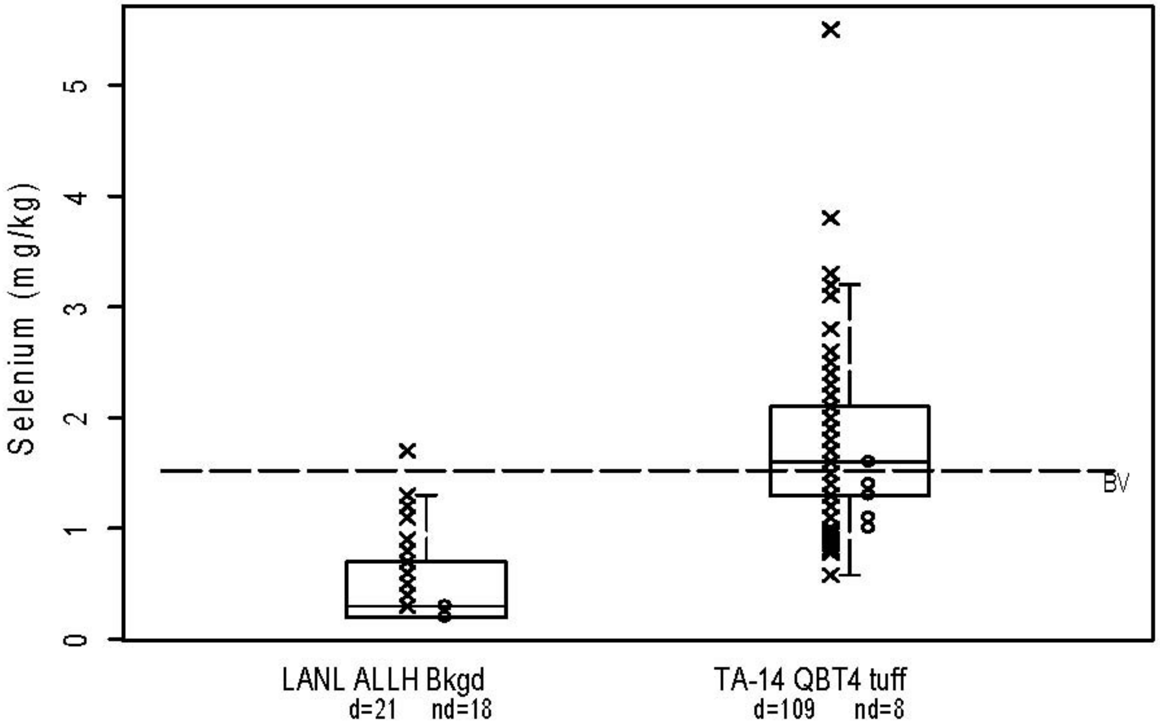


Figure G-31 Box plot of LANL soil background and weathered Qbt 4, selenium

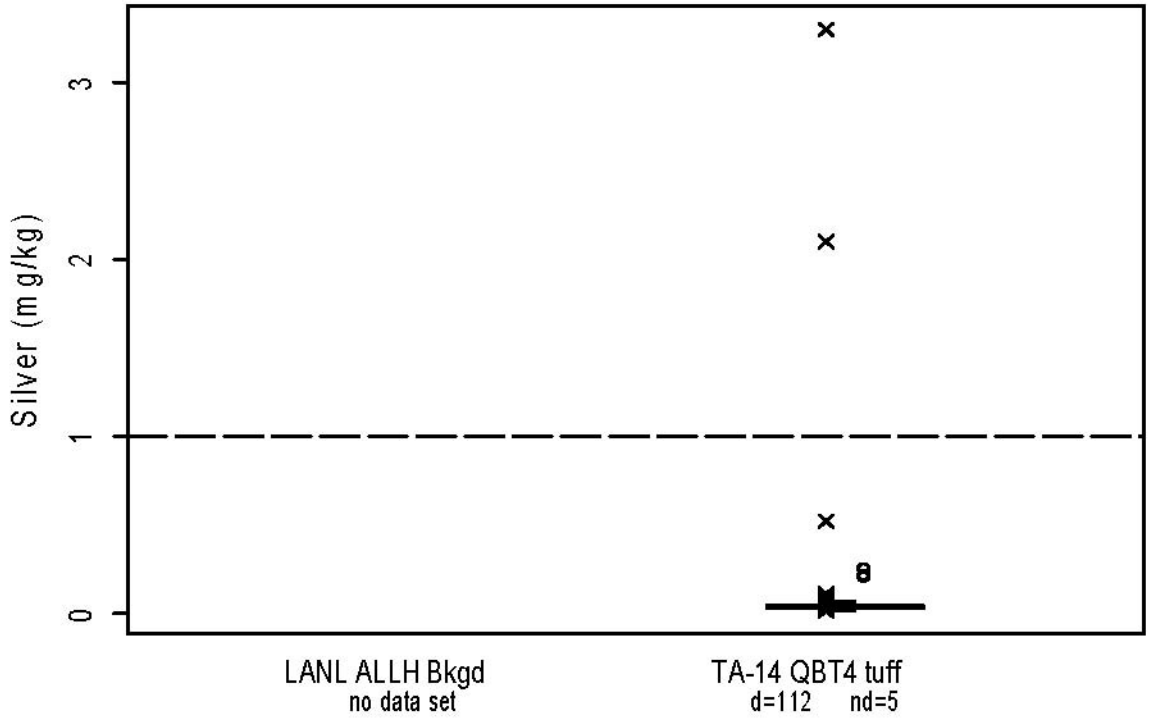


Figure G-32 Box plot of LANL soil background and weathered Qbt 4, silver

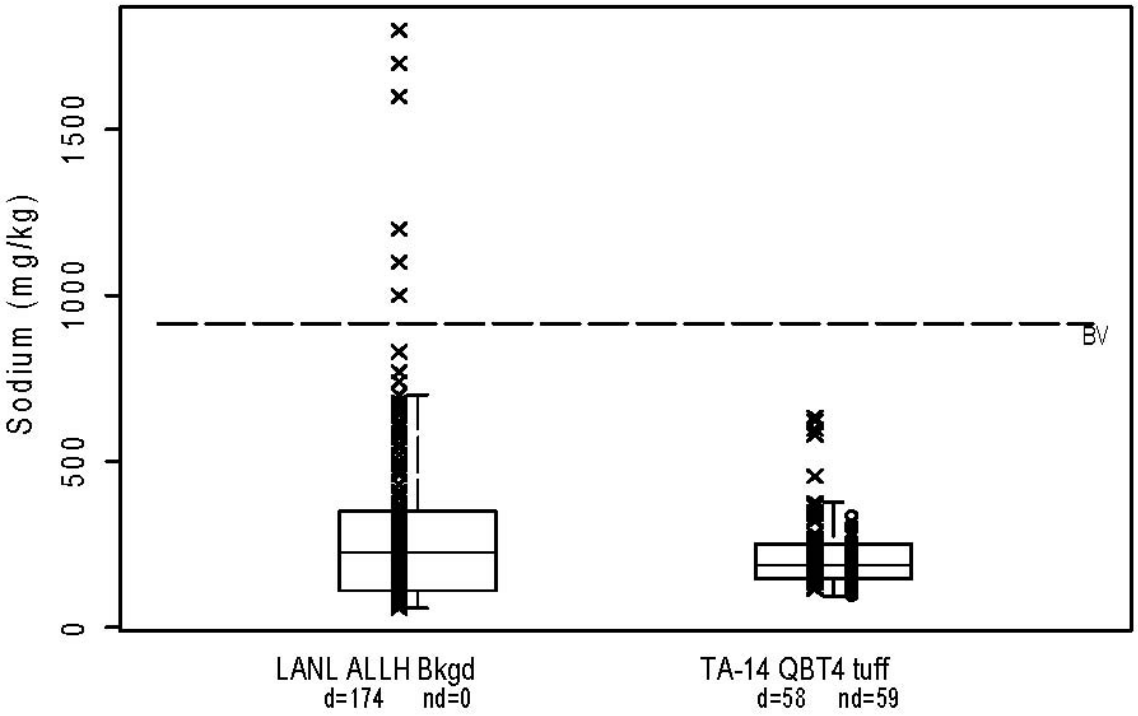


Figure G-33 Box plot of LANL soil background and weathered Qbt 4, sodium

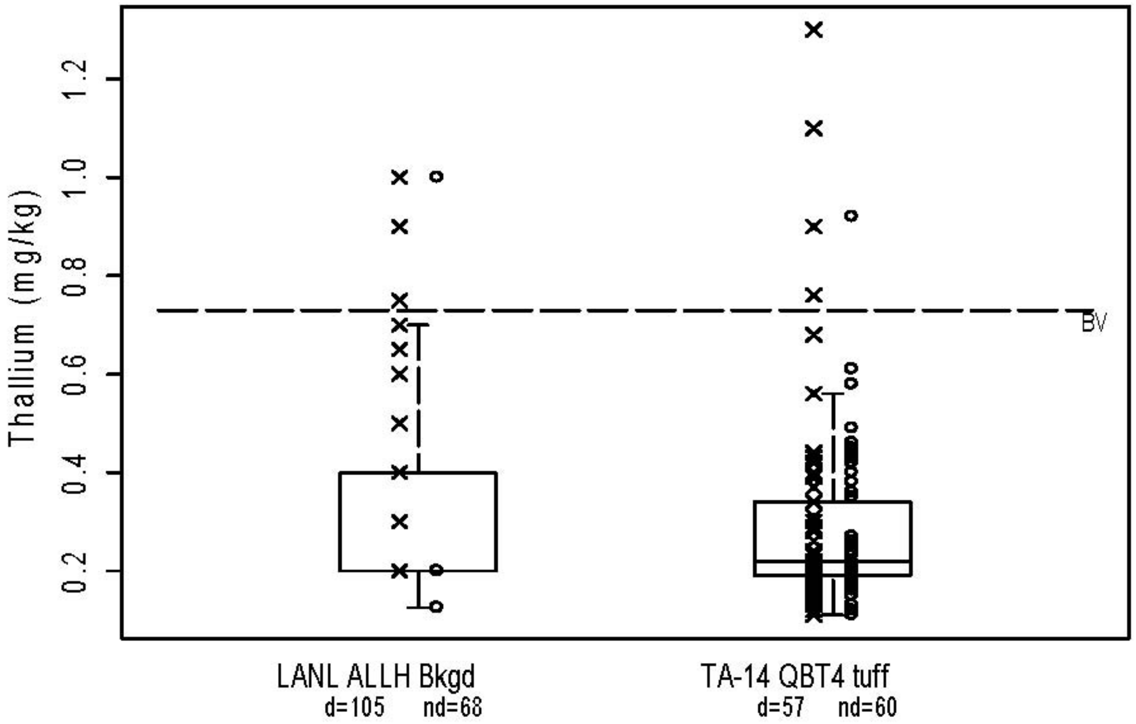


Figure G-34 Box plot of LANL soil background and weathered Qbt 4, thallium

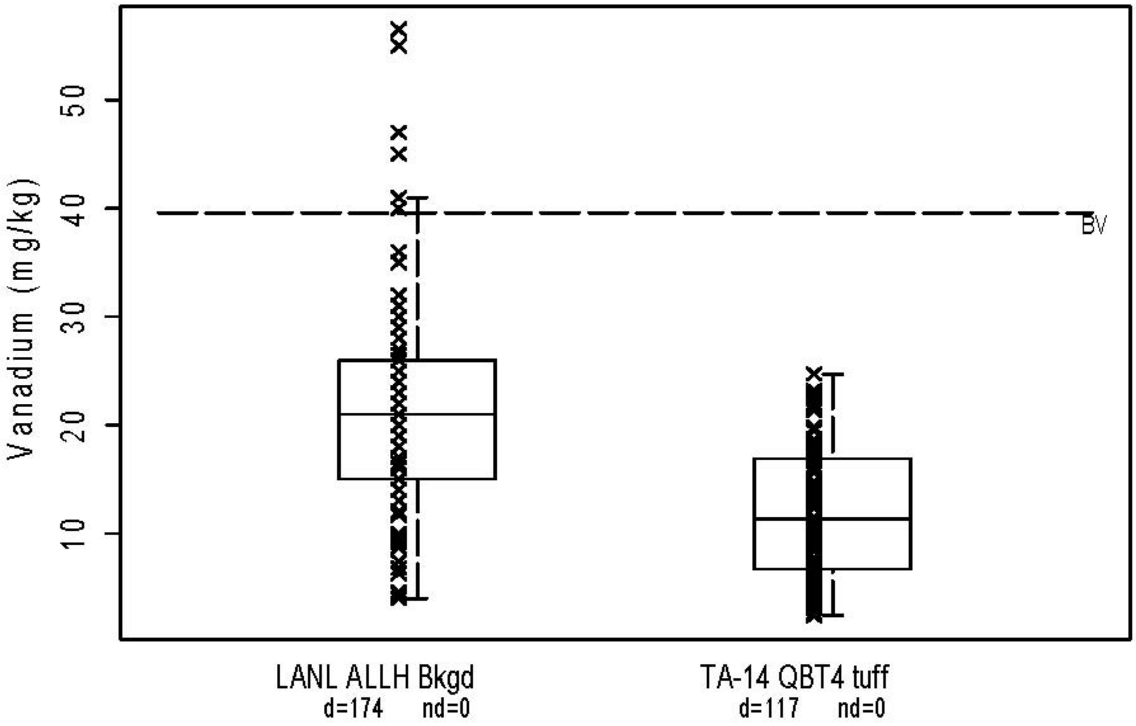


Figure G-35 Box plot of LANL soil background and weathered Qbt 4, vanadium

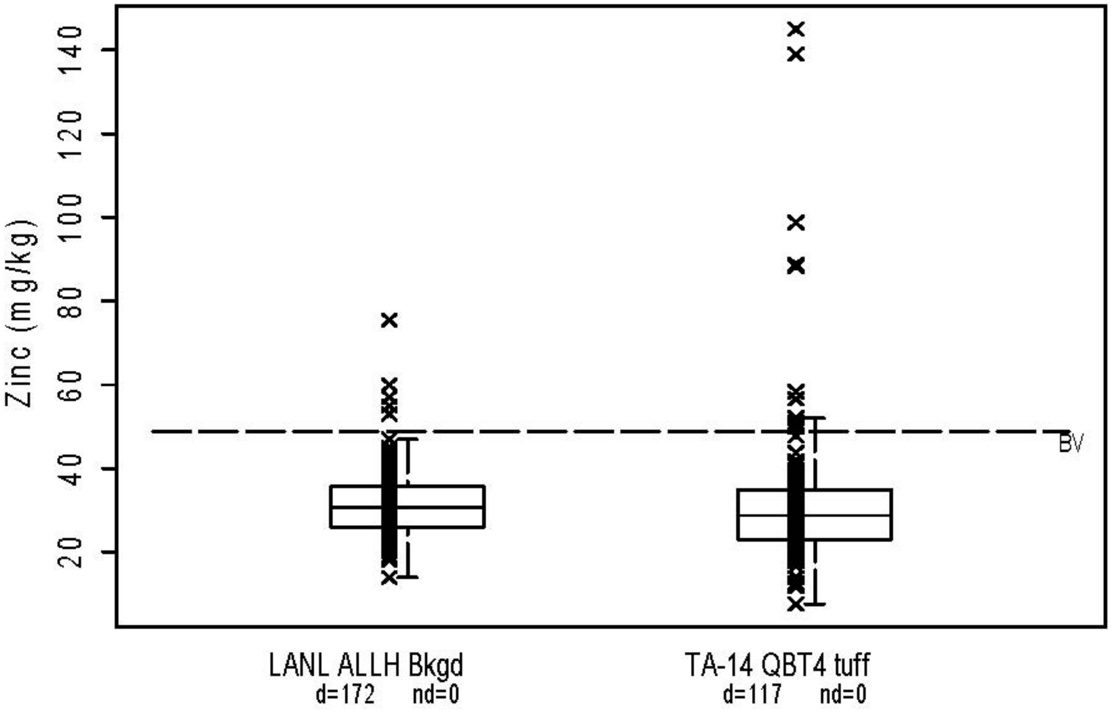


Figure G-36 Box plot of LANL soil background and weathered Qbt 4, zinc

Table G-1
Results of Statistical Tests Comparing TA-14 Weathered Qbt 4 Data to Soil Background Data

Analyte	Gehan	Quantile	Slippage	Pass?
Aluminum	0.9998	1	n/a[a]	Yes
Antimony	n/a	0.4213	0.5909	Yes
Arsenic	1	1	n/a	Yes
Barium	1	0.9919	n/a	Yes
Beryllium	1	0.9987	n/a	Yes
Cadmium	n/a	n/a	n/a	Yes[b]
Calcium	0.9998	0.8068	n/a	Yes
Chromium	1	0.9996	n/a	Yes
Cobalt	1	1	n/a	Yes
Copper	1	0.9934	n/a	Yes
Iron	0.9955	0.9999	n/a	Yes
Lead	0.9998	0.9762	n/a	Yes
Magnesium	1	1	n/a	Yes
Manganese	1	1	n/a	Yes
Mercury	n/a	0.0768	0.75	Yes
Nickel	0.9998	0.9996	n/a	Yes
Potassium	1	1	n/a	Yes
Selenium	5.53E-16	5.98E-05	1.06E-08	No
Silver	n/a	n/a	n/a	—[c]
Sodium	1	0.9999	n/a	Yes
Thallium	0.9606	1	n/a	Yes
Vanadium	1	1	n/a	Yes
Zinc	0.9777	0.7219	n/a	Yes

[a] n/a = Not applicable; test not run.

[b] Maximum detected concentration (0.21 mg/kg) and detection limit (0.07 mg/kg) are well below the BV and the maximum soil background concentration.

[c] No soil background data set for silver; maximum detected concentration above BV.

Table G-2
Comparison of Selected Inorganic Chemicals Detected at Depth in Soil and Weathered Qbt 4

Site	Sample ID	Location ID	Media	Depth (ft)	Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Nickel	Selenium	Vanadium
AOC 14-001(g)	RE14-11-23237	14-614463	QBT4	2–3	1700	ND[a]	0.91	18.5	611	3	0.75	1.8 (J)	3.9	437	3.5	1.9 (J-)	2.4
AOC 14-001(g)	RE14-11-23238	14-614464	QBT4	2–3	2070	ND	0.96	24.2	1190	3.7	1.1	2.8 (J)	3.1	780	2.2	1.5 (J-)	5.3
AOC 14-001(g)	RE14-11-23239	14-614465	QBT4	2–3	4300	ND	1.9	32.7	963	6.2	1.6	7.3 (J)	7	842	4	1.8 (J-)	8.5
AOC 14-001(g)	RE14-11-23240	14-614466	QBT4	2–3	3420	ND	1.3	34.5	1070	5.1	1.6	2.5 (J)	2.5	943	3.9	1.8 (J-)	7.8
AOC 14-001(g)	RE14-11-23241	14-614467	QBT4	2–3	2130	ND	1	17.4	1300	3.4	1.1	3.2 (J)	2.7	905	2.6	1.9 (J-)	5.6
AOC 14-001(g)	RE14-11-23242	14-614468	QBT4	2–3	2270	ND	1.3	19.7	1060	1.4	0.92	2.4 (J)	6.4	525	2.7	1.6 (J-)	3.5
AOC 14-001(g)	RE14-11-23243	14-614469	QBT4	2–3	7810	ND	2.7	49.4	2460	7.5	1.9	5.7 (J)	5.1	1680	6.7	3.3 (J-)	9.8
AOC 14-001(g)	RE14-11-23244	14-614470	QBT4	2–3	5140	ND	1.7	31.9	1620	3.9	1.2	3.1 (J)	6.4	925	3.4	2.2 (J-)	7.1
AOC 14-001(g)	RE14-11-23245	14-614471	QBT4	2–3	5200	ND	1.9	49.2	1660	4.3	1.8	4.2	7.7 (J+)	1050	3.7	1.6 (J+)	8.8
AOC 14-001(g)	RE14-11-23252	14-614475	QBT4	2–3	4450	ND	1.5	34.8	1330	4.4	1.3	2.7	5.4 (J+)	946	3.3	2.3 (J+)	6.7
AOC 14-001(g)	RE14-11-23253	14-614476	QBT4	2–3	3730	ND	1.3	29	1000	4.6	1.5	2.9	3.9 (J+)	793	3.8	2 (J+)	6.3
AOC 14-001(g)	RE14-11-23246	14-614472	SOIL	2–3	7800	ND	2.4	72.9	1790	4.8	2.2	3.6	16.8 (J+)	1250	4.6	1.2 (J+)	9.8
AOC 14-001(g)	RE14-11-23247	14-614473	SOIL	2–3	7790	ND	2.7	58.5	1370	5.2	2.3	3.7	15 (J+)	1310	4.5	1.9 (J+)	11.9
AOC 14-001(g)	RE14-11-23248	14-614474	SOIL	2–3	8070	ND	2.7	71.5	2250	6.2	1.9	5.8	10 (J+)	1670	4.9	2.9 (J+)	11.2
AOC 14-001(g)	RE14-11-23254	14-614477	SOIL	2–3	5070	ND	1.8	61.5	1660	4.7	2	3.5	6.4 (J+)	1100	4.1	1.7 (J+)	8.7
Range of Detects, QBT4					1700–7810	n/a[b]	0.91–2.7	17.4–49.4	611–2460	1.4–7.5	0.75–1.9	1.8–7.3	2.5–7.7	437–1680	2.2–6.7	1.5–3.3	2.4–9.8
Range of Detects, SOIL					5070–8070	n/a	1.8–2.7	58.5–72.9	1370–2250	4.7–6.2	1.9–2.3	3.5–5.8	6.4–16.8	1100–1670	4.1–4.9	1.2–2.9	8.7–11.9
SWMU 14-002(c)	RE14-11-23924	14-01089	QBT4	5–6	9190	ND	3.5	86.6 (J-)	1660	5.4	2.3 (J)	4 (J)	26.5 (J)	1600	5.1	2.1	12.3
SWMU 14-002(c)	RE14-11-23926	14-01090	QBT4	5–6	13100	ND	3.7	142 (J-)	2480	7.9	8.5 (J)	6.6	80.6 (J)	2770	10.4	3.2	16.9
SWMU 14-002(c)	RE14-11-23928	14-01091	QBT4	6–7	11300	ND	3.1	127 (J-)	2180	7.7	3.7 (J)	5.3	27.4 (J)	2000	6.5	2.1	18
SWMU 14-002(c)	RE14-11-23930	14-01092	QBT4	6–7	6770	0.12 (J)	2.4	71.4 (J)	1280	4.8	2.1 (J)	3.5 (J)	18	1350	4.8	1.8 (J-)	10
SWMU 14-002(c)	RE14-11-23920	14-614486	SOIL	2–3	14000	0.41 (J)	3.4	198 (J)	2720	12.4	6.8 (J)	12 (J)	18.5	2240	11.9	1.2 (J-)	25.8
SWMU 14-002(c)	RE14-11-23922	14-614487	SOIL	2–3	15600	0.62	3.7	213 (J)	3500	11.4	7.8 (J)	10 (J)	42	2320	11.2	1.5 (J-)	27.6
SWMU 14-002(c)	RE14-11-23923	14-01089	SOIL	1–2	19300	ND	3.9	247 (J-)	2810	10.8	6.9 (J)	10.3	34.4 (J)	2500	10.1	1.7	26.3
SWMU 14-002(c)	RE14-11-23925	14-01090	SOIL	1–2	17800	ND	4.2	218 (J-)	2030	11.4	7 (J)	7.6	16 (J)	2430	9.9	1.4	28
SWMU 14-002(c)	RE14-11-23927	14-01091	SOIL	1–2	9140	ND	1.9	240 (J-)	2060	7.6	4.4 (J)	7.3	39.9 (J)	1710	6.7	0.92	22.8
SWMU 14-002(c)	RE14-11-23929	14-01092	SOIL	1–2	13600	0.21 (J)	3	182 (J)	1950	9.6	6.5 (J)	6.6 (J)	14.7	2020	9.1	1.4 (J-)	23.6
Range of Detects, QBT4					6770–13100	0.12–0.12	2.4–3.7	71.4–142	1280–2480	4.8–7.9	2.1–8.5	3.5–6.6	18–27.4	1350–2770	4.8–10.4	1.8–3.2	10–18
Range of Detects, SOIL					9140–19300	0.21–0.62	1.9–4.2	182–247	1950–3500	7.6–12.4	4.4–7.8	6.6–12	14.7–18.5	1710–2500	6.7–11.9	0.92–1.7	22.8–28
SWMU 14-003	RE14-11-24035	14-614501	QBT4	3.5–4.5	8680	0.14 (J)	2.7	138	1980	7.7	5	5.4 (J)	10.8	1620	5.9	0.78	19.8
SWMU 14-003	RE14-11-24037	14-614502	QBT4	3.5–4.5	10500	0.14 (J)	3	151	1490	8.3	7.2	6 (J)	12.3	2030	6.6	0.9	21.8
SWMU 14-003	RE14-11-24039	14-614503	QBT4	3.5–4.5	12300	0.23 (J)	3.4	250	3420	9.5	6.2	7.8 (J)	13.2	2120	8.5	1.1	22.7
SWMU 14-003	RE14-11-24041	14-614504	QBT4	4.5–5.5	14500	ND	2.7	205 (J-)	3540	8.8	4.1	5.9	10.8	2260 (J-)	6.9	ND	17.6
SWMU 14-003	RE14-11-24043	14-614505	QBT4	5–6	13200	ND	2.7	150 (J-)	5030	9.3	3.6	5.9	9.5	2250 (J-)	6.6	ND	17.9
SWMU 14-003	RE14-11-24045	14-614506	QBT4	5–6	13500	ND	2.5	135 (J-)	2280	7.9	3.7	5	13.3	1910 (J-)	6.3	ND	15.6
SWMU 14-003	RE14-11-24047	14-614507	QBT4	3–4	16600	ND	3.3	223 (J-)	2220	9.5	5.5	7.9	13.2	2200 (J-)	7.9	ND	21.8
SWMU 14-003	RE14-11-24053	14-614510	QBT4	3–4	13100	ND	2.7	184 (J-)	1650	9	4.4	6.3	10.7	2050 (J-)	7.1	ND	18.7

Table G-2 (continued)

Site	Sample ID	Location ID	Media	Depth (ft)	Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Nickel	Selenium	Vanadium
SWMU 14-003	RE14-11-24055	14-614511	QBT4	3.5–4.5	11300	0.18 (J)	3.3	265	4440	8.7	7.8	7.1 (J)	13.8	2030	7.9	0.86	21.9
SWMU 14-003	RE14-11-24057	14-614512	QBT4	3–4	17000	ND	2.7	236 (J-)	3020	9	4.7	6.3	11.5	2010 (J-)	7.8	ND	19.6
SWMU 14-003	RE14-11-24059	14-614513	QBT4	3–4	13700	ND	3.5	204 (J-)	1920	10.9	5	7.3	12.1	2360 (J-)	8.4	ND	21.7
SWMU 14-003	RE14-11-24049	14-614508	SOIL	3–4	29200	ND	3.2	275 (J-)	2440	11.1	4.6	6.3	14.7	2410 (J-)	10.1	ND	22
SWMU 14-003	RE14-11-24051	14-614509	SOIL	3–4	26600	ND	3.2	277 (J-)	2660	10.8	6.2	7.7	15.8	2580 (J-)	10.3	ND	23.8
Range of Detects, QBT4					8680–17000	0.14–0.23	2.5–3.5	135–265	1490–5030	7.7–10.9	3.6–7.8	5–7.9	9.5–13.8	1620–2360	5.9–8.5	0.78–1.1	15.6–22.7
Range of Detects, SOIL					26600–29200	n/a	3.2–3.2	275–277	2440–2660	10.8–11.1	4.6–6.2	6.3–7.7	14.7–15.8	2410–2580	10.1–10.3	n/a	22–23.8
SWMU 14-006	RE14-11-24118	14-614531	QBT4	5–6	9510	ND	2.4	118	3030	5.8	2.4	5.1	73 (J+)	1370	4.8	1.4 (J-)	12.5
SWMU 14-006	RE14-11-24119	14-614531	QBT4	8–9	4150	ND	1.9	26.3	1080	2.8	1.3	2.9	5 (J+)	834	3.6	3.1 (J-)	6
SWMU 14-006	RE14-11-24120	14-614532	QBT4	5–6	14600	ND	3.6	188	5610	8.3	2.5	8.6	10.4 (J+)	2490	8.3	1.5 (J-)	17.7
SWMU 14-006	RE14-11-24121	14-614532	QBT4	8–9	1550	ND	0.97	21.8	771	2.9	0.79	2.2	5 (J+)	539	3.1	2 (J-)	3.1
SWMU 14-006	RE14-11-24122	14-614533	QBT4	5–6	11100	ND	3.1	223	4780	6.9	1.8	6.4	10.9 (J+)	2170	6.2	1.7 (J-)	14.2
SWMU 14-006	RE14-11-24123	14-614533	QBT4	8–9	2700	ND	1.6	24.4	937	2.1	0.92	5	4.7 (J+)	688	3.8	2.6 (J-)	3.9
SWMU 14-006	RE14-11-24125	14-614534	QBT4	7–8	11400	ND	3	119	2710	5.7	1.9	5.2	8.3 (J+)	2080	9.8	3.8 (J-)	11.5
SWMU 14-006	RE14-11-24127	14-614535	QBT4	4–5	13100	ND	7.7	40.3	2430	7.3	3	7.3	15.3 (J+)	1950	7.6	5.5 (J-)	14.7
SWMU 14-006	RE14-11-24129	14-614536	QBT4	3–4	6390	ND	3.4	29	1430	4.8	1.3	7.9	9.8 (J+)	1030	3.7	2.4 (J-)	11
SWMU 14-006	RE14-11-24131	14-614537	QBT4	3–4	10900	ND	3.2	47.4	1630	7.3	1.7	5.4	8.3 (J+)	1550	5.8	2.3 (J-)	12.3
SWMU 14-006	RE14-11-24133	14-614538	QBT4	3–4	2240	ND	1.5	20.3	1000	2.7	0.8	2.1	3 (J+)	709	2.3	2.1 (J-)	4.8
SWMU 14-006	RE14-11-24135	14-614539	QBT4	6–7	15500	0.15 (J)	4.1	149 (J+)	3090	10.8	6.1	10	13.5	3140	11.4	2	22.7
SWMU 14-006	RE14-11-24136	14-614540	QBT4	1.5–2.5	6890	ND	2.3	53.8	2830	4	1.3	4.9	7.4 (J+)	1320	7.6	2.6 (J-)	8.6
SWMU 14-006	RE14-11-24137	14-614540	QBT4	4.5–5.5	7080	ND	2.4	20.4	1410	4.2	1.1	4.7	6.9 (J+)	1250	5.7	3.3 (J-)	7
SWMU 14-006	RE14-11-24139	14-614541	QBT4	3–4	2590	ND	1.7	38.9	1130	4.5	1.3	3.6	5.6 (J+)	870	3.6	2.4 (J-)	7.7
SWMU 14-006	RE14-11-24124	14-614534	SOIL	4–5	15600	ND	3.4	175	2920	9	4.5	8.1	17.8 (J+)	2280	7.9	1.4 (J-)	19.6
SWMU 14-006	RE14-11-24126	14-614535	SOIL	1–2	15700	ND	4.3	89.8	2950	10.1	2.4	10.4	22.3 (J+)	2740	9.6	3.1 (J-)	17.6
SWMU 14-006	RE14-11-24134	14-614539	SOIL	2–3	14500	0.29 (J)	3.4	280 (J+)	3040	9.2	5.3	82.5	154	1950	8.1	1.6	22.4
Range of Detects, QBT4					1550–15500	0.15–0.15	0.97–7.7	20.3–223	771–5610	2.1–10.8	0.79–6.1	2.1–10	3–15.3	539–3140	2.3–11.4	1.4–3.8	3.1–22.7
Range of Detects, SOIL					14500–15700	0.29–0.29	3.4–4.3	89.8–280	2920–3040	9–10.1	2.4–5.3	8.1–10.4	17.8–22.3	1950–2740	7.9–9.6	1.4–3.1	17.6–22.4
SWMU 14-007	RE14-11-24181	14-614553	QBT4	3–4	20800	ND	2.9	257	3650	8.6	4.4	6 (J)	12.2	2230	9.3	1.2	19.6
SWMU 14-007	RE14-11-24186	14-614555	QBT4	6–7	10800	ND	3.3	203	2510	8.5	6.8	7.5	12.8	2110	7.5	1.5 (J-)	19.5
SWMU 14-007	RE14-11-24189	14-614556	QBT4	6–7	9210	ND	2.6	113	4410	5.8	3	4.7	8.9	1780	6.6	1.9 (J-)	11.2
SWMU 14-007	RE14-11-24192	14-614557	QBT4	6–7	7030	ND	2.5	121	6750	5.6	2.2	3.4	6.4	1630	4.2	1.9 (J-)	9.8
SWMU 14-007	RE14-11-24195	14-614558	QBT4	6–7	10700	0.22 (J)	2.8	201 (J+)	1750	6.6	5.7 (J)	5.6	11.9	1650	11.9	2.1	14.2
SWMU 14-007	RE14-11-24198	14-614559	QBT4	6–7	11100	0.2 (J)	2.3	103 (J+)	1420	6.8	2.5 (J)	4.5	7.5	1530	6.6	2	11.4
SWMU 14-007	RE14-11-24200	14-614560	QBT4	3–4	13200	0.22 (J)	3.2	199 (J+)	2620	9	8.9 (J)	7.4	15.9	2120	8.1	1.1	22.4
SWMU 14-007	RE14-11-24201	14-614560	QBT4	6–7	12900	0.26 (J)	2.8	138 (J+)	4650	8.2	2.6 (J)	5.3	8.8	2430	7.5	1.4	14.5
SWMU 14-007	RE14-11-24204	14-614561	QBT4	6–7	11200	0.2 (J)	2.7	110 (J)	3540	6.8	2.6 (J)	5 (J)	9.8	1890	6.5	1.6 (J-)	13.5
SWMU 14-007	RE14-11-24207	14-614562	QBT4	6–7	15900	0.28 (J)	3.5	137 (J+)	6870	10.1	2.5 (J)	7	9.3	3530	11.2	1.4	16.7
SWMU 14-007	RE14-11-25906	14-614542	QBT4	6–7	10900	ND	3.1	144	1910	10.2	5.5	7.6	11	2050	7.8	1.7 (J-)	21.3

Table G-2 (continued)

Site	Sample ID	Location ID	Media	Depth (ft)	Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Nickel	Selenium	Vanadium
SWMU 14-007	RE14-11-25908	14-614544	QBT4	9–10	3740	ND	2.1	45.9	1060	3.4	1.5	2.5	5.1	697	3.3 (J)	2.2 (J-)	6.5
SWMU 14-007	RE14-11-25909	14-614543	QBT4	6–7	14100	ND	3.4	190	1950	9.8	7.4	8.1	14.7	1940	8.6	1.7 (J-)	23
SWMU 14-007	RE14-11-25910	14-614553	QBT4	6–7	12000	ND	2.4	107	1920	7.7	3.3	5.2	8.8	1720	6.8	1.8 (J-)	13.9
SWMU 14-007	RE14-11-25911	14-614545	QBT4	6–7	11600	ND	2.6	120	2240	9.4	4.3	6.1	9.8	1960	7	1.6 (J-)	16.2
SWMU 14-007	RE14-11-25913	14-614550	QBT4	6–7	9700	ND	2.3	85.1	3620	8.5	2.2	4.7	6.5	1840	6.5	1.7 (J-)	12.8
SWMU 14-007	RE14-11-24151	14-614542	SOIL	3–4	20300	ND	3.7	216	2480	11.1	6.5	8.7 (J)	16.4	2680	10.4	1.7	26
SWMU 14-007	RE14-11-24153	14-614543	SOIL	3–4	16000	ND	3.6	223	2380	10.5	15.8	8.7 (J)	21.9	2260	9.3	1.3	26.1
SWMU 14-007	RE14-11-24155	14-614544	SOIL	3–4	13700	0.19 (J)	4.2	191	1930	9.8	6.8	8.1 (J)	14.3	2130	9.3	1	26.6
SWMU 14-007	RE14-11-24157	14-614545	SOIL	3–4	17900	ND	3.7	240	1710	9.4	6.1	7.9 (J)	15.4	2080	9.5	1.2	23.6
SWMU 14-007	RE14-11-24159	14-614546	SOIL	3–4	19900	ND	4	214	2020	10.5	6.9	8 (J)	15.3	2180	9.7	1.1	25.8
SWMU 14-007	RE14-11-24161	14-614547	SOIL	3–4	17200	ND	3.8	221	2270	9.2	5.2	7.2 (J)	15	1810	8.7	1.1	23.4
SWMU 14-007	RE14-11-24163	14-614548	SOIL	3–4	19900	ND	3.2	196	2000	11.4	6.9	8.2 (J)	14.6	3110	11.8	1.3	22.7
SWMU 14-007	RE14-11-24165	14-614549	SOIL	3–4	19200	ND	2.7	293	4100	8.7	4.5	6.1	11.6	2140	8.7	1.1 (J-)	20.4
SWMU 14-007	RE14-11-24167	14-614550	SOIL	3–4	17500	ND	2.8	206	2110	9.3	5.6	7.9	13.5	2080	8.9	1.2 (J-)	21.6
SWMU 14-007	RE14-11-24168	14-614551	SOIL	2.5–3.5	17900 (J+)	ND	3.1	217	2370	9.7	4.8	7.9	17.5	2350	8.7	1.5	22.4
SWMU 14-007	RE14-11-24169	14-614551	SOIL	5.5–6.5	12600 (J+)	ND	2.1	214	4160	7.4	3.7	4.7	8.9	1780	6.7	0.5	16
SWMU 14-007	RE14-11-24179	14-614552	SOIL	3–4	15900	ND	3.3	207	2130	9.4	5.9	7.8 (J)	14.4	2290	8.9	1.6	22.4
SWMU 14-007	RE14-11-24183	14-614554	SOIL	3–4	16800	ND	3	201	1940	9.1	4.9	6.3	12.4	2060	8	1.5 (J-)	21.5
SWMU 14-007	RE14-11-24185	14-614555	SOIL	3–4	19300	ND	3.6	227	2410	10.1	5.1	7.7	13.8	2420	9.1	1.7 (J-)	23.5
SWMU 14-007	RE14-11-24188	14-614556	SOIL	3–4	15400	ND	3	229	2280	8.8	5.3	6.9	13	2090	8.3	1.4 (J-)	21.6
SWMU 14-007	RE14-11-24191	14-614557	SOIL	3–4	14800	ND	2.8	207	2460	8.6	5.3	6.5	12.9	2030	7.9	1.3 (J-)	21.5
SWMU 14-007	RE14-11-24194	14-614558	SOIL	3–4	14600	ND	2.9	211	2110	9.2	5.7	7	13.8	2240	8.5	1 (J-)	24.1
SWMU 14-007	RE14-11-24197	14-614559	SOIL	3–4	28200	0.3 (J)	3.9	244 (J+)	2460	11.9	6.1 (J)	8.9	17.7	2620	10.5	1.4	26.1
SWMU 14-007	RE14-11-24203	14-614561	SOIL	3–4	19000	0.21 (J)	3.1	244 (J)	2610	10.8	5.4 (J)	7 (J)	13.4	2190	9.8	1.2 (J-)	22.3
SWMU 14-007	RE14-11-24206	14-614562	SOIL	3–4	18200	0.23 (J)	3.2	241 (J+)	2390	9.8	5.8 (J)	7.5	14	2380	9.4	1.8	22.7
SWMU 14-007	RE14-11-25905	14-614552	SOIL	6–7	16900	ND	2.2	154 (J+)	2040	7.4	3.9	5.5	8.5	1890	8.6	1.2	14.7
SWMU 14-007	RE14-11-25907	14-614544	SOIL	6–7	13700	ND	3.4	189	2210	11	5.5	6.8	12.7	2070	9.1	1.2 (J-)	25.1
SWMU 14-007	RE14-11-25912	14-614549	SOIL	6–7	14300	ND	2.9	178	2430	10.3	4.9	6.7	11.2	1920	8	1.7 (J-)	19.5
Range of Detects, QBT4					3740–20800	0.2–0.28	2.1–3.5	45.9–257	1060–6870	3.4–10.2	1.5–8.9	2.5–8.1	5.1–15.9	697–3530	3.3–11.9	1.1–2.2	6.5–23
Range of Detects, SOIL					12600–28200	0.19–0.3	2.1–4.2	154–293	1710–4160	7.4–11.9	3.7–6.9	4.7–8.9	8.5–21.9	1780–3110	6.7–11.8	0.5–1.8	14.7–26.6
SWMU 14-009	RE14-11-24071	14-614514	QBT4	5–6	16200	0.24 (J)	2.9	183	3520	11.4 (J-)	5.7	7.3	15.7 (J+)	2100	8.6 (J-)	1.3 (J-)	24.7
SWMU 14-009	RE14-11-24073	14-614515	QBT4	2.5–3.5	10100	0.28 (J)	2.8	108	2150	7.6 (J-)	3.4	7.6	24.5 (J+)	1450	5.5 (J-)	1.4 (J-)	14.6
SWMU 14-009	RE14-11-24075	14-614516	QBT4	2–3	7190	0.15 (J)	1.8	78.9	1510	4.5 (J-)	2.3	3.9	13.1 (J+)	1220	3.9 (J-)	1.2 (J-)	11.1
SWMU 14-009	RE14-11-24077	14-614517	QBT4	4.5–5.5	5580	0.35 (J)	2.6	68.8	2040 (J+)	4.2	1.9	4.1 (J)	11.4 (J+)	949	3.7	1.7	9.8
SWMU 14-009	RE14-11-24079	14-614518	QBT4	2–3	5480	0.11 (J)	1.8	116	3920	6.4 (J-)	2.5	4.5	8.3 (J+)	1250	4.5 (J-)	0.94 (J-)	17.3
SWMU 14-009	RE14-11-24081	14-614519	QBT4	1.5–2.5	4420	0.73	2.9	70.1	3090	49.6 (J-)	4.6	73	36.9 (J+)	1550	50.6 (J-)	1.1 (J-)	14.2
SWMU 14-009	RE14-11-24083	14-614520	QBT4	2–3	4820	0.31 (J)	2.1	23.4	1910	4.3 (J-)	1.8	9.8	45.5 (J+)	1310	4.6 (J-)	2 (J-)	8.9
SWMU 14-009	RE14-11-24085	14-614521	QBT4	2–3	2400	ND	2.6	17	1560	1.5	0.79	3.1	32.1	692	2.4 (J)	1.5 (J)	4.2

Table G-2 (continued)

Site	Sample ID	Location ID	Media	Depth (ft)	Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Nickel	Selenium	Vanadium
SWMU 14-009	RE14-11-24087	14-614522	QBT4	1–2	2150	ND	1.7	16	962	3.6	1.1	2.4	12.1	734	3.3 (J)	2.5 (J)	5.5
SWMU 14-009	RE14-11-24089	14-614523	QBT4	1–2	2470	ND	1.7	23.2	1160	3.3	1	2.9	4.7	679	2.5 (J)	2.3 (J)	5.3
SWMU 14-009	RE14-11-24091	14-614524	QBT4	1–2	1980	ND	1.3	18.4	1020	2.9	0.93	2.5	1.9	871	2.2 (J)	2.8 (J)	4.9
SWMU 14-009	RE14-11-24093	14-614525	QBT4	1–2	2950	0.13 (J)	1.9	19.9	1230	2.8	1.1	2.8	17.6	764	2.6 (J)	2 (J)	6.8
SWMU 14-009	RE14-11-24095	14-614526	QBT4	1–2	2980	0.073 (J)	1.5	29	1380	3.5	1.2	6.5	12.1	946	2.7 (J)	2 (J)	6.2
SWMU 14-009	RE14-11-24097	14-614527	QBT4	2.5–3.5	9970	23.8	2.4	118	2470 (J+)	7	3.4	6.7	12.4 (J+)	1440	6.5	1.2	17.9
SWMU 14-009	RE14-11-24099	14-614528	QBT4	3.5–4.5	10400	0.2 (J)	2.2	142	2480	7.7 (J-)	4.1	8.5	12 (J+)	1670	6.3 (J-)	1.3 (J-)	18.1
SWMU 14-009	RE14-11-24101	14-614529	QBT4	1–2	1590	ND	1.3	7.5	796	1.5	0.82	1.8	9.2	676	2.8 (J)	2.2 (J)	3.3
SWMU 14-009	RE14-11-24103	14-614530	QBT4	1–2	2530	ND	1.3	21.5	927	4.1	1.1	2.5	4.1	828	3.2 (J)	2.2 (J)	6.3
Range of Detects, QBT4					1590–16200	0.073–0.73	1.3–2.9	7.5–183	796–3920	1.5–11.4	0.79–5.7	1.8–9.8	1.9–24.5	676–2100	2.2–8.6	0.94–2.8	3.3–24.7
Range of Detects, SOIL					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SWMU 14-010	RE14-11-24363	14-614595	QBT4	3–4	2270	0.45 (J)	5.4	19.2	548	3.6	1.3	1.5	3.6	537	3.3	1.7	5.4
SWMU 14-010	RE14-11-24365	14-614596	QBT4	3–4	2430	0.7	3.4	29.8	1040	2.4	1	4.8	6.9	575	3.5	1.9	4.5
SWMU 14-010	RE14-11-24367	14-614597	QBT4	3–4	2730	0.44 (J)	3.7	29.2	1120	4.4	1.2	3.6	5.2	828	4.3	2.4	6.4
SWMU 14-010	RE14-11-24369	14-614598	QBT4	3–4	3850	0.5 (J)	2.2	28	902	3.8	1.5	2.4	19.1	760	3	1.6	7.3
SWMU 14-010	RE14-11-24371	14-614599	QBT4	3–4	1780	0.12 (J)	1.1	7.2	627	1.3	0.7	1.5	64.8	356	2	1.7	2.7
Range of Detects, QBT4					1780–3850	0.12–0.7	1.1–5.4	7.2–29.8	548–1120	1.3–4.4	0.7–1.5	1.5–4.8	3.6–19.1	356–828	2–4.3	1.6–2.4	2.7–7.3
Range of Detects, SOIL					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
AOC C-14-001	RE14-11-24392	14-614606	QBT4	3–4	8650	ND	2.4	80.4	5300	21.5	3.6	4.4	9.7	1020	12.2	1.2	13.9
AOC C-14-001	RE14-11-24394	14-614607	QBT4	3–4	9680	ND	2.2	104	1710	7.1	4.3	3.4	10.8	1240	5.1	1.2	16.1
AOC C-14-001	RE14-11-24396	14-614608	QBT4	3–4	10200	ND	2.6	93.1	1760	6.4	3.8	3.7	11.1	1350	4.8	1.4	14.8
AOC C-14-001	RE14-11-24398	14-614609	QBT4	3–4	8740	ND	2.2	82.2	1620	6.3	3.4	3.4	9.3	1140	4.6	0.9	13
AOC C-14-001	RE14-11-24390	14-614605	SOIL	3–4	10200	ND	2.6	101	1490	7.2	4.9	4.4	12.4	1410	6	1.4	18.5
Range of Detects, QBT4					8650–10200	n/a	2.2–2.6	80.4–104	1620–5300	6.3–21.5	3.4–4.3	3.4–4.4	9.3–11.1	1020–1350	4.6–12.2	0.9–1.4	13–16.1
Range of Detects, SOIL					10200–10200	n/a	2.6–2.6	101–101	1490–1490	7.2–7.2	4.9–4.9	4.4–4.4	12.4–12.4	1410–1410	6–6	1.4–1.4	18.5–18.5
AOC C-14-004	RE14-11-24432	14-614622	QBT4	3–4	15800	0.076 (J)	3.2	295	2290	9.2	3.8	6.5	15.9	2460	7.8	1.3	17.5
AOC C-14-004	RE14-11-24434	14-614623	QBT4	3–4	12300	0.16 (J)	3.4	82.4	2320	8.4	4.1	6.2	15.3	1850	6.9	1.4	17.5
AOC C-14-004	RE14-11-24436	14-614624	QBT4	3–4	11600	ND	3.4	94	4320	6.9	2	5.4	10.5	2380	6.9	1.6	13.1
AOC C-14-004	RE14-11-24438	14-614625	QBT4	3–4	2480	ND	1.3	24.1	1020	2.4	0.95	2.3 (J)	4.3	564	2.4	1.5	3.9
AOC C-14-004	RE14-11-24833	14-614642	QBT4	3–4	2470	ND	1.4	52.4	1130	2.7	0.86	1.8 (J)	6.6	605	3.4	1.5	4.6
AOC C-14-004	RE14-11-24440	14-614626	SOIL	3–4	14000	ND	3.2	148	3240	10.9	4.9	7.6	15.5	2400	8.4	1.2	20.4
Range of Detects, QBT4					2470–15800	0.076–0.16	1.3–3.4	24.1–295	1020–4320	2.4–9.2	0.86–4.1	1.8–6.5	4.3–15.9	564–2460	2.4–7.8	1.3–1.6	3.9–17.5
Range of Detects, SOIL					14000–14000	n/a	3.2–3.2	148–148	3240–3240	10.9–10.9	4.9–4.9	7.6–7.6	15.5–15.5	2400–2400	8.4–8.4	1.2–1.2	20.4–20.4
AOC C-14-005	RE14-11-24447	14-614627	SOIL	3–4	18500	0.19 (J)	3.1	250	3310	9.3	5.7	6.9	14	2300	9.5	1.1	22.4
AOC C-14-005	RE14-11-24449	14-614628	SOIL	3–4	17300	0.19 (J)	3.3	234	2460	9.4	5.1	6.6	14.4	2100	8.6	1.8	22.6
AOC C-14-005	RE14-11-24451	14-614629	SOIL	3–4	18300	0.19 (J)	2.8	223	2980	9.2	4.7	5.7	12.8	2180	8.1	1.1	21.3
AOC C-14-005	RE14-11-24453	14-614630	SOIL	3–4	21300	0.2 (J)	2.8	251	2920	9.9	4.9	6.4	13	2410	9.2	1.2	21.2
AOC C-14-005	RE14-11-24455	14-614631	SOIL	3–4	15900	0.2 (J)	3.2	242	2460	9.6	5.6	7.1	14	2210	8.9	1.4	24.2

Table G-2 (continued)

Site	Sample ID	Location ID	Media	Depth (ft)	Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Lead	Magnesium	Nickel	Selenium	Vanadium
Range of Detects, QBT4					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Range of Detects, SOIL					15900–21300	0.19–0.2	2.8–3.3	223–251	2460–3310	9.2–9.9	4.7–5.7	5.7–7.1	12.8–14.4	2100–2410	8.1–9.5	1.1–1.8	21.2–24.2
AOC C-14-007	RE14-11-24461	14-614632	QBT4	3–4	7340 (J+)	0.39 (J)	3.4	58.1	4800	49.3	2.3	9.7	9.6	1770	16.4	2.6	10.3
AOC C-14-007	RE14-11-24463	14-614633	QBT4	3–4	3520 (J+)	0.33 (J)	1.9	32.8	823	25.7	0.75	4.8	3.6	638	6.3	2.2	4.1
AOC C-14-007	RE14-11-24465	14-614634	QBT4	3–4	2210 (J+)	0.43 (J)	5.1	15.7	695	14.4	1.1	3.8	3.3	618	5.4	2	4.5
AOC C-14-007	RE14-11-24467	14-614635	QBT4	3–4	3740 (J+)	0.26 (J)	6.3	18.4	853	28.4	1.5	5.9	17.7	940	9	2.2	6.7
AOC C-14-007	RE14-11-24469	14-614636	QBT4	3–4	2120 (J+)	0.28 (J)	2.9	20.3	680	19.4	1.4	3.4	3.5	681	7.8	2.5	5.1
Range of Detects, QBT4					2120–7340	0.26–0.43	1.9–6.3	15.7–58.1	680–4800	14.4–28.4	0.75–2.3	3.4–9.7	3.3–17.7	618–1770	5.4–16.4	2–2.6	4.1–10.3
Range of Detects, SOIL					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
AOC C-14-008	RE14-11-24481	14-614640	QBT4	3–4	20700	0.13 (J)	3.5	270 (J+)	3830	10.8	5.6	8	14.3	2730	10	1.8	23.2
AOC C-14-008	RE14-11-24475	14-614637	SOIL	3–4	33100	0.086 (J)	4.2	356 (J+)	3000	12.8	5.7	9.1	17.6	2830	12.5	2.2	27.1
AOC C-14-008	RE14-11-24477	14-614638	SOIL	3–4	24800	0.1 (J)	4	243 (J+)	2330	13.2	6.9	9.3	17.3	3010	11.4	2.4	30
AOC C-14-008	RE14-11-24479	14-614639	SOIL	3–4	30800	0.22 (J)	4.2	324 (J+)	2940	12.9	5.5	9.1	18.1	2940	11.6	2.1	28.7
AOC C-14-008	RE14-11-24483	14-614641	SOIL	3–4	17700	ND	3.4	344 (J+)	3350	9.3	6.7	6.2	14.2	2170	8.9	1.2	22
Range of Detects, QBT4					20700–20700	0.13–0.13	3.5–3.5	270–270	3830–3830	10.8–10.8	5.6–5.6	8–8	14.3–14.3	2730–2730	10–10	1.8–1.8	23.2–23.2
Range of Detects, SOIL					17700–33100	0.086–0.22	3.4–4.2	243–356	2330–3350	9.3–13.2	5.5–6.9	6.2–9.3	14.2–18.1	2170–3010	8.9–12.5	1.2–2.4	22–30
AOC C-14-009	RE14-11-24418	14-614615	QBT4	3–4	4900	0.11 (J)	1.6	59	1420	4.3	1.7	3.4 (J)	11	1020	3.9	1.1	8.7
AOC C-14-009	RE14-11-24420	14-614616	QBT4	3–4	6470	0.15 (J)	2	79.2	1230	5.1	2.9	4.6 (J)	66.7	1310	5.9	1.1	11.3
AOC C-14-009	RE14-11-24422	14-614617	QBT4	3–4	5470	0.096 (J)	1.8	50.7	1240	5.9	1.5	4.2 (J)	6.2	1220	5.3	1.3	8.4
AOC C-14-009	RE14-11-24424	14-614618	QBT4	3–4	2270	0.13 (J)	1.1	42.2	1030	3.2	1.4	2.1 (J)	6.4	791	2.9	0.8	5.5
AOC C-14-009	RE14-11-24426	14-614619	QBT4	3–4	2010	ND	0.95	28.7	854	2.9	1	2.3 (J)	4.1	645	2.5	1.3	5
Range of Detects, QBT4					2010–6470	0.96–0.15	0.95–2	28.7–79.2	854–1420	2.9–5.9	1–2.9	2.1–4.6	4.1–11	645–1310	2.5–5.9	0.8–1.3	5–11.3
Range of Detects, SOIL					n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A. Grey shading indicates value was not included in the range. Value may indicate potential contamination.

[a] ND = Not detected.

[b] n/a = Range not applicable.

Appendix H

Risk Assessments

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Attachment H-2 Johnson and Ettinger Model Spreadsheets (on CD included with this document)

Attachment H-3 Ecological Scoping Checklist for Technical Area 14, Cañon de Valle Aggregate Area

H-1.0 INTRODUCTION

This appendix presents the results of the human health and ecological risk-screening assessments for the investigations conducted at sites where the nature and extent of contamination are defined within the Technical Area 14 (TA-14) portion of the Cañon de Valle Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). Sites include seven solid waste management units (SWMUs) and areas of concern (AOCs) located within TA-14.

Human health and ecological risk-screening assessments were conducted for AOCs 14-001(a,b,c,d,e), SWMU 14-003, and AOC C-14-001. These sites are described in section 6 of the investigation report and are summarized below.

H-2.0 TA-14 BACKGROUND

The sites discussed in this appendix are located in the southeastern portion of TA-14 and on the northern side of Cañon de Valle. All the TA-14 sites drain into Cañon de Valle. Elevations at TA-14 range from 7410 to 7280 ft above mean sea level. The topography has a gentle 2- to 5-degree slope to the south toward Cañon de Valle. Known as Q-site, TA-14 has been used since 1944 for explosives development and testing, including testing involving radioactive materials. In 1952, the firing site was renovated, the structures were removed, and a new firing site was constructed.

H-2.1 Site Descriptions and Operation History

H-2.1.1 AOCs 14-001(a,b,c,d,e)

AOCs 14-001(a,b,c,d,e) are small steel pull boxes (structures 14-25, 14-26, 14-27, 14-28, and 14-29, respectively) located at TA-14. Each pull box measures 26 in. long × 32 in. wide × 32 in. high and is covered with a metal lid. Each box is belowground, with only the lid and top 2 to 3 in. of the box exposed. Pull boxes were used to contain detonator and diagnostic electrical hookups. Historically, the pull boxes contained capacitor-discharge units. The pull boxes have been decommissioned and the tops have been welded shut. During a 2011 site visit, all pull boxes were visible, with the exception of AOC 14-001(b), because it had been completely covered over with sand.

H-2.1.2 SWMU 14-003

SWMU 14-003 is a former burning area located approximately 300 ft northeast of a control building (structure 14-5) in the southeastern portion of TA-14. The burning area measured approximately 5 ft wide × 20 ft long and was surrounded on three sides by a U-shaped, 3-ft-high soil berm. The area was used for burning combustible high explosives– (HE-) contaminated debris and for flash-burning noncombustible HE-contaminated debris from test shots. Burning operations began in 1951 and ceased in the 1960s. In 1997, the burning area soil was removed, and the site, including the berms, was regraded during a voluntary corrective action conducted at the site in 1997.

H-2.1.3 AOC C-14-001

AOC C-14-001 is the location of a former magazine (structure 14-1) in the south-central portion of TA-14. Constructed in 1944, the wood-framed magazine measured 9 ft wide × 11 ft long × 8 ft high and was covered with an earthen berm on three sides and the top. The magazine was destroyed by burning in 1963.

H-2.2 Sampling Results and Determination of Chemicals of Potential Concern

The data used to identify chemicals of potential concern (COPCs) and to evaluate potential risks or doses to human health and the environment for the TA-14 sites consisted of all qualified analytical results compiled from both historical sampling activities and the 2011 investigation. Only those data determined to be of decision-level quality following the data-quality assessment (Appendix C) are included in the data sets evaluated in this risk appendix. The data are presented in Appendix D (on DVD).

No COPCs were identified at AOCs 14-001(a,b,c,d,e). Tables H-2.2-1 to H-2.2-5 summarize the COPCs evaluated for potential risk at SWMU 14-003 and AOC C-14-001. Section 5.1 of the investigation report summarizes the COPC selection process. Inorganic chemicals and radionuclides above background values (BVs) or fallout values (FVs) and detected organic chemicals or radionuclides in tuff are retained as COPCs. 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 below ground surface (bgs) for construction worker and residential scenarios, 0–5 ft bgs for ecological risk, and 0–1 ft bgs for the industrial scenario. Therefore, the COPCs evaluated for each scenario may differ for the site depending on the depth at which the COPC was identified. 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 assessments.

H-3.0 CONCEPTUAL SITE MODEL

Potential contaminant sources at the TA-14 sites evaluated include a former burning area, a former HE magazine, and electrical pull boxes. COPCs may be found in surface material and may have also migrated into the subsurface.

H-3.1 Receptors and Exposure Pathways

The land use at TA-14 within the Cañon de Valle Aggregate Area is currently industrial and is expected to remain industrial for the reasonably foreseeable future. The industrial and construction worker scenarios are evaluated for the sites investigated. Because part of TA-14 is active with explosives testing, Laboratory employees are not permitted to use the area for recreational activities such as walking or jogging and it is not accessible to the general public. Therefore, the recreational scenario is not applicable for the sites investigated. Although the residential scenario is not applicable given the current and foreseeable future land use, this scenario is evaluated for comparison purposes per the Compliance Order on Consent.

The primary exposure pathway for human receptors is surface soil and subsurface soil or tuff that may be brought to the surface through intrusive activities. Human receptors (all scenarios) may be exposed through direct contact with surface 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 a resident and construction worker. The exposure pathways are the same as those for surface soil. Sources, exposure pathways, and receptors are shown in the conceptual site model (Figure H-3.1-1).

The TA-14 sites in the Cañon de Valle Aggregate Area are in an industrial area, which provides potential habitat for ecological receptors. Exposure pathways are complete to surface soil and tuff for ecological receptors. Exposure is assessed across the site to a depth of 0–5 ft. 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 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. Sources, exposure pathways, and receptors are presented in the conceptual site model (Figure H-3.1-1).

H-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 discussions of nature and extent presented in the main text. 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 chemical properties of the COPCs, and the lack of saturated conditions, the potential for contaminant migration to groundwater is very low.

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). Screening contaminant concentrations in soil against these DAF SSLs does not, however, provide an indication of the potential for contaminants to migrate to groundwater. The assumptions used to develop these DAF SSLs include uniform contaminant concentrations from the contaminant source to the water table (i.e., it is assumed that migration to groundwater has already occurred). For these reasons, screening of contaminant concentrations in soil against the DAF SSLs was not performed.

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 transport of volatile organic compounds (VOCs) occurs primarily in the vapor phase by diffusion or advection in subsurface air. The chemical and physical properties of the TA-14 COPCs are presented in Tables H-3.2-1 through H-3.2-3.

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 and radiological 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.

H-3.2.1 Inorganic Chemicals

In general, and particularly in a semiarid climate such as that found at the TA-14 sites within the Cañon de Valle Aggregate Area, 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 the soil-water partition coefficient (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). Table H-3.2-1 presents the K_d values for the inorganic COPCs identified at the TA-14 sites. Based on this criterion, aluminum, antimony, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, thallium, and vanadium have a low potential to mobilize and migrate through soil and the vadose zone. The K_d values for arsenic, copper, cyanide, iron, perchlorate, selenium, silver, and uranium are less than 40 and may indicate these inorganic chemicals have a greater potential to mobilize and migrate through soil and the vadose zone. These COPCs are discussed further in the following sections. Information about the fate and transport properties of inorganic chemicals was obtained from individual chemical profiles published by the Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR 1997, 056531). Information for these inorganic chemicals is also available from the ATSDR website at http://www.atsdr.cdc.gov/toxprofiles/index.asp.

- Arsenic may undergo a variety of reactions including oxidation-reduction reactions, ligand exchange, precipitation, and biotransformation. Arsenic forms insoluble complexes with iron, aluminum, and magnesium oxides commonly found in soil, and in this form, arsenic is relatively immobile. However, under low pH and reducing conditions, arsenic can become soluble and may potentially leach into groundwater or result in runoff of arsenic into surface waters. Arsenic is expected to have low mobility under the environmental conditions (average pH = 7.0).
- 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 7.0, so leaching of copper is unlikely.

- Cyanide tends to adsorb onto various natural media, including clay and sediment; however, sorption is insignificant relative to the potential for cyanide to volatilize and/or biodegrade. At soil surfaces, volatilization of hydrogen cyanide is a significant mechanism for cyanide loss. Cyanide occurring at low concentrations in subsurface soil is likely to biodegrade under both aerobic and anaerobic conditions. The extent of cyanide is defined.
- Iron is naturally occurring in soil and tuff and may be relatively mobile under reducing conditions. Iron is sensitive to soil pH conditions and occurs in two oxidation states: iron(III), the insoluble oxidized form, and iron(II), the reduced soluble form. Most iron in well-drained neutral to alkaline soil is present as precipitates of iron(III) hydroxides and oxides. With time, these precipitates are mineralized and form various iron-bearing minerals, such as lepidcrocite, hematite, and goethite. Iron is not expected to be mobile in soil with an average pH of 7.0. The extent of iron is defined.
- Perchlorate is soluble in water and may migrate with water molecules in saturated soil. As noted above, the subsurface material beneath the TA-14 sites has low moisture content, which inhibits the mobility of perchlorate as well as most other inorganic chemicals.
- 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 is 7.0, which indicates selenium is not likely to migrate.
- Silver sorbs onto soil and sediment and tends to form complexes with inorganic chemicals and humic substances in soil. Organic matter complexes with silver and reduces its mobility. Silver compounds tend to leach from well-drained soil so silver may potentially migrate into the subsurface. The extent of silver is defined at depth.
- Uranium is a natural and commonly occurring radioactive element present in nearly all rock and soil. The mobility of uranium in soil and its vertical transport to groundwater depend on properties of the soil such as pH, Eh, concentration of complexing anions, porosity of the soil, soil-particle size, and sorption properties as well as the amount of water available. In general, the actinide nuclides form comparatively insoluble compounds in the environment and are therefore not considered biologically mobile. The actinides are transported in ecosystems mainly by physical and sometimes chemical processes. They tend to attach, sometimes strongly, to surfaces and tend to accumulate in soil and sediment, which ultimately serve as strong reservoirs. Subsequent movement is largely associated with geological processes such as erosion and sometimes leaching.

H-3.2.2 Organic Chemicals

Table H-3.2-2 presents the physical and chemical properties (water solubility, organic carbon-water partition coefficient [K_{oc}], logarithm to the base 10 octanol-water partition coefficient [log K_{ow}], and vapor pressure) of the organic COPCs identified for the TA-14 sites within Cañon de Valle Aggregate Area. Physical and chemical properties of organic chemicals are important when evaluating their fate and transport. The following physiochemical property information, summarized from Ney (1995, 058210), illustrates some aspects of the fate and transport tendencies of the COPCs at TA-14.

Water solubility may be the most important chemical characteristic used to assess 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. A highly soluble chemical (water solubility greater than 1000 mg/L) is prone to biodegradation and metabolism that may detoxify the parent chemical. Benzoic acid; 1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX); and methylene chloride have water solubilities greater than 1000 mg/L. 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. The COPCs identified as having water solubilities less than 10 mg/L are bis[2-ethylhexyl]phthalate and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).

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 2009, 108070). Bis[2-ethylhexyl]phthalate; HMX; pentaerythritol tetranitrate (PETN); 2,3,7,8-TCDD; and 2,4,6-trinitrotoluene have K_{oc} values above 500 L/kg, indicating a very low potential to migrate toward groundwater. The COPCs with K_{oc} values less than 500 L/kg are 2-amino-4,6-dinitrotoluene; benzoic acid; and methylene chloride.

The K_{ow} is an indicator of a chemical's potential to bioaccumulate or bioconcentrate in the fatty tissues of living organisms. The unitless K_{ow} value is an indicator of water solubility, mobility, sorption, and bioaccumulation. The higher the K_{ow}, the greater the affinity the chemical has for bioaccumulation in the food chain, the greater its potential for sorption in the soil, and the lower its mobility (Ney 1995, 058210). The COPC with a K_{ow} greater than 1000 is bis[2-ethylhexyl]phthalate. 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. Amino-4,6-dinitrotoluene[2-]; benzoic acid; methylene chloride; PETN; and 2,4,6-trinitrotoluene have K_{ow} values less than 500.

Vapor pressure is a chemical characteristic used to evaluate the tendency of organic chemicals to volatilize. 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. Methylene chloride has vapor pressure greater than 0.01 mm Hg. Chemicals with vapor pressures less than 0.00001 mm Hg are less likely to volatilize, and therefore, tend to remain immobile. Amino-4,6-dinitrotoluene[2-]; PETN; and 2,4,6-trinitrotoluene have vapor pressures less than 0.00001 mm Hg.

In summary, bis[2-ethylhexyl]phthalate and 2,3,7,8-TCDD are the least mobile and the most likely to bioaccumulate. The more soluble and volatile COPCs, such as benzoic acid and methylene chloride, are more mobile but are also more likely to travel toward the atmosphere and not migrate toward groundwater. The four explosive compounds (2-amino-4,6-dinitrotoluene; PETN; triaminotrinitrobenzene [TATB]; and 2,4,6-trinitrotoluene) in general have low affinity for bioaccumulation and low vapor pressure. Because the organic COPCs were detected at low concentrations and the extent is defined, they are not likely to migrate to groundwater.

H-3.2.3 Radionuclides

Radionuclides are generally not highly soluble or mobile in the environment, particularly in the semiarid climate of the Laboratory. The physical and chemical factors that determine the distribution of radionuclides within soil and tuff are the K_d, the pH of the soil and other soil characteristics (e.g., sand or clay content), and the Eh. The interaction of these factors is complex, but 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 values. Radionuclides with K_d values greater than 40 are very unlikely to migrate through soil towards the water table (Kincaid et al. 1998, 093270). Table H-3.2-3 presents physical and chemical properties of the radionuclide COPCs identified at the TA-14 sites. Based on K_d values, cesium-134 and cesium-137 have a very low potential to migrate towards groundwater, and their extent is defined.

H-3.3 Exposure Point Concentration Calculations

The exposure point concentrations (f647s) represent upper bound concentrations of COPCs. For comparison to risk-screening levels, the upper confidence limit (UCL) of the arithmetic mean 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 UCLs of the mean concentration was done using the U.S. Environmental Protection Agency's (EPA's) ProUCL, Version 4.1 (EPA 2010, 109944), which is based on EPA guidance (EPA 2002, 085640, Section 15.4-1). The ProUCL program calculates 95%, 97.5%, and 99% UCLs and recommends a distribution and a UCL. 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 95% UCL for the recommended calculation method 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 ProUCL documentation strongly recommends against using the maximum detected concentration for the EPC. However, the maximum detected concentration was used to represent the EPC when data did not allow a UCL to be calculated.

The summary statistics, including the EPC for each COPC for the human health and the ecological risk-screening assessments and the distribution used for the calculation, are presented in Tables H-2.2-1 to H-2.2-5. Input and output data files for ProUCL calculations are provided on CD as Attachment H-1.

H-4.0 HUMAN HEALTH RISK-SCREENING ASSESSMENTS

The extent of contamination was defined at seven TA-14 sites within the Cañon de Valle Aggregate Area. No COPCs were identified at five of the seven sites: AOCs 14-001(a,b,c,d,e). Therefore, no potential human health risk or dose or ecological risk exists at these five sites.

Human health risk-screening assessments were conducted for the remaining two sites at TA-14: SWMU 14-003 and AOC C-14-001 where extent is defined. Both sites were screened for the industrial scenario using data from 0–1 ft bgs and for the construction worker and residential scenarios using data from 0–10 ft bgs. The human health risk-screening assessments compare the EPC of each COPC with SSLs (for inorganic and organic chemicals) or with screening action levels (SALs) (for radionuclides).

H-4.1 SSLs and SALs

Human health risk-screening assessments were conducted using the SSLs obtained from NMED guidance (NMED 2009, 108070) or the EPA regional tables (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm). The SSLs are based on either a cancer risk of 1×10^{-5} or a hazard quotient (HQ) of 1. 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}. Surrogate chemicals were used for some COPCs without a screening value, based on structural similarity or because the COPC is a breakdown product (NMED 2003, 081172). Exposure parameters used to calculate the SSLs are presented in Table H-4.1-1.

Radionuclide SALs are used for comparison with radionuclide COPC EPCs and were derived using the residual radioactive (RESRAD) model, Version 6.5 (LANL 2009, 107655). The SALs are based on a 15-mrem/yr dose (DOE 2000, 067489). Exposure parameters used to calculate the SALs are presented in Table H-4.1-2.

In addition, vapor intrusion of VOCs into a building was evaluated for the residential scenario. The potential risk was assessed using the Johnson and Ettinger model (http://www.epa.gov/swerrims/riskassessment/airmodel/johnson_ettinger.htm) for subsurface vapor intrusion into buildings (EPA 2002, 094114). Only one VOC (methylene chloride) was detected at SWMU 14-003, and VOCs were not detected at AOC C-14-001. Because only soil data are available, the advanced soil model (Attachment H-2) was used to calculate risk-based soil concentration for methylene chloride at SWMU 14-003. The maximum detected concentration of the VOC was compared with the risk-based concentration generated by the model for the site. The model input and risk-based concentration generated are provided in Attachment H-2. The total excess cancer risk for methylene chloride was calculated. The NMED target cancer risk level of 1×10^{-5} was applied.

H-4.2 Results of the Human Health Risk-Screening Evaluations

The EPC of each COPC was compared with the SSL/SAL for the appropriate scenario. The EPCs for carcinogenic COPCs were divided by the SSL and multiplied by 1×10^{-5}. The sums of the cancer risks were compared with the NMED target cancer risk level of 1×10^{-5} (NMED 2009, 108070). An HQ was generated for each noncarcinogenic COPC by dividing the EPC by the SSL. The HQs were summed to generate a hazard index (HI). The HI was compared with the NMED target HI of 1 (NMED 2009, 108070). The radionuclide EPCs were divided by the SAL and multiplied by 15 mrem/yr. The total doses were compared with the U.S. Department of Energy (DOE) target level of 15 mrem/yr (DOE 2000, 067489). The results of the human health screening evaluations are presented in Tables H-4.2-1 to H-4.2-14.

H-4.2.1 AOCs 14-001(a,b,c,d,e)

The AOCs 14-001(a,b,c,d,e) pull boxes are belowground. Two samples were collected at the base of each of the pull boxes at depth intervals of 3–4 ft and 6–7 ft bgs. No samples were collected between 0–1 ft bgs. No potential exposure pathways exist. Therefore, a risk-screening assessment was not performed for the industrial scenario.

Because no COPCs are identified at these sites, risk-screening assessments were not performed for the construction worker and residential scenarios. No potential unacceptable risk exists for the construction worker and residential scenarios at AOCs 14-001(a,b,c,d,e) because no COPCs were identified at the site.

H-4.2.2 SWMU 14-003

Calcium

Calcium does not have a published toxicity value, but is among those elements identified in section 5.9.4 of the Risk Assessment Guidance for Superfund (RAGS) (EPA 1989, 008021) as an essential macronutrient. As an essential nutrient, calcium may be compared with the recommended daily allowance (RDA) for adults and children. The RDA is 1200 mg/d of calcium for an adult and 800 mg/d for a child (National Research Council, available at http://www.nap.edu/openbook.php?record_id=1349&page=174). If all the daily incidental ingestion of soil were to occur at the location of the maximum concentration detected between 0–10 ft at SWMU 14-003 of 5030 mg/kg, at the EPA default adult soil ingestion rate of 100 mg/d of soil, an adult would ingest approximately 0.72 mg/d of calcium. At the intake level of 0.72

mg/d of calcium, the adult's ingestion of calcium is less than the RDA for calcium of 1200 mg/d. If all the daily incidental ingestion of soil were to occur at the location of the maximum concentration detected between 0–10 ft at SWMU 14-003 of 5030 mg/kg, at the EPA default child soil ingestion rate of 200 mg/d of soil, a child would ingest approximately 1.68 mg/d of calcium. At the intake level of 1.68 mg/d of calcium, the child's ingestion of calcium is less than the RDA for calcium of 800 mg/d. Therefore, no adverse health effects are expected from calcium at the site, and calcium is eliminated as a COPC.

Magnesium

Magnesium does not have a published toxicity value but is among those elements identified in section 5.9.4 of RAGS (EPA 1989, 008021) as an essential macronutrient. As an essential nutrient, magnesium may be compared with the RDA for adults and children. The RDA is 310–420 mg/d of magnesium for an adult and 80–240 mg/d for a child (National Research Council, available at http://www.nap.edu/openbook.php?record_id=1349&page=187). If all the daily incidental ingestion of soil were to occur at the location of the maximum concentration detected between 0–10 ft of 2360 mg/kg at the EPA default adult soil ingestion rate of 100 mg/d of soil, an adult would ingest approximately 0.34 mg/d of magnesium. At the intake level of 0.34 mg/d of magnesium, the adult's ingestion of magnesium is less than the RDA for magnesium of 310–420 mg/d. If all the daily incidental ingestion of soil were to occur at the location of the maximum concentration detected between 0–10 ft of 2360 mg/kg, at the EPA default child soil ingestion rate of 200 mg/d of soil, a child would ingest approximately 0.78 mg/d of magnesium. At the intake level of 0.78 mg/d of magnesium, the child's ingestion of magnesium is less than the RDA for magnesium of 80–240 mg/d. Therefore, no adverse health effects are expected from magnesium at the site, and magnesium is eliminated as a COPC.

The dioxin and furan congener toxicity equivalency factor (TEF) calculations for the industrial scenario are presented in Table H-4.2-1. The results of the risk-screening assessments for the industrial scenario are presented in Tables H-4.2-2 to H-4.2-4. The total excess cancer risk is 2×10^{-6}, 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 dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489).

The dioxin and furan congener TEF calculations for the construction worker scenario are presented in Table H-4.2-5. The results of the risk-screening assessments for the construction worker scenario are presented in Tables H-4.2-6 and H-4.2-7. No carcinogens were retained as COPCs under the construction worker scenario. The HI is 2, which is above the NMED target HI of 1 (NMED 2009, 108070). The total dose for the construction worker scenario is 0.4 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489).

The dioxin and furan congener TEF calculations for the residential scenario are presented in Table H-4.2-5. The results of the risk-screening assessments for the residential scenario are presented in Tables H-4.2-8 to H-4.2-10. The total excess cancer risk is 9×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070). The HI is 1, which is equivalent to the NMED target HI of 1 (NMED 2009, 108070). The total dose for the residential scenario is 1 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489).

The results of the residential vapor intrusion screening assessment are presented in Table H-4.2-11. The total excess cancer risk is approximately 2×10^{-9}, which is less than the NMED target cancer risk level of 1×10^{-5}.

H-4.2.3 AOC C-14-001

Calcium

Calcium does not have a published toxicity value but is among those elements identified in section 5.9.4 of RAGS (EPA 1989, 008021) as an essential macronutrient. As an essential nutrient, calcium may be compared with the RDA for adults and children. The RDA is 1200 mg/d of calcium for an adult and 800 mg/d for a child (National Research Council, available at http://www.nap.edu/openbook.php?record_id=1349&page=174). If all the daily incidental ingestion of soil were to occur at the location of the maximum concentration detected between 0–10 ft at AOC C-14-001 of 5300 mg/kg, at the EPA default adult soil ingestion rate of 100 mg/d of soil, an adult would ingest approximately 0.76 mg/d of calcium. At the intake level of 0.76 mg/d of calcium, the adult's ingestion of calcium is less than the RDA for calcium of 1200 mg/d. If all the daily incidental ingestion of soil were to occur at the location of the maximum concentration detected between 0–10 ft at AOC C-14-001 of 5300 mg/kg, at the EPA default child soil ingestion rate of 200 mg/d of soil, a child would ingest approximately 1.77 mg/d of calcium. At the intake level of 1.77 mg/d of calcium, the child's ingestion of calcium is less than the RDA for calcium of 800 mg/d. Therefore, no adverse health effects are expected from calcium at the site, and calcium is eliminated as a COPC.

No carcinogens were retained as COPCs and radionuclides were not analyzed at AOC C-14-001. The result of the risk-screening assessment for the industrial scenario is presented in Table H-4.2-12. The HI is 0.06, which is below the NMED target HI of 1 (NMED 2009, 108070). The result of the risk-screening assessment for the construction worker scenario is presented in Table H-4.2-13. The HI is 0.6, which is below the NMED target HI of 1 (NMED 2009, 108070). The result of the risk-screening assessment for the residential scenario is presented in Table H-4.2-14. The HI is 0.6, which is below the NMED target HI of 1 (NMED 2009, 108070).

The results indicate no potential unacceptable risk to receptors under the industrial, construction worker, and residential scenarios at AOC C-14-001.

H-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.

H-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 that are either detected or have detection limits above background are retained for further analysis. However, established BVs may not accurately represent certain subunits of the Bandelier Tuff (e.g., fractured, clay-rich material or weathered Qbt 4) that may be encountered during sampling because such data are not included in the background data set. As a result, some inorganic chemicals and radionuclides may have been retained as COPCs that are not site-related. There are no established BVs for organic chemicals; therefore, all detected organic chemicals are identified as COPCs and are retained for further analysis.

Other uncertainties associated with inorganic and organic chemicals may include errors in sampling, laboratory analysis, and data analysis. However, because some concentrations used in the risk-screening assessments are less than the estimated quantitation limits (EQLs), data evaluation uncertainties are expected to have little effect on the risk-screening results.

H-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.

The current and reasonably foreseeable future land use is industrial. To the degree actual activity patterns are not represented by those activities assumed by the industrial scenario, uncertainties are introduced in the assessment, and the evaluation presented in this assessment overestimates potential risk. An individual may be subject to exposures in a different manner than the exposure assumptions used to derive the SSLs. For the sites evaluated, individuals are not 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, for 25 yr; the construction worker SSLs are based on 8 h/d, 250 d/yr, for 1 yr; and the residential SSLs are based on exposure of 24 h/d, 350 d/yr, for 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 (such as those found in NMED guidance [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 cause exposure in the same manner as if they were in soil 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.

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The HI for the construction worker scenario is approximately 2 (1.8), which is above the NMED target HI of 1 (NMED 2009, 108070). The HI is primarily from manganese with an HQ of 0.9. Manganese was detected above the Qbt 4 BV in only one sample at the site, which indicates any potential release is of limited extent and all other concentrations are below the BV. The concentration (486 mg/kg) was only slightly above the Qbt 4 BV (482 mg/kg) and below the maximum Qbt 2, 3, 4 background concentration (752 mg/kg). Therefore, 486 mg/kg is within the range of Qbt 2, 3, 4 background concentrations for manganese. In addition, the construction worker SSL (463 mg/kg) is less than the Qbt 2, 3, 4 BV and the maximum Qbt 2, 3, 4 background concentration. As a result, the HQ for manganese does not reflect a potential risk to the construction worker above that which would result from exposure to naturally occurring levels, and the construction worker HI is overestimated. Without manganese, the HI is 0.9, which is below the NMED target HI of 1. Furthermore, as indicated in the investigation report (section 5.3), Qbt 4 at TA-14 is weathered tuff to approximately 10 ft bgs and more closely resembles soil than tuff. Comparing the Qbt 4 concentration (486 mg/kg) with the soil BV (671 mg/kg) indicates the concentration is not above the soil BV. This analysis further supports the overestimation of potential risk to the construction worker.

H-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 five areas with respect to the toxicity values: (1) extrapolation from other animals to humans, (2) individual variability in the human population, (3) the derivation of SFs and RfDs, (4) the chemical form of the COPC, and (5) the use of surrogate chemicals.

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 bioavailable. This assumption can lead to an overestimation of the total risk.

Use of Surrogate Chemicals

The use of surrogates for chemicals that do not have EPA-approved or provisional toxicity values also contributes to uncertainty in risk assessment. Surrogates were used to establish toxicity values for 2-hexanone, 4-isopropyltoluene, di-n-octylphthalate, and TATB based on structural similarity (NMED 2003, 081172). The overall impact of surrogates on the risk assessment is minimal because the COPCs were detected at low concentrations, and the HQs were less than 0.1.

PETN

No toxicity values are available from the EPA Integrated Risk Information System or Health Effects Assessment Summary Tables for PETN and a surrogate has not been identified. PETN was detected at a concentration of 0.13 mg/kg in one sample from 0–1 ft bgs located within the burn area at SWMU 14-003. This concentration is below the EQL of 0.22 mg/kg. Therefore, PETN at this concentration is unlikely to have significant effects on the risks for SWMU 14-003.

H-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 over- 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.

H-4.4 Interpretation of Human Health Risk-Screening Results

H-4.4.1 AOCs 14-001(a,b,c,d,e)

Industrial Scenario

Because the AOCs 14-001(a,b,c,d,e) pull boxes are belowground, no samples were collected between 0–1 ft bgs. No potential exposure pathways exist for the industrial scenario. Therefore, a risk-screening assessment was not performed for the industrial scenario.

Construction Worker and Residential Scenarios

Because no COPCs are identified at these sites, risk-screening assessments were not performed for the construction worker and residential scenarios. No potential unacceptable risks exist for the construction worker and residential scenarios at AOCs 14-001(a,b,c,d,e) because no COPCs are identified at the site.

Based on the risk-screening assessment results, no potential unacceptable risks exist for the industrial, construction worker, and residential scenarios at AOCs 14-001(a,b,c,d,e).

H-4.4.2 SWMU 14-003

Industrial Scenario

The total excess cancer risk for the industrial scenario is 2×10^{-6}, 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 dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489). The total dose is equivalent to a total risk of 3 × 10^{-6}, based on a comparison with EPA's outdoor worker preliminary remediation goals (PRGs) for radionuclides (http://epa-prgs.ornl.gov/radionuclides/download/rad_master_prg_table_pci.xls).

Construction Worker Scenario

No carcinogens were retained as COPCs under the construction worker scenario. The HI is approximately 2, which is above the NMED target HI of 1 (NMED 2009, 108070). The HI is primarily from manganese. As discussed in the uncertainty analysis (section H-4.3.2), the single concentration above the Qbt 4 BV is within the range of background concentrations. Therefore, the construction worker HI is overestimated. Also, the similarity between weathered tuff and soil results in all manganese concentrations being below the soil BV. Without manganese, the HI is 0.9, which is below the NMED target HI of 1.

The total dose for the construction worker scenario is 0.4 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489). The total dose is equivalent to a total risk of 3 × 10^{-6}, based on a comparison with EPA's outdoor worker PRGs for radionuclides (http://epa-prgs.ornl.gov/radionuclides/download/rad_master_prg_table_pci.xls).

Residential Scenario

The total excess cancer risk for the residential scenario is 9 × 10^{-6}, which is below the NMED target risk level of 1 × 10^{-5} (NMED 2009, 108070). The residential cancer risk includes the contribution from the vapor-intrusion pathway. The HI is 1, which is equivalent to the NMED target HI of 1 (NMED 2009, 108070). The total dose for the residential scenario is 1 mrem/yr, which is below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489). The total dose is equivalent to a total risk of 6 × 10^{-6}, based on a comparison with EPA's residential PRGs for radionuclides (http://epa-prgs.ornl.gov/radionuclides/download/rad_master_prg_table_pci.xls).

Based on the risk-screening assessment results, no potential unacceptable risk or dose exists for the industrial, construction worker, and residential scenarios at SWMU 14-003.

H-4.4.3 AOC C-14-001

No carcinogens were retained as COPCs and radionuclides were not analyzed at AOC C-14-001.

Industrial Scenario

The HI for the industrial scenario is 0.06, which is below the NMED target HI of 1 (NMED 2009, 108070).

Construction Worker Scenario

The HI for the construction worker scenario is 0.6, which is below the NMED target HI of 1 (NMED 2009, 108070).

Residential Scenario

The HI for the residential scenario is 0.6, which is below the NMED target HI of 1 (NMED 2009, 108070).

Based on the risk-screening assessment results, no potential unacceptable risks exist for the industrial, construction worker, and residential scenarios at AOC C-14-001.

H-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.

H-5.1 Scoping Evaluation

The scoping evaluation establishes the breadth and focus of the screening assessment. The ecological scoping checklists for the seven sites evaluated at TA-14 are useful tools for organizing existing ecological information (Attachment H-3). 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 sites are in industrially developed areas.

The scoping portion of the assessment indicated terrestrial receptors were appropriate for evaluating the concentrations of contaminants in soil and tuff samples. Aquatic receptors were not evaluated because no aquatic communities and no aquatic habitat or perennial source of water exist at any of the sites evaluated. The potential exposure pathways for terrestrial receptors in soil and tuff are root uptake, inhalation, soil ingestion, dermal contact, external irradiation, and food-web transport (Figure H-3.1-1).

The 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" (LANL 2004, 087630). The ecological screening levels (ESLs) are derived for each of these receptors where information was 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 calculation of ESLs, including concentration equations, dose equations, bioconcentration factors, transfer factors, and toxicity reference values (TRVs), are presented in the ECORISK Database, Release 3.0 (LANL 2010, 110846).

H-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 is 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.

H-5.3 Screening Evaluation

The ecological risk-screening assessments identify chemicals of potential ecological concern (COPECs) based on the comparison of EPCs with ESLs in accordance with Laboratory guidance (LANL 2004, 087630). The EPCs are presented in Tables H-2.2-2 and H-2.2-5. The ESLs for all COPCs and receptors evaluated were obtained from the ECORISK Database, Release 3.0 (LANL 2011, 206473) and are presented in Table H-5.3-1.

The risk-screening assessments involve the calculation of HQs for all COPECs and all screening receptors (LANL 2004, 087630). The HQs are the ratios of the EPCs (UCLs, maximum detected concentrations, or maximum detection limits) to the ESLs. The analysis begins with a comparison of the minimum ESL with the EPC for each COPC. The COPCs with HQs greater than 0.3 are identified as COPECs and are evaluated further. The COPECs are evaluated by receptor with individual HQs for a receptor summed to produce an HI. For the purposes of the ecological screening, it is assumed nonradionuclides have common toxicological effects. An HI greater than 1 requires further assessment to determine if exposure to multiple COPECs results in potential adverse impacts to a given receptor population. 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. COPCs without ESLs are retained as COPECs and are evaluated further in the uncertainty section.

H-5.3.1 AOCs 14-001(a,b,c,d,e)

The ecological scoping checklist for AOCs 14-001(a,b,c,d,e) is provided in Attachment H-3. AOCs 14-001(a,b,c,d,e) are located in an industrial area that is currently in use. The area provides some habitat for ecological receptors. However, no COPCs were identified at these sites. Therefore, no potential ecological risks exist for any receptor at AOCs 14-001(a,b,c,d,e).

H-5.3.2 SWMU 14-003

The dioxin and furan congener TEF calculations for the ecological receptors are presented in Table H-5.3-2. The results of the minimum ESL comparisons are presented in Table H-5.3-3. The following COPCs are retained as COPECs because they have HQs greater than 0.3: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, lead, manganese, mercury, nickel, selenium, thallium, vanadium, bis(2-ethylhexyl)phthalate, HMX, and 2,3,7,8-TCDD.

Table H-5.3-4 presents the HQs and HIs for each receptor/COPEC at SWMU 14-003. The HI analysis indicates that the carnivorous kestrel, omnivorous kestrel, robin (herbivore), robin (omnivore), robin (insectivore), shrew, deer mouse, earthworm, and plant have HIs greater than 1.

Aluminum, iron, perchlorate, and TATB do not have ESLs for any receptors. Aluminum is discussed below, while iron, perchlorate, and TATB are retained as COPECs and discussed in the uncertainty section.

Potential ecological risks associated with aluminum are based on soil pH. Aluminum is retained only in soil with a pH lower than 5.5, in accordance with EPA guidance (EPA 2003, 085645). Aluminum was eliminated as a COPEC and was not evaluated further because the soil pH at SWMU 14-003 is 7.5 (the average soil pH for TA-14 is 7.0).

H-5.3.3 AOC C-14-001

The results of the minimum ESL comparisons are presented in Table H-5.3-5. Antimony, barium, chromium, cobalt, cyanide, nickel, selenium, and benzoic acid have HQs greater than 0.3 and are retained as COPECs.

Table H-5.3-6 presents the HQs and HIs for each receptor/COPEC at AOC C-14-001. The HI analysis indicates robin (herbivore), robin (omnivore), robin (insectivore), shrew, deer mouse, and plant have HIs greater than 1.

Aluminum does not have ESLs for any receptors. Potential ecological risks associated with aluminum are based on soil pH. Aluminum is retained only in soil with a pH lower than 5.5, in accordance with EPA guidance (EPA 2003, 085645). Aluminum was eliminated as a COPEC and was not evaluated further because the soil pH at AOC C-14-001 is 6.4 (average soil pH for TA-14 is 7.0).

H-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. The following is a qualitative uncertainty analysis of the issues relevant to evaluating potential ecological risk at each site.

H-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 bodyweight, 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.

H-5.4.2 Exposure Assumptions

The EPCs used in the HQ calculations are UCLs, maximum detected concentrations, or maximum detection limits in the soil, fill, or 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 in TA-14 are likely to overestimate potential ecological exposure and risk.

H-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.

H-5.4.4 Comparison with Background Concentrations

Although concentrations of inorganic chemicals were detected above background, the EPCs for some inorganic chemicals were similar to the range of background concentrations, indicating no potential risk from exposure across the site. This relationship is presented in Tables H-5.4-1 and H-5.4-2. 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. If the EPCs are similar to the range of background concentrations, then the receptor is exposed to an average concentration, which is comparable with naturally occurring levels across the site. Whether some concentrations are elevated and reflect site releases is incorporated into the UCL calculations. If the EPC is similar to the range of background concentrations, the RME across the site is indistinguishable from background. 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 Qbt 2, 3, 4, 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.

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The ecological screening assessment for this site is based on the exposure of ecological receptors to contamination to a depth of 5 ft bgs. The EPCs for all the inorganic COPECs, except barium, are similar to the range of background concentrations, indicating exposure to these inorganic chemicals across the site is similar to background (Table H-5.4-1). Furthermore, cyanide and mercury were not detected above BVs in any sample. In addition, because Qbt 4 at TA-14 is weathered, it is more similar to soil than tuff (Appendix G). Comparison of the Qbt 4 concentrations to the soil BVs results in only barium being above the soil BV and/or the maximum soil background concentration. Antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, cyanide, iron, lead, manganese, mercury, nickel, selenium, thallium, and vanadium are eliminated as COPECs because their EPCs are similar to the range of background concentrations and their weathered Qbt 4 concentrations are less than the soil BVs and/or maximum soil background concentrations. Barium is retained as a COPEC at SWMU 14-003.

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The ecological screening assessment for this site is based on the exposure of ecological receptors to contamination to a depth of 5 ft bgs. The EPCs for all the inorganic COPECs, except chromium, are similar to the range of background concentrations, indicating exposure to these inorganic chemicals across the site is similar to background (Table H-5.4-2). Furthermore, antimony was not detected above BVs in any sample and the cyanide EPC (0.13 mg/kg), which is the maximum detected concentration, is not above the BVs. In addition, because the Qbt 4 at TA-14 is weathered, it is more similar to soil than tuff (Appendix G). Comparison of the Qbt 4 concentration to the soil BVs results in only chromium being above the soil BV and/or the maximum soil background concentration. Antimony, barium, cobalt, cyanide, nickel, and selenium are eliminated as COPECs because their EPCs are similar to the range of background concentrations and their weathered Qbt 4 concentrations are less than the soil BVs and/or maximum soil background concentrations. Chromium is retained as a COPEC at AOC C-14-001.

H-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 that 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 14-003 is 0.0099 ha, which results in an AUF of 0.00003 for the Mexican spotted owl (Table H-5.4-3). The unadjusted HI for the kestrel (top carnivore) is 4 (Table H-5.3-4). Application of the AUF for the Mexican spotted owl 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 at SWMU 14-003.

The site area for AOC C-14-001 is 0.00092 ha, which results in an AUF of 0.000003 for the Mexican spotted owl (Table H-5.4-3). The unadjusted HI for the kestrel (top carnivore) is 0.3 (Table H-5.3-6). Application of the AUF for the Mexican spotted owl to the HI for the kestrel (top carnivore) results in an adjusted HI of 0.0000009. Therefore, there are no potential adverse impacts to the Mexican spotted owl at AOC C-14-001.

H-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 address 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 40 HR.

The population area use factor (PAUF) is calculated by dividing the site area by the population area of the receptor. The PAUFs for SWMU 14-003 and AOC C-14-001 are presented in Table H-5.4-3. The HQs are recalculated minus the COPECs eliminated based on similarity to background (section H-5.4.4) and adjusted by multiplying by the PAUFs. If the PAUF is greater than 1, the HQs are not adjusted for that receptor. The HQs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs are presented in Tables H-5.4-4 and H-5.4-5. The adjusted HI analysis indicates all receptors, except for the earthworm and plant, have HIs less than 1 at SWMU 14-003. The adjusted HI analysis indicates all receptors have HIs less than 1 at AOC C-14-001.

H-5.4.7 LOAEL Analysis

SWMU 14-003 has HIs greater than 1 for the earthworm and plant (Table H-5.4-4). To address the HIs and reduce the associated uncertainty, a LOAEL analysis was conducted using ESLs calculated based on a LOAEL rather than a NOAEL. The analysis addresses some of the uncertainties and conservativeness of the ESLs used in the initial screening assessments. The LOAEL-based ESLs are provided in the ECORISK Database, Version 3.0 (LANL 2011, 206473) and presented in Table H-5.4-6 for SWMU 14-003. The HQs using LOAEL-based ESLs for SWMU 14-003 are presented in Table H-5.4-7. The LOAEL analysis resulted in HIs of 0.2 and 2 for the earthworm and plant, respectively, at SWMU 14-003.

H-5.4.8 Site Discussions

SWMU 14-003

The adjusted HIs for SWMU 14-003 (Table H-5.4-4) are less than 1 for the kestrel (intermediate and top carnivore); robin (herbivore, omnivore, and insectivore); cottontail; Montane shrew; deer mouse; and red fox. The adjusted HIs are greater than 1 for earthworm and plant with barium being the primary COPEC. The HI analysis using LOAEL-based ESLs resulted in an HI less than 1 for earthworm and an HI of 2 for plant. However, the LOAEL-based ESL of barium (260 mg/kg) is less than the soil BV for barium (295 mg/kg), indicating the potential ecological risk to the plant is overestimated.

In addition, field observations made during the site visit found no indication of adverse effects on the plant community (Attachment H-3). Field observations indicated no adverse effects of any kind, and there appears to be a functioning ecological habitat for all terrestrial receptors, including plants, invertebrates, birds, and mammals. Therefore, the HI is not consistent with field observations and does not indicate potential risk to the plants.

H-5.4.9 COPECs without ESLs

Several COPECs do not have ESLs for any receptor in release 3.0 of the ECORISK Database (LANL 2010, 110846) because literature searches for relevant toxicity data for these chemicals have not been completed. In an effort to address this uncertainty and provide a quantitative assessment of potential ecological risk, several online toxicity databases have been searched to determine if any relevant toxicity information is available. The online databases searched were EPA Ecotox Database, EPA Office of Pesticide Programs Aquatic Life Benchmarks, U.S. Army Corps of Engineers/EPA Environmental Residue-Effects, California Cal/Ecotox Database, Pesticide Action Network Pesticide Database, U.S. Army Wildlife Toxicity Assessment Program, USDA Integrated Pesticide Management Database, American Bird Conservancy Pesticide Toxicity Database, and Oak Ridge National Laboratory Risk Assessment Information System. Toxicity data were obtained for some COPECs and receptors as a result of this online database search. However, some COPECs did not have any relevant toxicity data in the online databases listed above.

In the absence of a chemical-specific ESL, COPEC concentrations can be compared with the ESLs for a surrogate chemical. Comparison to surrogate ESLs provides an estimate of potential effects of a chemically related compound and a line of evidence to indicate the likelihood that ecological receptors are potentially impacted.

Some COPECs without ESLs do not have chemical-specific toxicity data or surrogate chemicals to be used in the screening assessments and cannot be assessed quantitatively for potential ecological risk. These COPECs are often infrequently detected across the site. In these cases, comparisons to residential human health SSLs are presented as part of a qualitative assessment. The comparison of COPEC concentrations to residential human health SSLs is a viable alternative for several reasons. Animal studies are used to infer effects on humans and are the basic premise of modern toxicology (EPA 1989, 008021). In addition, toxicity values derived for the calculation of human health SSLs are often based on potential effects that are more sensitive than the ones used to derive ESLs (e.g., cellular effects for humans versus survival or reproductive effects for terrestrial animals). The EPA also applies uncertainty factors or modifying factors to ensure the toxicity values are protective (i.e., they are adjusted by uncertainty factors to values much lower than the study results). COPEC concentrations compared with these values are an order of magnitude or more below the SSLs, which corresponds to uncertainty factors of 10 or more. Therefore, it is assumed the differences in toxicity would not be more than an order of magnitude for any given chemical. The relative difference between values provides a weight of evidence that the potential toxicity of the COPC is likely to be low or very low to the receptor(s).

SWMU 14-003

No ESLs are available in the ECORISK Database, Release 3.0 (LANL 2010, 110846) for iron and perchlorate. In addition, no toxicity data were found as a result of the online database searches.

Iron was detected in one soil sample (22,000 mg/kg) and in one Qbt 4 sample (15,200 mg/kg). The NMED residential SSL for iron is 54,800 mg/kg, indicating that potential toxicity is low. In addition, as discussed in section H-5.4.4 and presented in Table H-5.4-1, the iron EPC is within the range of background concentrations and is less than the soil BV. Because of the potentially low toxicity and the similarity of the iron concentrations to background, iron is eliminated as a COPEC.

Perchlorate was detected in one soil sample (0.0022 mg/kg) and in three Qbt 4 samples, with a maximum concentration of 0.029 mg/kg. The NMED residential SSL for perchlorate is 54.8 mg/kg, indicating its potential toxicity is low. Because of the potentially low toxicity, perchlorate is eliminated as a COPEC.

TATB was detected in three samples with a maximum concentration of 0.16 mg/kg. The minimum ESL for 1,3,5-trinitrobenzene (6.6 mg/kg for the deer mouse) is used to screen the TATB EPC (0.16 mg/kg) and results in a maximum HQ of 0.02. Because this HQ is less than 0.3, TATB is eliminated as a COPEC.

H-5.5 Interpretation of Ecological Risk-Screening Results

H-5.5.1 Receptor Lines of Evidence

Based on the ecological risk-screening assessments, several COPECs were identified at SWMU 14-003 and AOC C-14-001. Receptors were evaluated using various lines of evidence: minimum ESL comparisons, HI analyses, comparison with background concentrations, potential effects to populations (individuals for T&E species), and LOAEL analysis.

Red Fox (Carnivore)

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the red fox, were less than 0.3 at SWMU 14-003.
- The HI analysis indicated that the HI for the red fox was less than 1 at SWMU 14-003 and AOC C-14-001.

These lines of evidence support the conclusion that no potential ecological risk to the red fox exists at SWMU 14-003 and AOC C-14-001.

Kestrel (Top Carnivore)

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the kestrel (top carnivore), were less than 0.3 at SWMU 14-003.
- The HI analysis indicated that the HI for the kestrel (top carnivore) was less than 1 at AOC C-14-001.
- A number of COPECs were eliminated because their EPCs were similar to background concentrations at SWMU 14-003.
- The HI for the kestrel (top carnivore) was adjusted by the PAUF, which is the ratio of the site area to the kestrel's population area. The adjusted HI was less than 1 for the kestrel (top carnivore) at SWMU 14-003.
- 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 AUF-adjusted HIs were less than 1 at SWMU 14-003 and AOC C-14-001.

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 14-003 and AOC C-14-001.

Kestrel (Intermediate Carnivore)

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the kestrel (intermediate carnivore), were less than 0.3 at SWMU 14-003.
- The HI analysis indicated that the HI for the kestrel (intermediate carnivore) was less than 1 at AOC C-14-001.
- A number of COPECs were eliminated because their EPCs were similar to background concentrations at SWMU 14-003.
- The HI for the kestrel (intermediate carnivore) was adjusted by the PAUFs, which is the ratio of the site area to the kestrel's population area. The adjusted HI was less than 1 for the kestrel (intermediate carnivore) at SWMU 14-003.

These lines of evidence support the conclusion that no potential ecological risk to the kestrel (intermediate carnivore) exists at SWMU 14-003 and AOC C-14-001.

Robin (Herbivore, Omnivore, Insectivore)

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the robin (herbivore, omnivore, insectivore), were less than 0.3 at SWMU 14-003.
- A number of COPECs were eliminated because their EPCs were similar to background concentrations at SWMU 14-003 and AOC C-14-001.
- The HIs for the robin (herbivore, omnivore, insectivore) were adjusted by the PAUFs, which is the ratio of the site area to the robin's population area. The adjusted HIs were less than 1 for the robin (herbivore, omnivore, insectivore) at SWMU 14-003 and AOC C-14-001.

These lines of evidence support the conclusion that no potential ecological risk to the robin (herbivore, omnivore, insectivore) exists at SWMU 14-003 and AOC C-14-001.

Deer Mouse (Omnivore)

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the deer mouse, were less than 0.3 at SWMU 14-003.
- A number of COPECs were eliminated because their EPCs were similar to background concentrations at SWMU 14-003 and AOC C-14-001.
- The HIs for the deer mouse were adjusted by the PAUF, which is the ratio of the site area to the deer mouse's population area. The adjusted HIs were less than 1 for the deer mouse at SWMU 14-003 and AOC C-14-001.

These lines of evidence support the conclusion that no potential ecological risk to the deer mouse exists at SWMU 14-003 and AOC C-14-001.

Desert Cottontail (Herbivore)

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the cottontail, were less than 0.3 at SWMU 14-003.
- The HI analysis indicated that the HIs for the cottontail were equivalent to 1 at SWMU 14-003 and AOC C-14-001.
- A number of COPECs were eliminated because their EPCs were similar to background concentrations at SWMU 14-003 and AOC C-14-001.
- The HIs for the cottontail were adjusted by the PAUF, which is the ratio of the site area to the cottontail's population area. The adjusted HIs were less than 1 for the cottontail at SWMU 14-003 and AOC C-14-001.

These lines of evidence support the conclusion that no potential ecological risk to the cottontail exists at SWMU 14-003 and AOC C-14-001.

Montane Shrew (Insectivore)

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the shrew, were less than 0.3 at SWMU 14-003.
- A number of COPECs were eliminated because their EPCs were similar to background concentrations at SWMU 14-003 and AOC C-14-001.
- The HIs for the shrew were adjusted by the PAUFs, which is the ratio of the site area to the shrew's population area. The adjusted HI was less than 1 for the shrew at SWMU 14-003 and AOC C-14-001.

These lines of evidence support the conclusion that no potential ecological risk to the Montane shrew exists at SWMU 14-003 and AOC C-14-001.

Earthworm (Invertebrate)

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the earthworm, were less than 0.3 at SWMU 14-003.
- The HI analysis indicated that the HI for the earthworm was less than 1 at AOC C-14-001.
- A number of COPECs were eliminated because their EPCs were similar to background concentrations at SWMU 14-003.
- The HI analyses using the LOAEL-based ESL resulted in an HI of less than 1 at SWMU 14-003.

These lines of evidence support the conclusion that no potential ecological risk to the earthworm exists at SWMU 14-003 and AOC C-14-001.

Plant

- Initial screening using the minimum ESLs eliminated some COPECs because the HQs for all of the receptors, including the plant, were less than 0.3 at SWMU 14-003.
- A number of COPECs were eliminated because their EPCs were similar to background concentrations at SWMU 14-003 and AOC C-14-001.

- The HI analyses using the LOAEL-based ESL resulted in an HI of 2 at SWMU 14-003. The HI is from barium and is overestimated because the LOAEL-based ESL is less than the soil BV for barium.
- The plant communities were evaluated at all sites during site visits. 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 14-003 and AOC C-14-001.

H-5.5.2 COPECs with No ESLs

The COPECs with no ESLs were evaluated. The analysis of COPECs with no ESLs supports the conclusion that no potential ecological risk to any receptor exists at SWMU 14-003 and AOC C-14-001.

H-5.5.3 Summary

No potential ecological risk exists at AOCs 14-001(a,b,c,d,e) because no COPCs were identified at these sites.

Based on evaluations of the minimum ESL, HI analysis, comparisons to background, potential effects to populations (individuals for T&E species), and LOAEL analysis, no potential ecological risk exists at SWMU 14-003 and AOC C-14-001.

H-6.0 CONCLUSIONS AND RECOMMENDATIONS

H-6.1 Human Health

The AOCs 14-001(a,b,c,d,e) pull boxes are located below ground so no samples were collected between 0–1 ft bgs. No potential exposure pathways exist. Therefore, a risk-screening assessment was not performed for the industrial scenario. No potential unacceptable risk or dose exists for the construction worker and residential scenarios at AOCs 14-001(a,b,c,d,e) because no COPCs were identified at the site.

The human health risk-screening assessments indicated no potential unacceptable risks or doses exist for the industrial and residential scenarios at SWMU 14-003. The total excess cancer risks were below the NMED target risk level of 1×10^{-5} (NMED 2009, 108070), the HIs were less than the NMED target HI of 1 (NMED 2009, 108070), and the total doses were below the DOE target dose limit of 15 mrem/yr (DOE 2000, 067489) for both scenarios. SWMU 14-003 does not pose a potential unacceptable carcinogenic risk or dose under the construction worker scenario. However, the construction worker HI is above 1 primarily from manganese. As shown in the uncertainty analysis, the one concentration above background is within the range of Qbt 4 background concentrations and the concentration is below the soil BV (tuff is weathered and more similar to soil) and does not pose a potential risk to the construction worker. Without manganese, the construction worker HI is 0.9, which is below the NMED target HI of 1. The total doses at SWMU 14-003 were equivalent to total risks ranging from 3×10^{-6} to 6×10^{-6} under the three scenarios, based on a comparison with EPA's PRGs for radionuclides (http://epa-prgs.ornl.gov/radionuclides/download/rad_master_prg_table_pci.xls).

Because no carcinogens were retained as COPCs at AOC C-14-001, no carcinogenic risk exists at AOC C-14-001. The human health risk-screening assessments indicated no potential unacceptable noncarcinogenic risks exist for the industrial, construction worker, and residential scenarios at AOC C-14-001. Radionuclides were not analyzed at AOC C-14-001.

The Laboratory's as low as reasonably achievable (ALARA) program description states that quantitative ALARA evaluations are not necessary for a potential annual public exposure less than a 3-mrem total effective dose equivalent individual dose ("Los Alamos National Laboratory Environmental ALARA Program," PD410, p. 7, effective November 8, 2008). In addition, sites at TA-14 are not accessible by the public and are not planned for release by DOE in the foreseeable future. Therefore, an ALARA evaluation for radiological exposure to the public is not required. Should DOE's plans for releasing this area change, an ALARA evaluation will be conducted at that time, if appropriate. It should be noted that the Laboratory addresses considerations for radiation exposures to workers under the Laboratory's occupational radiological protection program in compliance with 10 Code of Federal Regulations 835. The Laboratory's radiation protection program implements ALARA and consists of the following elements: management commitment, training, design review, radiological work review, performance assessments, and documentation.

H-6.2 Ecology

No potential ecological risk exists at AOCs 14-001(a,b,c,d,e) because no COPCs were identified at these sites.

No potential ecological risks exist for any receptor at SWMU 14-003 and AOC C-14-001 based on minimum ESL comparisons, HI analyses, comparisons to background concentrations, potential effects to populations (individuals for T&E species), and LOAEL analysis.

H-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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Primary Source	Primary Release Mechanism	Affected Media	Secondary Release Mechanism	Impacted Media	Exposure Pathways	Residential	Construction Worker	Industrial	Biota
Laboratory Operations, Waste Disposal, and Releases to Surface Soil, Subsurface Soil/Tuff, and Sediment	Infiltration Percolation	Groundwater	Domestic Use	Water	None	O	O	O	O
			Seeps	Water	None	O	O	O	O
	Volatilization	Soil and Tuff	Volatilization	Air	Inhalation	X	X	X	O
	Resuspension	Airborne Particulates		Air	Inhalation	X	X	X	O
	Direct Release	Surface Soil (0–1 ft)		Soil	Ingestion Dermal External Irradiation	X X X	X X X	X X X	X X X
			Erosion	Sediment	Ingestion Dermal External Irradiation	X X X	X X X	X X X	X X X
		Subsurface Soil (1–10 ft or 1–5 ft)		Soil and Tuff	Ingestion Dermal External Irradiation	X X X	X X X	O O O	X X X
		Subsurface Soil (Below 10 ft or 5 ft)		Soil and Tuff	None	O	O	O	O

X = Evaluated in risk screening; major or minor pathway.

O = Not evaluated in risk screening; no pathway.

Figure H-3.1-1 Conceptual site model for human and ecological receptors at TA-14

Table H-2.2-1
EPCs for SWMU 14-003 for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	25	25	6070	42,000	Nonparametric	22873	95% Chebyshev (Mean, Sd)
Antimony	25	4	0.17(U)	13(U)	n/a[a]	0.28[b]	Maximum detected concentration
Arsenic	25	25	1.61	5.5	Normal	3.478	95% Student's-t
Barium	25	25	157	1800	Nonparametric	645.7	95% Chebyshev (Mean, Sd)
Beryllium	25	25	0.607	2.1	Lognormal	1.199	95% Student's-t
Cadmium	25	13	0.063	0.64(U)	Nonparametric	0.133	95% KM(t)
Calcium	25	25	1590	5000	Nonparametric	2486	95% Student's-t
Chromium	25	25	5.82	21	Gamma	10.77	95% Approximate Gamma
Cobalt	25	25	5.16	9.4	Approximate Gamma	6.877	95% Approximate Gamma
Copper	25	25	4.94	12.3	Gamma	8.331	95% Approximate Gamma
Cyanide (Total)	13	0	0.53(U)	0.55(U)	n/a	0.55(U)	Maximum detection limit
Iron	25	25	8110	22,000	Normal	14073	95% Student's-t
Lead	25	24	0.789(U)	18	Normal	15.38	95% KM(t)
Magnesium	25	25	1430	4100	Nonparametric	2331	95% Student's-t
Manganese	25	25	310	566	Normal	441.9	95% Student's-t
Mercury	25	0	0.0307(U)	0.13(U)	n/a	0.13(U)	Maximum detection limit
Nickel	25	25	5.65	17	Nonparametric	9.43	95% Student's-t
Perchlorate	13	1	0.0022	0.0055(U)	n/a	0.0022[b]	Maximum detected concentration
Selenium	25	2	0.0225(U)	2.1(U)	n/a	1.2[b]	Maximum detected concentration
Silver	25	15	0.036	2.6(U)	Nonparametric	0.816	95% KM(Chebyshev)
Thallium	25	20	0.16	1.2	Nonparametric	0.488	95% KM(BCA)
Uranium	12	8	2.98(U)	4.61	Gamma	3.59	95% KM(Percentile Bootstrap)
Vanadium	25	25	17.5	32	Normal	24.83	95% Student's-t

Table H-2.2-1 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Organic Chemicals (mg/kg)							
Amino-4,6-dinitrotoluene[2-]	25	2	0.045	0.25(U)	n/a	0.107[b]	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	13	2	0.055	0.36(U)	n/a	0.079[b]	Maximum detected concentration
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	13	9	4.73E-07	2.09E-06	Normal	1.28E-06	95% KM(t)
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	13	4	4.57E-07(U)	2.19E-06	n/a	2.19E-06	Maximum detected concentration
Hexachlorodibenzofuran[1,2,3,4,7,8-]	13	1	4.41E-07(U)	6.16E-07	n/a	6.16E-07	Maximum detected concentration
HMX	25	1	0.052	2.2(U)	n/a	0.052[b]	Maximum detected concentration
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	12	10	3.17E-06	0.0000187	Gamma	9.85E-06	95% KM(BCA)
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	13	3	9.17E-07(U)	2.59E-06	n/a	2.59E-06	Maximum detected concentration
Pentachlorodibenzofuran[2,3,4,7,8-]	13	1	4.41E-07(U)	6.78E-07	n/a	6.78E-07	Maximum detected concentration
PETN	13	1	0.13	0.22(U)	n/a	0.13[b]	Maximum detected concentration
TATB	13	3	0.11	0.44(U)	n/a	0.16[b]	Maximum detected concentration
Tetrachlorodibenzofuran[2,3,7,8-]	12	3	1.54E-07(U)	4.28E-07	n/a	4.28E-07	Maximum detected concentration
Trinitrotoluene[2,4,6-]	25	1	0.085(U)	0.25(U)	n/a	0.131[b]	Maximum detected concentration
Radionuclides (pCi/g)							
Cesium-137	13	5	−0.009(U)	0.328	n/a	0.328	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); thus, the maximum detected concentration is less than the maximum concentration.

Table H-2.2-2
EPCs for SWMU 14-003 for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	36	36	6070	42,000	Nonparametric	17507	95% Student's-t
Antimony	36	8	0.14	13(U)	Normal	0.18	95% KM(t)
Arsenic	36	36	1.61	5.5	Normal	3.351	95% Student's-t
Barium	36	36	138	1800	Nonparametric	518.8	95% Chebyshev (Mean, Sd)
Beryllium	36	36	0.607	2.1	Lognormal	1.178	95% Student's-t
Cadmium	36	24	0.031	0.64(U)	Nonparametric	0.0975	95% KM(BCA)
Calcium	36	36	1490	5000	Nonparametric	2574	95% Student's-t
Chromium	36	36	5.82	21	Nonparametric	10.37	95% Student's-t
Cobalt	36	36	4.1	9.4	Normal	6.539	95% Student's-t
Copper	36	36	4.94	12.3	Lognormal	7.841	95% Student's-t
Cyanide (Total)	24	0	0.52(U)	0.57(U)	n/a[a]	0.57(U)	Maximum detection limit
Iron	36	36	8110	22,000	Normal	13917	95% Student's-t
Lead	36	35	0.789(U)	18	Normal	14.66	95% KM(t)
Magnesium	36	36	1430	4100	Approximate Gamma	2272	95% Approximate Gamma
Manganese	36	36	260	566	Normal	420.3	95% Student's-t
Mercury	36	0	0.0238(U)	0.13(U)	n/a	0.13(U)	Maximum detection limit
Nickel	36	36	5.65	17	Nonparametric	9.008	95% Student's-t
Perchlorate	24	3	0.0022	0.029	n/a	0.029	Maximum detected concentration
Selenium	36	6	0.225(U)	2.1(U)	n/a	1.2[b]	Maximum detected concentration
Silver	36	26	0.028	2.6(U)	Nonparametric	0.537	95% KM(Chebyshev)
Thallium	36	31	0.16	1.2	Nonparametric	0.524	95% KM(Chebyshev)

Table H-2.2-2 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Uranium	12	8	2.98(U)	4.61	Gamma	3.581	95% KM(Percentile Bootstrap)
Vanadium	36	36	17.5	32	Approximate Gamma	23.77	95% Approximate Gamma
Organic Chemicals (mg/kg)							
Amino-4,6-dinitrotoluene[2-]	36	2	0.045	0.25(U)	n/a	0.107[b]	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	24	2	0.055	0.37(U)	n/a	0.079[b]	Maximum detected concentration
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	24	10	4.65E-07(U)	2.09E-06	Normal	9.55E-07	95% KM(t)
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	24	4	4.57E-07(U)	2.19E-06	n/a	2.19E-06	Maximum detected concentration
Hexachlorodibenzofuran[1,2,3,4,7,8-]	24	1	4.41E-07(U)	6.16E-07	n/a	6.16E-07	Maximum detected concentration
HMX	36	2	0.052	2.2(U)	n/a	0.13[b]	Maximum detected concentration
Methylene chloride	11	4	0.0028	0.0057(U)	n/a	0.0033[b]	Maximum detected concentration
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	23	19	1.79E-06	0.0000187	Lognormal	8.87E-06	95% KM(Chebyshev)
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	24	3	9.14E-07(U)	2.59E-06	n/a	2.59E-06	Maximum detected concentration
Pentachlorodibenzofuran[2,3,4,7,8-]	24	1	4.41E-07(U)	6.78E-07	n/a	6.78E-07	Maximum detected concentration
PETN	24	1	0.13	0.23(U)	n/a	0.13[b]	Maximum detected concentration
TATB	24	3	0.11	0.45(U)	n/a	0.16[b]	Maximum detected concentration
Tetrachlorodibenzofuran[2,3,7,8-]	22	6	1.52E-07(U)	4.28E-07	n/a	4.28E-07	Maximum detected concentration
Trinitrotoluene[2,4,6-]	36	1	0.085(U)	0.25(U)	n/a	0.131[b]	Maximum detected concentration
Radionuclides (pCi/g)							
Cesium-134	24	1	−0.129(U)	0.064(U)	n/a	0.052[b]	Maximum detected concentration
Cesium-137	24	6	−0.04(U)	0.328	n/a	0.328	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); thus, the maximum detected concentration is less than the maximum concentration.

Table H-2.2-3
EPCs for SWMU 14-003 for the Construction Worker and Residential Scenarios

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	38	38	6070	42,000	Nonparametric	17286	95% Student's-t
Antimony	38	8	0.14	13(U)	Normal	0.18	95% KM(t)
Arsenic	38	38	1.61	5.5	Normal	3.314	95% Student's-t
Barium	38	38	135	1800	Nonparametric	500.4	95% Chebyshev (Mean, Sd)
Beryllium	38	38	0.607	2.1	Lognormal	1.164	95% Student's-t
Cadmium	38	26	0.031	0.64(U)	Nonparametric	0.0935	95% KM(BCA)
Calcium	38	38	1490	5030	Nonparametric	2661	95% Student's-t
Chromium	38	38	5.82	21	Nonparametric	10.28	95% Student's-t
Cobalt	38	38	3.6	9.4	Normal	6.424	95% Student's-t
Copper	38	38	4.94	12.3	Lognormal	7.729	95% Student's-t
Cyanide (Total)	26	0	0.52(U)	0.57(U)	n/a[a]	0.57(U)	Maximum detection limit
Iron	38	38	8110	22,000	Normal	13868	95% Student's-t
Lead	38	37	0.789(U)	18	Normal	14.51	95% KM(t)
Magnesium	38	38	1430	4100	Approximate Gamma	2261	95% Approximate Gamma
Manganese	38	38	232	566	Normal	413.2	95% Student's-t
Mercury	38	0	0.0238(U)	0.13(U)	n/a	0.13(U)	Maximum detection limit
Nickel	38	38	5.65	17	Nonparametric	8.885	95% Student's-t
Perchlorate	26	4	0.0022	0.029	n/a	0.029	Maximum detected concentration
Selenium	38	6	0.225(U)	2.1(U)	n/a	1.2[b]	Maximum detected concentration
Silver	38	28	0.028	2.6(U)	Nonparametric	0.506	95% KM(Chebyshev)
Thallium	38	33	0.16	1.2	Nonparametric	0.507	95% KM(Chebyshev)
Uranium	12	8	2.98(U)	4.61	Gamma	3.609	95% KM(Percentile Bootstrap)
Vanadium	38	38	15.6	32	Normal	23.46	95% Student's-t

Table H-2.2-3 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Organic Chemicals (mg/kg)							
Amino-4,6-dinitrotoluene[2-]	38	2	0.045	0.25(U)	n/a	0.107[b]	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	26	2	0.055	0.37(U)	n/a	0.079[b]	Maximum detected concentration
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	26	10	4.65E-07(U)	2.09E-06	Normal	9.24E-07	95% KM(t)
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	26	4	4.57E-07(U)	2.19E-06	n/a	2.19E-06	Maximum detected concentration
Hexachlorodibenzofuran[1,2,3,4,7,8-]	26	1	4.41E-07(U)	6.16E-07	n/a	6.16E-07	Maximum detected concentration
HMX	38	2	0.052	2.2(U)	n/a	0.13[b]	Maximum detected concentration
Methylene chloride	13	4	0.0028	0.0057(U)	n/a	0.0033[b]	Maximum detected concentration
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	24	19	1.79E-06	0.0000187	Lognormal	6.37E-06	95% KM(BCA)
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	26	3	9.14E-07(U)	2.59E-06	n/a	2.59E-06	Maximum detected concentration
Pentachlorodibenzofuran[2,3,4,7,8-]	26	1	4.41E-07(U)	6.78E-07	n/a	6.78E-07	Maximum detected concentration
PETN	26	1	0.13	0.23(U)	n/a	0.13[b]	Maximum detected concentration
TATB	26	3	0.11	0.45(U)	n/a	0.16[b]	Maximum detected concentration
Tetrachlorodibenzofuran[2,3,7,8-]	23	7	1.52E-07(U)	4.28E-07	n/a	4.28E-07	Maximum detected concentration
Trinitrotoluene[2,4,6-]	38	1	0.085(U)	0.25(U)	n/a	0.131[b]	Maximum detected concentration
Radionuclides (pCi/g)							
Cesium-134	26	1	−0.129(U)	0.064(U)	n/a	0.052[b]	Maximum detected concentration
Cesium-137	26	6	−0.04(U)	0.328	n/a	0.328	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); thus, the maximum detected concentration is less than the maximum concentration.

Table H-2.2-4
EPCs for AOC C-14-001 for Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	5	5	8990	12,500	n/a[a]	12,500	Maximum detected concentration
Antimony	5	0	0.54(U)	0.57(U)	n/a	0.57(U)	Maximum detection limit
Barium	5	5	90.9	138	n/a	138	Maximum detected concentration
Calcium	5	5	1420	2150	n/a	2150	Maximum detected concentration
Chromium	5	5	6.9	75.5	n/a	75.5	Maximum detected concentration
Cobalt	5	5	5.1	6	n/a	6	Maximum detected concentration
Cyanide (Total)	5	1	0.13	0.57(U)	n/a	0.13[b]	Maximum detected concentration
Nickel	5	5	5.7	8.4	n/a	8.4	Maximum detected concentration
Selenium	5	5	1.1	1.3	n/a	1.3	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); thus, the maximum detected concentration is less than the maximum concentration.

Table H-2.2-5
EPCs for AOC C-14-001 for Ecological Risk, Construction Worker Scenario, and Residential Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	10	10	8650	12,500	Normal	11071	95% Student's-t
Antimony	10	0	0.53(U)	0.57(U)	n/a[a]	0.57(U)	Maximum detection limit
Barium	10	10	80.4	138	Normal	113.8	95% Student's-t
Calcium	10	10	1420	5300	Nonparametric	2717	95% Student's-t
Chromium	10	10	6.3	75.5	Nonparametric	45.23	95% Chebyshev (Mean, Sd)
Cobalt	10	10	3.4	6	Normal	5.313	95% Student's-t
Cyanide (Total)	10	1	0.13	0.57(U)	n/a	0.13[b]	Maximum detected concentration
Nickel	10	10	4.6	12.2	Gamma	8.024	95% Approximate Gamma
Selenium	10	10	0.9	1.4	Normal	1.306	95% Student's-t
Organic Chemicals (mg/kg)							
Benzoic Acid	10	1	0.36	1.8(U)	n/a	0.36[b]	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); thus, the maximum detected concentration is less than the maximum concentration.

Table H-3.2-1
Physical and Chemical Properties of Inorganic COPCs

COPC	Soil-Water Partition Coefficient, K_d[a] (cm^3/g)	Water Solubility[a,b] (g/L)
Aluminum	1500	Insoluble
Antimony	45	Insoluble
Arsenic	29	Insoluble
Barium	41	Insoluble
Beryllium	790	Insoluble
Cadmium	75	Insoluble
Chromium	850	Insoluble
Cobalt	45	Insoluble
Copper	35	Insoluble
Cyanide (Total)	9.9	na[c]
Iron	25	Insoluble
Lead	900	Insoluble
Manganese	65	Insoluble
Mercury	52	Insoluble
Nickel	65	Insoluble
Perchlorate	na	245
Selenium	5	Insoluble
Silver	8.3	Insoluble
Thallium	71	Insoluble
Uranium	0.4	Insoluble
Vanadium	1000	Insoluble

[a] Information from http://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem_spef.

[b] Information from http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm.

[c] na = Not available.

Table H-3.2-2
Physical and Chemical Properties of Organic COPCs

COPC	Water Solubility[a] (mg/L)	Organic Carbon Coefficient K_{oc}[a] (L/kg)	Log Octanol-Water Partition Coefficient, Log K_{ow}[a]	Vapor Pressure[a] (mm Hg at 25°C)
Amino-4,6-dinitrotoluene[2-]	3.19E+02	2.83E+02	1.84E+00	3.33E-06
Benzoic acid	3.40E+03[b]	1.45E+01	1.87E+00[b]	7.00E-04[b]
Bis(2-ethylhexyl)phthalate	2.70E-01[b]	1.65E+05	7.60E+00[b]	1.42E-07[b]
HMX	9.44E+03[c]	1.85E+03[c]	1.60E-01	3.30E-14
Methylene chloride	1.30E+04[b]	2.37E+01	1.30E+00[b]	4.30E+02[b]
PETN	4.30E+01	6.48E+02	2.38E+00	5.4E-09
TATB	2.78E+02[d]	1.68E-03[d]	1.18E+00[d]	6.44E-06[d]
TCDD[2,3,7,8-]	2.00E-04	1.46E+05	6.80E+00	1.50E-09
Trinitrotoluene[2,4,6-]	1.15E+02	2.81E+03	1.60E+00	8.02E-06

[a] Information from http://rais.ornl.gov/cgH-bin/tools/TOX_search, unless noted otherwise.

[b] Information from http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm.

[c] Information from NMED (2009, 108070).

[d] Trinitrobenzene[1,3,5-] used as surrogate based on structural similarity.

Table H-3.2-3
Physical and Chemical Properties of Radionuclide COPCs

COPC	Soil-Water Partition Coefficient, K_d[a] (cm^3/g)	Water Solubility[b] (g/L)
Cesium-134	1000	Insoluble
Cesium-137	1000	Insoluble

[a] Superfund Chemical Data Matrix (EPA 1996, 064708).

[b] Information from http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm.

Table H-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)	ED × 365 d	ED × 365 d	ED × 365 d
Skin absorption factor	Semivolatile organic compound (SVOC) = 0.1	SVOC = 0.1	SVOC = 0.1
	Chemical-specific	Chemical-specific	Chemical-specific
Adherence factor–child	0.2 mg/cm^2	n/a[a]	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	6.61×10^9 m^3/kg	2.1×10^6 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 duration[b]	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^3/d	20 m^3/d	20 m^3/d

Note: Parameter values from NMED (2009, 108070).

[a] n/a = Not applicable.

[b] Exposure duration for lifetime resident is 30 yr. For carcinogens, the exposures are combined for child (6 yr) and adult (24 yr).

Table H-4.1-2
Parameter Values Used to Calculate Radionuclide SALs for the Industrial, Construction Worker, and Residential Scenarios

Parameter	Industrial, Adult	Construction Worker, Adult	Residential, Adult	Residential, Child
Inhalation rate (m^3/yr)	19,481[a]	19,478[b]	7305[c]	3652.5[d]
Mass loading (g/m^3)	1.5×10^{-7}[e]	0.0004[f]	1.5×10^{-7}[e]	1.5×10^{-7}[e]
Outdoor time fraction	0.2053[g]	0.2567[h]	0.0599[i]	0.2236[j]
Indoor time fraction	0	0	0.8984[k]	0.7347[l]
Soil ingestion (g/yr)	97.4[m]	321[n]	36.5[m]	73[o]

[a] Calculated as [20 m^3/d × 225 d/yr] / [indoor + outdoor time fractions], where 20 m^3/d is the daily inhalation rate of an adult and 225 d/yr is the exposure frequency (NMED 2009, 108070).

[b] Calculated as [20 m^3/d × 250 d/yr] / [indoor + outdoor time fractions], where 20 m^3/d is the daily inhalation rate of an adult and 250 d/yr is the exposure frequency (NMED 2009, 108070).

[c] Calculated as [20 m^3/d × 350 d/yr] / [indoor + outdoor time fractions], where 20 m^3/d is the daily inhalation rate of an adult (NMED 2009, 108070).

[d] Calculated as [10 m^3/d × 350 d/yr] / [indoor + outdoor time fractions], where 10 m^3/d is the daily inhalation rate of a child (NMED 2009, 108070).

[e] Calculated as [1/6.6 × 10^{+9} m^3/kg) × 1000 g/kg, where 6.6 × 10^{+9} m^3/kg is the particulate emission factor (NMED 2009, 108070).

[f] Calculated as [1/2.1 × 10^{+6} m^3/kg) × 1000 g/kg, where 2.1 × 10^{+6} m^3/kg is the particulate emission factor (NMED 2009, 108070).

[g] Calculated as [8 h/d × 225 d/yr] / 8766 h/yr, where 8 h/d is an estimate of the average length of the work day.

[h] Calculated as [9 h/d × 250 d/yr] / 8766 h/yr, where 9 h/d is an estimate of the average length of the work day.

[i] Calculated as [1.5 h/d × 350 d/yr] / 8766 h/yr, where 1.5 h/d is an estimate of time spent outdoors for an adult 12 yr and older (EPA 1997, 066598, Section 15.4-1).

[j] Calculated as [5.6 h/d × 350 d/yr] / 8766 h/yr, where 5.6 h/d is an estimate of time spent outdoors for a 3–11 yr old child (EPA 1997, 066598, Section 15.4-1).

[k] Calculated as [24-1.5 h/d × 350 d/yr] / 8766 h/yr, where 1.5 h/d is an estimate of time spent outdoors for an adult 12 yr and older (EPA 1997, 066598, Section 15.4-1).

[l] Calculated as [24-5.6 h/d × 350 d/yr] / 8766 h/yr, where 5.6 h/d is an estimate of time spent outdoors for a 3–11 yr old child (EPA 1997, 066598, Section 15.4-1).

[m] Calculated as [0.1 g/d × 225 d/yr] / [indoor + outdoor time fractions], where 0.1 g/d is the adult soil ingestion rate (NMED 2009, 108070).

[n] Calculated as [0.33 g/d × 250 d/yr] / [indoor + outdoor time fractions], where 0.33 g/d is the adult soil ingestion rate (NMED 2009, 108070).

[o] Calculated as [0.2 g/d × 350 d/yr] / [indoor + outdoor time fractions], where 0.2 g/d is the child soil ingestion rate (NMED, 2009, 108070).

Table H-4.2-1
Dioxin/Furan Calculation for the Industrial Scenario for SWMU 14-003

COPC	EPC (mg/kg) (0–1 ft)	TEF*	Toxic Equivalency Calculation
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	1.28E-06	0.01	1.28E-08
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	2.19E-06	0.01	2.19E-08
Hexachlorodibenzofuran[1,2,3,4,7,8-]	6.16E-07	0.1	6.16E-08
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	9.85E-06	0.0003	2.95E-09
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	2.59E-06	0.0003	7.68E-10
Pentachlorodibenzofuran[2,3,4,7,8-]	6.78E-07	0.3	2.03E-07
Tetrachlorodibenzofuran[2,3,7,8-]	4.28E-07	0.1	4.28E-08
		TCDD[2,3,7,8-] Sum	**3.46E-07**

*TEFs from www.who.int/ipcs/assessment/tef_update/en/print.html.

Table H-4.2-2
Industrial Carcinogenic Screening Evaluation for SWMU 14-003

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	HQ
Arsenic	3.478	17.7	2.0E-06
Bis(2-ethylhexyl)phthalate	0.079	1370	5.8E-10
TCDD[2,3,7,8-]	3.46E-07	0.000204	1.7E-08
		HI	**2E-06**

*SSLs from NMED (2009, 108070).

Table H-4.2-3
Industrial Noncarcinogenic Screening Evaluation for SWMU 14-003

COPC	EPC (mg/kg)	Industrial SSL[a] (mg/kg)	HQ
Aluminum	22,873	1,130,000	0.02
Antimony	0.28	454	6.2E-04
Barium	645.7	224,000	2.9E-03
Beryllium	1.199	2260	5.3E-04
Cadmium	0.133	1120	1.2E-04
Chromium	10.77	2920[b]	3.7E-03
Cobalt	6.877	300[c]	0.02
Copper	8.331	45,400	1.8E-04
Cyanide (Total)	0.55(U)	22,700	2.4E-05
Iron	14,073	795,000	0.02
Lead	15.38	800	0.2
Manganese	441.9	145,000	3.0E-03
Mercury	0.13(U)	310[c]	4.2E-04
Nickel	9.43	22,700	4.2E-04
Perchlorate	0.0022	795	2.8E-06
Selenium	1.2	5680	2.1E-04
Silver	0.816	5680	1.4E-04
Thallium	0.488	74.9	6.5E-03
Uranium	3.59	3410	1.1E-03
Vanadium	24.83	5680	4.4E-03
Amino-4,6-dinitrotoluene[2-]	0.107	2000	5.4E-05
HMX	0.052	34,200	1.5E-06
TATB	0.16	27,000[c,d]	5.9E-06
Trinitrotoluene[2,4,6-]	0.131	469	2.8E-04
		HI	**0.3**

Note: Data qualifiers are defined in Appendix A.

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

[b] SSLs are for hexavalent chromium.

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

[d] Trinitrobenzene[1,3,5-] used as surrogate based on structural similarity.

Table H-4.2-4
Industrial Radionuclide Screening Evaluation for SWMU 14-003

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Total Dose (mrem/yr)
Cesium-137	0.328	23	0.2
		Total Dose	**0.2**

*SALs from LANL (2009, 107655).

Table H-4.2-5
Dioxin/Furan Calculation for the Construction Worker and Residential Scenarios for SWMU 14-003

COPC	EPC (mg/kg) (0–10 ft)	TEF*	Toxic Equivalency Calculation
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	9.24E-07	0.01	9.24E-09
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	2.19E-06	0.01	2.19E-08
Hexachlorodibenzofuran[1,2,3,4,7,8-]	6.16E-07	0.1	6.16E-08
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	6.37E-06	0.0003	1.91E-09
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	2.59E-06	0.0003	7.77E-10
Pentachlorodibenzofuran[2,3,4,7,8-]	6.78E-07	0.3	2.03E-07
Tetrachlorodibenzofuran[2,3,7,8-]	4.28E-07	0.1	4.28E-08
		TCDD[2,3,7,8-] Sum	**3.42E-07**

*TEFs from www.who.int/ipcs/assessment/tef_update/en/print.html.

Table H-4.2-6
Construction Worker
Noncarcinogenic Screening Evaluation for SWMU 14-003

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Aluminum	17,286	40,700	0.4
Antimony	0.18	124	1.5E-03
Arsenic	3.314	65.4	5.1E-02
Barium	500.4	4350	0.1
Beryllium	1.164	144	8.1E-03
Cadmium	0.0935	309	3.0E-04
Chromium	10.28	449[b]	0.02
Cobalt	6.424	34.6[c]	0.2
Copper	7.729	12,400	6.2E-04
Cyanide (Total)	0.57(U)	6190	9.2E-05
Iron	13,868	217,000	0.06
Lead	14.51	800	0.02
Manganese	413.2	463	0.9
Mercury	0.13(U)	92.9[c]	1.4E-03
Nickel	8.885	6190	1.4E-03
Perchlorate	0.029	217	1.3E-04
Selenium	1.2	1550	7.7E-04
Silver	0.506	1550	3.3E-04
Thallium	0.507	20.4	0.02
Uranium	3.609	929	3.9E-03
Vanadium	23.46	1550	0.02
Amino-4,6-dinitrotoluene[2-]	0.107	601	1.8E-04
Bis(2-ethylhexyl)phthalate	0.079	4760	1.7E-05
HMX	0.13	11,900	1.1E-05
Methylene chloride	0.0033	10,600	3.1E-07
TATB	0.16	8760[c,d]	1.8E-05
TCDD[2,3,7,8-]	3.42E-07	2.84E-04	1.2E-03
Trinitrotoluene[2,4,6-]	0.131	141	7.8E-04
		HI	**2**

Note: Data qualifiers are defined in Appendix A.

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

[b] SSLs are for hexavalent chromium.

[c] SSL calculated using toxicity values from EPA regional screening tables (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

[d] Trinitrobenzene[1,3,5-] used as surrogate based on structural similarity.

Table H-4.2-7
Construction Worker
Radionuclide Screening Evaluation for SWMU 14-003

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Total Dose (mrem/yr)
Cesium-134	0.052	7.7	0.1
Cesium-137	0.328	18	0.3
		Total Dose	**0.4**

*SALs from LANL (2009, 107655).

Table H-4.2-8
Residential Carcinogenic Screening Evaluation for SWMU 14-003

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	HQ
Arsenic	3.314	3.9	8.5E-06
Bis(2-ethylhexyl)phthalate	0.079	347	2.3E-09
Methylene chloride	0.0033	199	1.7E-10
TCDD[2,3,7,8-]	3.42E-07	0.000045	7.6E-08
		HI	**9E-06**

Note: Data qualifiers are defined in Appendix A.
*SSLs from NMED (2009, 108070).

Table H-4.2-9
Residential Noncarcinogenic Screening Evaluation for SWMU 14-003

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Aluminum	17,286	78,100	0.2
Antimony	0.18	31.3	5.8E-03
Barium	500.4	15,600	0.03
Beryllium	1.164	156	7.5E-03
Cadmium	0.0935	77.9	1.2E-03
Chromium	10.28	219[b]	0.05
Cobalt	6.424	23[c]	0.3
Copper	7.729	3130	2.5E-03
Cyanide (Total)	0.57(U)	1560	3.7E-04
Iron	13,868	54,800	0.3
Lead	14.51	400	0.04
Manganese	413.2	10,700	0.04
Mercury	0.13(U)	23[c]	5.7E-03
Nickel	8.885	1560	5.7E-03
Perchlorate	0.029	54.8	5.3E-04
Selenium	1.2	391	3.1E-03
Silver	0.506	391	1.3E-03
Thallium	0.507	5.16	0.1
Uranium	3.609	235	0.02
Vanadium	23.46	391	0.06
Amino-4,6-dinitrotoluene[2-]	0.107	150[c]	7.1E-04
HMX	0.13	3060	4.2E-05
TATB	0.16	2200[c,d]	7.3E-05
Trinitrotoluene[2,4,6-]	0.131	35.9	3.6E-03
		HI	**1**

Note: Data qualifiers are defined in Appendix A.

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

[b] SSLs are for hexavalent chromium.

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

[d] Trinitrobenzene[1,3,5-] used as surrogate based on structural similarity.

Table H-4.2-10
Residential Radionuclide Screening Evaluation for SWMU 14-003

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Total Dose (mrem/yr)
Cesium-134	0.052	2.4	3.3E-01
Cesium-137	0.328	5.6	8.8E-01
		Total Dose	**1**

*SALs from LANL (2009, 107655).

Table H-4.2-11
Residential Carcinogenic
Screening Evaluation of Vapor Intrusion for SWMU 14-003

COPC	EPC (mg/kg)	Vapor Intrusion Risk-Based Concentration* (mg/kg)	Cancer Risk
Methylene chloride	0.0033	15.6	2E-09
		Total Excess Cancer Risk	**2E-09**

*Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table H-4.2-12
Industrial Noncarcinogenic
Screening Evaluation for AOC C-14-001

COPC	EPC (mg/kg)	Industrial SSL[a] (mg/kg)	HQ
Aluminum	12500	1,130,000	1.1E-02
Antimony	0.57(U)	454	1.3E-03
Barium	138	224,000	6.2E-04
Chromium	75.5	2920[b]	2.6E-02
Cobalt	6	300[c]	2.0E-02
Cyanide (Total)	0.13	22,700	5.7E-06
Nickel	8.4	22,700	3.7E-04
Selenium	1.3	5680	2.3E-04
		HI	**0.06**

Note: Data qualifiers are defined in Appendix A.

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

[b] SSLs are for hexavalent chromium.

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

Table H-4.2-13
Construction Worker
Noncarcinogenic Screening Evaluation for AOC C-14-001

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Aluminum	11,071	40,700	0.3
Antimony	0.57(U)	124	4.6E-03
Barium	113.8	4350	0.03
Chromium	45.23	449[b]	0.1
Cobalt	5.313	34.6[c]	0.2
Cyanide (Total)	0.13	6190	2.1E-05
Nickel	8.024	6190	1.3E-03
Selenium	1.306	1550	8.4E-04
Benzoic acid	0.36	952,000[c]	3.8E-07
		HI	**0.6**

Note: Data qualifiers are defined in Appendix A.

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

[b] SSLs are for hexavalent chromium.

[c] SSL calculated using toxicity values from EPA regional screening tables (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm) and equation and parameters from NMED (2009, 108070).

Table H-4.2-14
Residential Noncarcinogenic Screening Evaluation for AOC C-14-001

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Aluminum	11,071	78,100	0.1
Antimony	0.57(U)	31.3	0.02
Barium	113.8	15,600	7.3E-03
Chromium	45.23	219[b]	0.2
Cobalt	5.313	23[c]	0.2
Cyanide (Total)	0.13	1560	8.3E-05
Nickel	8.024	1560	5.1E-03
Selenium	1.306	391	3.3E-03
Benzoic acid	0.36	240,000[c]	1.5E-06
		HI	**0.6**

Note: Data qualifiers are defined in Appendix A.

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

[b] SSLs are for hexavalent chromium.

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

Table H-5.3-1
ESLs for Terrestrial Receptors

Analyte	Red Fox	Kestrel (top carnivore)	Kestrel (intermediate carnivore)	Robin (herbivore)	Robin (omnivore)	Robin (insectivore)	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Inorganic Chemicals (mg/kg)											
Antimony	45	na[a]	na	na	na	na	2.9	0.26	0.48	78	0.05
Arsenic	810	1100	160	42	26	18	160	15	32	6.8	18
Barium	41,000	37,000	11,000	820	930	1000	3300	1300	1800	330	110
Beryllium	420	na	na	na	na	na	170	18	56	40	2.5
Cadmium	510	580	2	4.4	0.54	0.29	9.9	0.27	0.51	140	32
Chromium (Total)	1800	1200	260	68	40	28	840	45	110	na	na
Cobalt	5400	3500	930	170	120	96	1800	160	400	na	13
Copper	3800	1600	110	38	22	15	270	38	64	80	70
Cyanide (Total)	2200	0.58	0.47	0.1	0.1	0.1	740	310	340	na	na
Lead	3700	810	120	21	16	14	370	72	120	1700	120
Manganese	41,000	90,000	35,000	1400	1900	3100	2000	1500	1400	450	220
Mercury	46	0.28	0.082	0.07	0.022	0.013	22	1.7	3	0.05	34
Nickel	1200	2900	160	160	38	21	500	9.7	20	280	38
Selenium	84	97	5.6	1	0.87	0.75	2.1	0.66	0.83	4.1	0.52
Silver	4100	840	19	11	4.3	2.6	150	14	24	na	560
Thallium	2.8	75	6.6	9.2	1.6	0.9	2.8	0.032	0.068	na	0.1
Uranium	4800	39,000	21,000	1900	1700	1600	2000	220	750	na	25
Vanadium	3300	170	84	8.9	7.6	6.7	1500	140	480	na	0.025
Organic Chemicals (mg/kg)											
Amino-4,6-dinitrotoluene[2-]	3700	na	na	na	na	na	14	27	10	na	80
Benzoic acid	350	na	na	na	na	na	4.2	1	1.3	na	na
Bis(2-ethylhexyl)phthalate	1.2	0.033	0.045	20	0.04	0.02	2700	0.59	1.1	na	na
HMX	29,000	na	na	na	na	na	29	3100	27	0.014	2700

Table H-5.3-1 (continued)

Analyte	Red Fox	Kestrel (top carnivore)	Kestrel (intermediate carnivore)	Robin (herbivore)	Robin (omnivore)	Robin (insectivore)	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Methylene chloride	1700	na	na	na	na	na	3.4	9	2.6	na	1600
PETN	7600	na	na	na	na	na	110	870	100	na	na
TATB[b]	3900	na	na	na	na	na	7.3	400	6.6	na	na
TCDD[2,3,7,8-]	1.2E-06	na	na	na	na	na	4.8E-05	2.9E-07	5.8E-07	5	na
Trinitrotoluene[2,4,6-]	17,000	2700	1400	6.4	12	140	90	920	80	32	62
Radionuclides (pCi/g)											
Cesium-134	320	1300	1700	1900	1700	1700	1000	1100	1100	770	1100
Cesium-137	680	2900	3700	4200	3700	3800	2300	2400	2400	1700	2300

Note: Values from ECORISK Database, Release 3.0 (LANL 2011, 206473).

[a] na = Not available.

[b] Trinitrobenzene[1,3,5-] used as a surrogate based on structural similarity.

Table H-5.3-2
Dioxin/Furan Calculation for SWMU 14-003 for the Ecological Receptors

COPC	EPC (mg/kg)	TEF*	Toxic Equivalency Calculation
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	9.55E-07	0.01	9.55E-09
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	2.19E-06	0.01	2.19E-08
Hexachlorodibenzofuran[1,2,3,4,7,8-]	6.16E-07	0.1	6.16E-08
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	8.87E-06	0.0003	2.66E-09
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	2.59E-06	0.0003	7.77E-10
Pentachlorodibenzofuran[2,3,4,7,8-]	6.78E-07	0.3	2.03E-07
Tetrachlorodibenzofuran[2,3,7,8-]	4.28E-07	0.1	4.28E-08
		TCDD[2,3,7,8-] Sum	**3.43E-07**

*TEFs from www.who.int/ipcs/assessment/tef_update/en/print.html.

Table H-5.3-3
Minimum ESL Comparison for SWMU 14-003

COPC	EPC	Minimum ESL	Receptor	HQ	COPEC
Inorganic Chemicals (mg/kg)					
Antimony	0.18	0.05	Plant	**3.6**	**Yes**
Arsenic	3.351	6.8	Earthworm	**0.49**	**Yes**
Barium	518.8	110	Plant	**4.72**	**Yes**
Beryllium	1.178	2.5	Plant	**0.47**	**Yes**
Cadmium	0.0975	0.27	Shrew	**0.36**	**Yes**
Chromium	10.37	28	Robin (insectivore)	**0.37**	**Yes**
Cobalt	6.539	13	Plant	**0.5**	**Yes**
Copper	7.841	15	Robin (insectivore)	**0.52**	**Yes**
Cyanide (Total)	0.57(U)	0.1	Robin (insectivore)	**5.7**	**Yes**
Lead	14.66	14	Robin (insectivore)	**1.05**	**Yes**
Manganese	420.3	220	Plant	**1.91**	**Yes**
Mercury	0.13(U)	0.013	Robin (insectivore)	**10**	**Yes**
Nickel	9.008	9.7	Shrew	**0.93**	**Yes**
Selenium	1.2	0.52	Plant	**2.31**	**Yes**
Silver	0.537	2.6	Robin (insectivore)	0.21	No
Thallium	0.524	0.032	Shrew	**16.38**	**Yes**
Uranium	3.581	25	Plant	0.14	No
Vanadium	23.77	0.025	Plant	**950.8**	**Yes**
Organic Chemicals (mg/kg)					
Amino-4,6-dinitrotoluene[2-]	0.107	10	Deer Mouse	0.01	No
Bis(2-ethylhexyl)phthalate	0.079	0.02	Robin (insectivore)	**3.95**	**Yes**
HMX	0.13	27	Deer Mouse	**9.29**	**Yes**
Methylene chloride	0.0033	2.6	Deer Mouse	0.0013	No
PETN	0.13	100	Deer Mouse	0.0013	No
TCDD[2,3,7,8-]	3.43E-07	2.9E-07	Shrew	**1.18**	**Yes**
Trinitrotoluene[2,4,6-]	0.131	6.4	Robin (herbivore)	0.02	No
Radionuclides (pCi/g)					
Cesium-134	0.052	320	Red Fox	0.00016	No
Cesium-137	0.328	680	Red Fox	0.00048	No

Notes: Bolded values indicate HQ greater than 0.3. Data qualifiers are defined in Appendix A.

Table H-5.3-4
HI Analysis for SWMU 14-003

COPEC	EPC (mg/kg)	Red Fox	Kestrel (top carnivore)	Kestrel (intermediate carnivore)	Robin (herbivore)	Robin (omnivore)	Robin (insectivore)	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Antimony	0.18	4.0E-03	na*	na	na	na	na	0.062	**0.69**	**0.38**	2.3E-03	**3.60**
Arsenic	3.351	4.1E-03	3.0E-03	0.021	0.080	0.13	0.19	0.021	0.22	0.10	**0.49**	0.19
Barium	518.8	0.013	0.014	0.047	**0.63**	**0.56**	**0.52**	0.16	**0.40**	0.29	**1.57**	**4.72**
Beryllium	1.178	2.8E-03	na	na	na	na	na	6.9E-03	0.065	0.021	0.029	**0.47**
Cadmium	0.0975	1.9E-04	1.7E-04	0.049	0.022	0.18	**0.34**	0.010	**0.36**	0.19	7.0E-04	3.0E-03
Chromium	10.37	5.8E-03	8.6E-03	0.040	0.15	0.26	**0.37**	0.012	0.23	0.094	na	na
Cobalt	6.539	1.2E-03	1.9E-03	7.0E-03	0.038	0.054	0.068	3.6E-03	0.041	0.016	na	**0.50**
Copper	7.841	2.1E-03	4.9E-03	0.071	0.21	**0.36**	**0.52**	0.029	0.21	0.12	0.098	0.11
Cyanide (Total)	0.57(U)	2.6E-04	**0.98**	**1.21**	**5.70**	**5.70**	**5.70**	7.7E-04	1.8E-03	1.7E-03	na	na
Lead	14.66	4.0E-03	0.018	0.12	**0.70**	**0.92**	**1.05**	0.040	0.20	0.12	8.6E-03	0.12
Manganese	420.3	0.010	4.7E-03	0.012	0.30	0.22	0.14	0.21	**0.28**	0.30	**0.93**	**1.91**
Mercury	0.13(U)	2.8E-03	**0.46**	**1.59**	**1.86**	**5.91**	**10.00**	5.9E-03	0.076	0.043	**2.60**	3.8E-03
Nickel	9.008	7.5E-03	3.1E-03	0.056	0.056	0.24	**0.43**	0.018	**0.93**	**0.45**	0.032	0.24
Selenium	1.2	0.014	0.012	0.21	**1.20**	**1.38**	**1.60**	**0.57**	**1.82**	**1.446**	0.29	**2.31**
Thallium	0.524	0.187	7.0E-03	0.079	0.057	**0.33**	**0.58**	0.19	**16.38**	**7.71**	na	**5.24**
Vanadium	23.77	7.2E-03	0.14	0.28	**2.67**	**3.13**	**3.55**	0.016	0.17	0.05	na	**950.80**
Bis(2-ethylhexyl)phthalate	0.079	0.066	**2.39**	**1.76**	4.0E-03	**1.98**	**3.95**	2.9E-05	0.13	0.072	na	na
HMX	0.13	4.5E-06	na	na	na	na	na	4.5E-03	4.2E-05	4.8E-03	9.3E-04	4.8E-05
TCDD[2,3,7,8-]	3.43E-07	0.29	na	na	na	na	na	7.1E-03	**1.18**	**0.59**	6.9E-08	na
HI		0.6	**4**	**6**	**14**	**21**	**29**	1	**23**	**12**	**6**	**970**

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0. Data qualifiers are defined in Appendix A.

*na = Not available.

Table H-5.3-5
Minimum ESL Comparison for AOC C-14-001

COPC	EPC	Minimum ESL	Receptor	HQ	COPEC
Inorganic Chemicals (mg/kg)					
Antimony	0.57(U)	0.05	Plant	**11.4**	**Yes**
Barium	113.8	110	Plant	**1.03**	**Yes**
Chromium	45.23	28	Robin (Insectivore)	**1.62**	**Yes**
Cobalt	5.313	13	Plant	**0.41**	**Yes**
Cyanide (Total)	0.13	0.1	Robin (Insectivore)	**1.3**	**Yes**
Nickel	8.024	9.7	Shrew	**0.83**	**Yes**
Selenium	1.306	0.52	Plant	**2.51**	**Yes**
Organic Chemicals (mg/kg)					
Benzoic acid	0.36	1	Shrew	**0.36**	**Yes**

Notes: Bolded values indicate HQ greater than 0.3. Data qualifiers are defined in Appendix A.

Table H-5.3-6
HI Analysis for AOC C-14-001

COPECs	EPC (mg/kg)	Red Fox	Kestrel (top carnivore)	Kestrel (intermediate carnivore)	Robin (herbivore)	Robin (omnivore)	Robin (insectivore)	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Antimony	0.57(U)	0.013	na*	na	na	na	na	0.20	**2.19**	**1.19**	0.0073	**11.40**
Barium	113.8	0.0028	0.0031	0.01	0.14	0.12	0.11	0.034	0.088	0.063	**0.34**	**1.03**
Chromium	45.23	0.025	0.038	0.17	**0.67**	**1.13**	**1.62**	0.054	**1.01**	**0.41**	na	na
Cobalt	5.313	0.001	0.0015	0.006	0.031	0.044	0.055	0.003	0.033	0.013	na	**0.41**
Cyanide (Total)	0.13	5.91E-05	0.22	0.28	**1.30**	**1.30**	**1.30**	1.76E-04	4.19E-04	3.82E-04	na	na
Nickel	8.024	0.0067	0.0028	0.05	0.05	0.21	**0.38**	0.016	**0.83**	**0.40**	0.029	0.21
Selenium	1.306	0.016	0.013	0.23	**1.31**	**1.50**	**1.74**	**0.62**	**1.98**	**1.57**	**0.32**	**2.51**
Benzoic acid	0.36	0.001	na	na	na	na	na	0.086	**0.36**	0.28	na	na
	HI	0.1	0.3	0.7	**4**	**4**	**5**	1	**6**	**4**	0.7	**16**

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0. Data qualifiers are defined in Appendix A.

*na = Not available.

Table H-5.4-1
Comparison of EPCs with Background Concentrations for SWMU 14-003

COPEC	EPC (mg/kg)	Soil Background Concentrations[a] (mg/kg)	Tuff Background Concentrations[a] (mg/kg)
Antimony	0.18	0.1–1.0	0.5[b]
Arsenic	3.351	0.3–9.3	0.25–5
Barium	**518.8**	21–410	1.4–51.6
Beryllium	1.178	0.04–3.95	0.04–1.8
Cadmium	0.0975	0.2–2.6	0.1–1.5
Chromium	10.37	1.9–36.5	0.25–13
Cobalt	6.539	1–9.5	3.14[b]
Copper	7.841	0.25–16	0.25–6.2
Cyanide (Total)	0.57(U)	0.5[b]	0.5[b]
Iron	13,917	3300–36,000	190–19,500
Lead	14.66	2–28	1.6–15.5
Manganese	420.3	76–1100	22–752
Mercury	0.13(U)	0.05–0.1	0.1[b]
Nickel	9.008	1–29	0.5–7
Selenium	1.2	0.1–1.7	0.1–0.105
Thallium	0.524	0.063–1	0.05–1.7
Vanadium	23.77	4–56.5	0.25–21

Notes: Bolded COPEC is retained. Data qualifiers are defined in Appendix A.

[a] Background concentrations from LANL (1998, 059730).

[b] BV used.

Table H-5.4-2
Comparison of EPCs with Background Concentrations for AOC C-14-001

COPEC	EPC (mg/kg)	Soil Background Concentrations[a] (mg/kg)	Tuff Background Concentrations[a] (mg/kg)
Antimony	0.57(U)	0.1–1.0	0.5[b]
Barium	113.8	21–410	1.4–51.6
Chromium	**45.23**	1.9–36.5	0.25–13
Cobalt	5.313	1–9.5	3.14
Cyanide (Total)	0.13	0.5[b]	0.5[b]
Nickel	8.024	1–29	0.5–7
Selenium	1.306	0.1–1.7	0.1–0.105

Notes: Bolded COPEC is retained. Data qualifiers are defined in Appendix A.

[a] Background concentrations from LANL (1998, 059730).

[b] BV used.

Table H-5.4-3
PAUFs and AUFs for Ecological Receptors at SWMU 14-003 and AOC C-14-001

Receptor	HR[a] (ha)	Population Area (ha)	PAUF for SWMU 14-003 Site area = 0.0099 ha	PAUF for AOC C-14-001 Site area = 0.00092 ha
American Kestrel	106	4240	2E-06	2E-07
American Robin	0.42	16.8	6E-04	5E-05
Deer Mouse	0.077	3.1	3E-03	3E-04
Montane Shrew	0.39	15.6	6E-04	6E-05
Desert Cottontail	3.1	124	8E-05	7E-06
Red Fox	1038	41,520	2E-07	2E-08
Mexican Spotted Owl[b]	366	n/a[c]	3E-05	3E-06

Note: PAUF is calculated as the area of the site divided by the population area.

[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 H-5.4-4
Adjusted HIs at SWMU 14-003

COPEC	EPC (mg/kg)	Red Fox	Kestrel (top carnivore)	Kestrel (intermediate carnivore)	Robin (herbivore)	Robin (omnivore)	Robin (insectivore)	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Barium	518.8	3.0E-09	3.3E-08	1.1E-07	3.8E-04	3.3E-04	3.1E-04	1.3E-05	2.6E-04	9.3E-04	**1.6**	**4.7**
Bis(2-ethylhexyl)phthalate	0.079	1.6E-08	5.6E-06	4.1E-06	2.3E-06	1.2E-03	2.3E-03	2.4E-09	8.6E-05	2.3E-04	na*	na
HMX	0.13	1.1E-12	na	na	na	na	na	3.6E-07	2.7E-08	1.6E-05	9.3E-04	4.8E-05
TCDD[2,3,7,8-]	3.43E-07	6.9E-08	na	na	na	na	na	5.8E-07	7.6E-04	1.9E-03	6.9E-08	na
Adjusted HI		9E-08	6E-06	4E-06	4E-04	0.002	0.003	1E-05	0.001	0.003	**2**	**5**

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

*na = Not available.

Table H-5.4-5
Adjusted HIs at AOC C-14-001

COPEC	EPC (mg/kg)	Red Fox	Kestrel (top carnivore)	Kestrel (intermediate carnivore)	Robin (herbivore)	Robin (omnivore)	Robin (insectivore)	Cottontail	Shrew	Deer Mouse	Earthworm	Plant
Chromium	45.23	5.6E-10	8.2E-09	3.8E-08	3.6E-05	6.2E-05	8.8E-05	4.0E-07	5.9E-06	1.2E-04	na*	na
Benzoic acid	0.36	2.3E-11	na	na	na	na	na	6.4E-07	2.1E-05	8.3E-05	na	na
Adjusted HI		6E-10	8E-09	4E-08	4E-05	6E-05	9E-05	1E-06	3E-05	2E-04	na	na

*na = Not available.

Table H-5.4-6
LOAEL-Based ESLs for SWMU 14-003

COPECs	Earthworm (mg/kg)	Plant (mg/kg)
Barium	3200	260

Note: Values from ECORISK Database, Release 3.0 (LANL 2011, 206473).

Table H-5.4-7
HI Analysis Using LOAEL-Based ESLs for SWMU 14-003

COPECs	EPC (mg/kg)	Earthworm	Plant
Barium	518.8	0.2	2
	HI	0.2	**2**

Note: Bolded values indicate HI greater than 1.

Attachment H-1

ProUCL Files
(on CD included with this document)

Attachment H-2

Johnson and Ettinger Model Spreadsheets
(on CD included with this document)

Attachment H-3

Ecological Scoping Checklist for Technical Area 14, Cañon de Valle Aggregate Area

PART A—SCOPING MEETING DOCUMENTATION

Site ID	14-001(a,b,c,d,e), 14-003, and C-14-001
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.	Technical Area 14 (TA-14) is located north of Cañon de Valle and east of TA-16 and includes sites associated with firing sites, burning areas, an incinerator, a high explosives (HE) sump and drainline, and a septic system. Known as Q-site, TA-14 has been used since 1944 for explosives development and testing, including testing that involves radioactive materials. In 1952, the firing site was renovated, the structures were removed, and a new firing site was constructed. Spatially, all of the Cañon de Valle sites at TA-14 are located within very close proximity to each other. Areas of Concern (AOCs) 14-001(a,b,c,d,e) consist of inactive small steel “pull boxes” located mostly in the ground and covered with metal lids. Pull boxes were associated with firing sites and were used for detonator and diagnostic electrical hookups. They were associated with active firing sites at TA-14 and were used to hold capacitor discharge units. The sites have the potential to release polychlorinated biphenyls (PCBs) from the capacitor discharge units. Solid Waste Management Unit (SWMU) 14-003 is a former burning area located approximately 300 ft northeast of a control building in the southeastern portion of TA-14. The area was used for burning combustible HE-contaminated debris and for flash-burning noncombustible HE-contaminated debris from test shots. Site release at this site consisted of solid material disposal and the products of the combustion of these materials. AOC C-14-001 is the location of a former magazine in the southeastern portion of TA-14. Constructed in 1944, the wood-framed magazine was covered with an earthen berm on three sides and the top. The magazine was destroyed by burning in 1963. Potential releases were to surface and subsurface media.
List of Primary Impacted Media (Indicate all that apply.)	**Surface soil –** Applicable **Surface water/sediment –** Applicable (sediment) **Subsurface –** Applicable **Groundwater –** NA **Other, explain –** NA
FIMAD vegetation class based on Arcview vegetation coverage (Indicate all that apply.)	**Water –** NA **Bare Ground/Unvegetated –** Applicable **Spruce/fir/aspen/mixed conifer –** NA **Ponderosa pine –** Applicable **Piñon juniper/juniper savannah –** Applicable **Grassland/shrubland –** Applicable **Developed –** Several structures, fences, active firing sites, and utilities
Is T&E Habitat Present? **If applicable, list species known or suspected to use the site for breeding or foraging.**	Yes. Location information maintained by FIMAD was intersected with threatened and endangered (T&E) species habitat using GIS databases. The sites are within Mexican spotted owl nesting habitat and within an area where the owl can conservatively be assumed to forage at a high frequency. The sites are also entirely within an area where the peregrine falcon can conservatively be assumed to forage at a relatively high frequency.

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 the sites listed above.
Surface Water Erosion Potential Information	Run-on to site occurs from stormwater. Runoff from site may infiltrate the surface and subsurface media and move as sheet flow or through small drainage channels into Cañon de Valle.

Part B—Site Visit Documentation

Site ID	14-001(a,b,c,d,e), 14-003, and C-14-001
Date of Site Visit	10/21/2011
Site Visit Conducted by	John Branch

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none) =** medium **Relative wetland cover (high, medium, low, none) =** none **Relative structures/asphalt, etc. cover (high, medium, low, none) =** medium
Field notes on the FIMAD vegetation class to assist in ground-truthing the Arcview information	The majority of the locations are located on the mesa top just south of R-Site Road. Vegetation from the ponderosa pine zone and piñon/juniper zone is established throughout the locations; there are also limited amounts of secondary successional grass and shrub species in the areas resulting from disturbances associated with the Q-site firing areas and erosion.
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.	The area in and around the sites may provide an ideal foraging habitat for the Mexican spotted owl and the peregrine falcon. The area in and around the sites may also provide a suitable nesting and mating habitat for the two T&E species present in the area.
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. The sites contain terrestrial biota such as reptiles, mammals, insects, birds, and plants. The quality of habitat at the sites is sustainable for native plant and animal species present in the area.

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).**	The areas on the mesa top have minimal potential for erosion because of their physical geographical location and the amount of vegetation located within the site. The terminal point of the surface water is the bottom of Cañon de Valle.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	The potential for surface water off-site transport pathways is very minimal at the sites because of their physical geographical location and the amount of vegetation located within the site. Groundwater is located several hundred feet below the surface.
Interim action needed to limit off-site transport? **(yes/no/uncertain)** **Provide explanation/ recommendation to project lead for IA SMDP.**	No. The contaminants for these areas are at low levels and the erosion potential for the area is very low.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities, review historical aerial photos where appropriate.)**	The sites located on the mesa top have a moderate amount of physical disturbances present. The area is moderately developed, containing roads, buildings, fences, and firing site–related structures.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	No. The only obvious ecological effects are the result of the minimal development in the area.
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 area remains in use and effects do not warrant any action.

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.)**	Yes. The nature and extent of potential contamination has been defined.
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 extent of contamination has been defined.

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 are not frequently detected in the subsurface and are at low concentrations.

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 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 active 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 several hundred feet below ground surface.

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: 1

Terrestrial Animals: 1

Provide explanation: Volatile organic compounds are detected infrequently and are at low concentrations.

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 percentage of 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 (COPCs) 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: COPCs in surface and subsurface 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 at these sites.

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: 2

Terrestrial Animals: 2

Provide explanation: Gamma-emitting radionuclides were detected infrequently and at low concentrations.

Question N:

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 is no aquatic habitat present.

Question O:

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 is no aquatic habitat present.

Question P:

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 is no aquatic habitat present.

Question Q:

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 is no aquatic habitat present.

Question R:

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 is no aquatic habitat present.

Question S:

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 is no aquatic habitat present.

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 is no aquatic habitat present.

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 is no aquatic habitat present.

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):

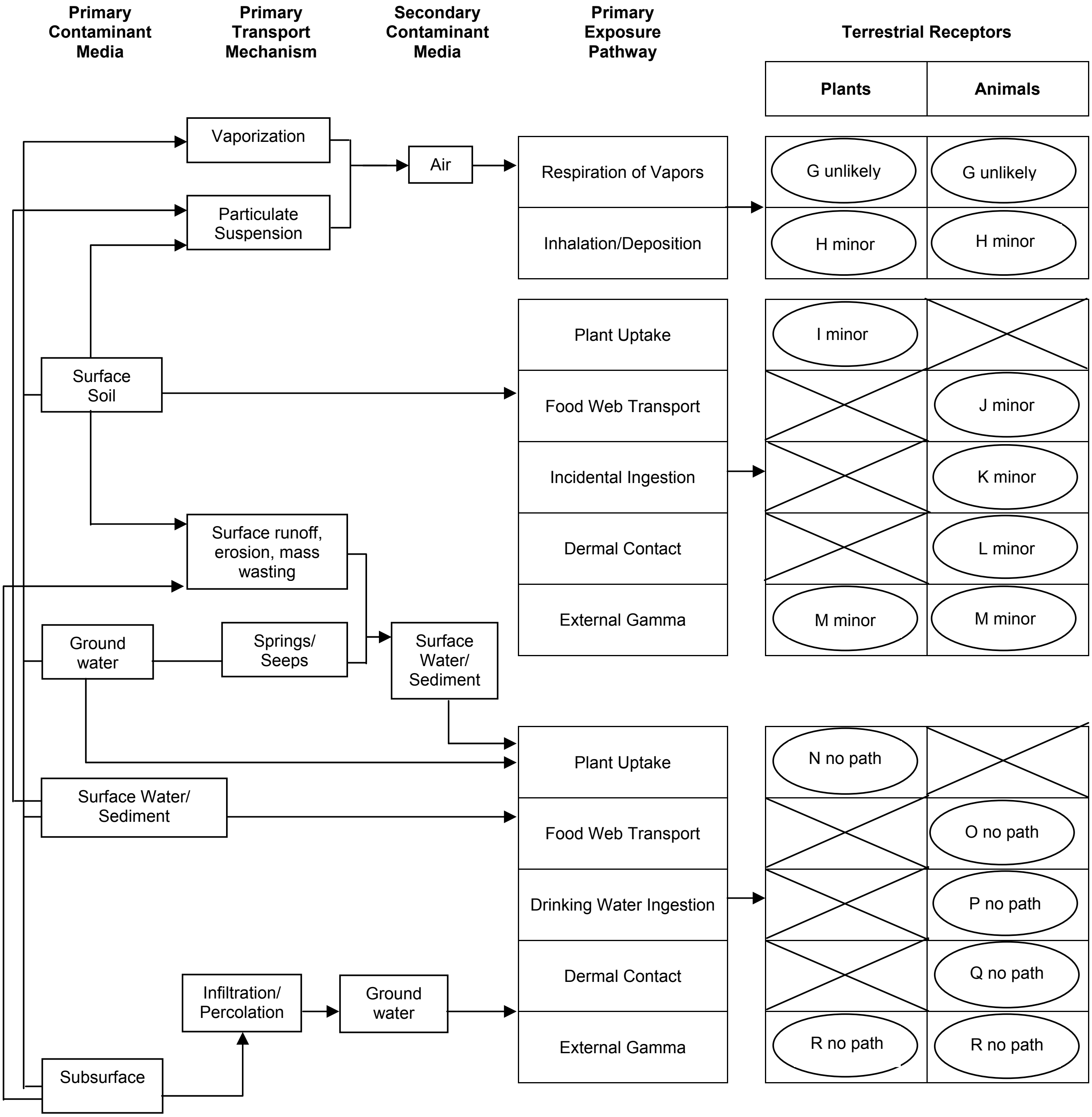
Aquatic Plants: 0

Aquatic Animals: 0

Provide explanation: There is no aquatic habitat present.

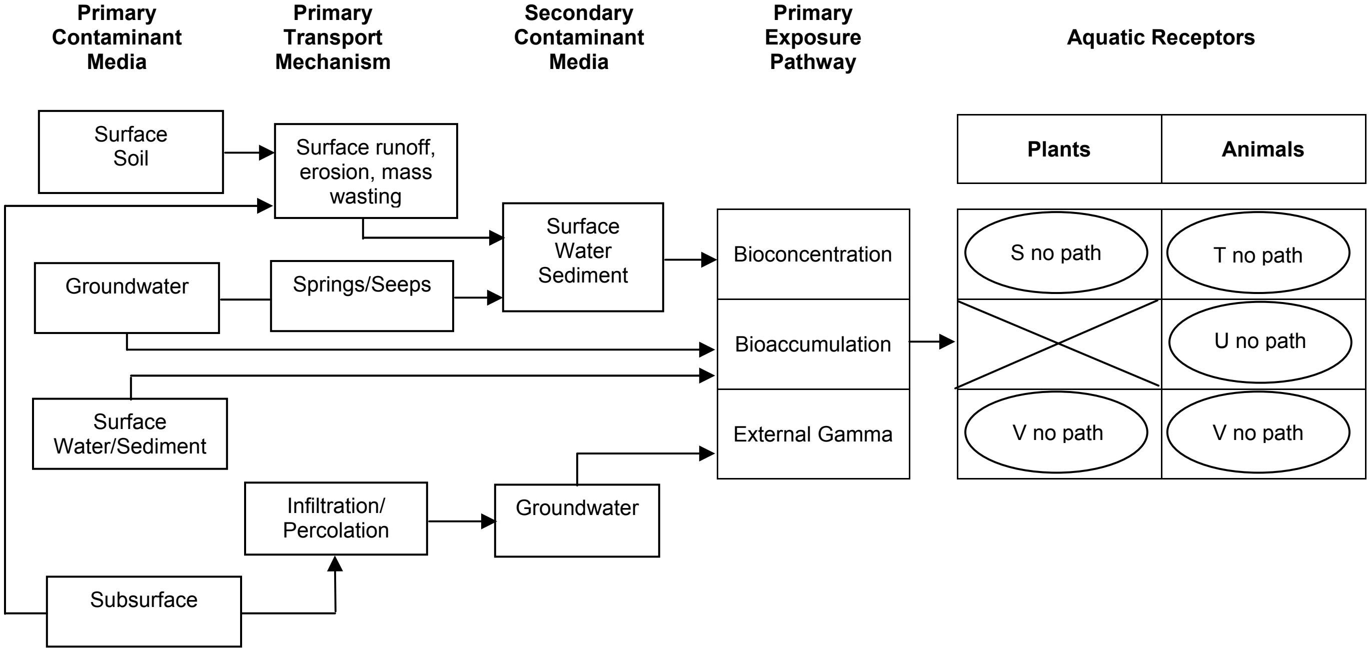
NOTE:
Letters in circles refer to questions on the Scoping Checklist

Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model



NOTE:
Letters in circles refer to questions on the Scoping Checklist

Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model



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, Inc.
Phone number: 505-662-1822
Date Completed: 12/15/2011

Verification by a member of Environmental Programs Ecological Risk Task Team (provide name, organization, and phone number):

Name (printed): Richard J. Mirenda
Name (signature): Richard J. Mirenda
Organization: Los Alamos National Laboratory
Phone number: 505-665-6953