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John Kieling, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Investigation Report for the Former Los Alamos Inn Property Sites within the Upper Los Alamos Canyon Aggregate Area

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Investigation Report for the Former Los Alamos Inn Property Sites within the Upper Los Alamos Canyon Aggregate Area.

As previously discussed in our meeting on August 2, 2016, and the site visit on August 11, 2016, this investigation report for the sites within or intersecting with the former Los Alamos Inn property is being submitted separate from, and in advance of, the Phase II investigation report for the Upper Los Alamos Canyon Aggregate Area. To facilitate the completion of corrective actions for these sites, a request for modification of Los Alamos National Laboratory's (the Laboratory's) Hazardous Waste Facility Permit was submitted to the New Mexico Environment Department (NMED) on October 27, 2016, and approved by NMED on November 9, 2016.

The former Los Alamos Inn property specific investigation was completed, and this report was prepared in response to requests by the private property owner and Los Alamos County to document the absence of site contamination requiring corrective actions and to resolve potential land use restrictions to facilitate the sale and development of the property. The sites presented in this report are located on, and surrounded by, both developed and undeveloped private and U.S. Department of Energy (DOE) properties. The subject private property itself is currently vacant and listed for sale.

The sampling data indicate the extent of contamination is defined or further sampling for extent is not warranted for all sites presented in this report, and no potential unacceptable risks or doses exist from chemicals of potential concern under the industrial, construction worker, and residential scenarios. The results of an ecological risk-screening assessment also indicate no potential risks to any ecological receptors at these sites. Based on the sampling data and assessment results, no further investigation or remediation activities are necessary for the sites discussed in this report.

Given the request of the property owner described above, DOE Environmental Management respectfully requests that NMED expedite its review and approval of this report. Following the approval of this report, the Laboratory will submit a request for certificates of completion without controls for all sites evaluated in this investigation report.

If you have any questions, please contact Todd Haagenstad at (505) 665-2936 (hth@lanl.gov) or Cheryl Rodriguez at (505) 665-5330 (cheryl.rodriguez@em.doe.gov).

Sincerely,

Bruce Robinson, Program Director
Environmental Remediation Program
Los Alamos National Laboratory

Sincerely,

David S. Rhodes, Director
Office of Quality and Regulatory Compliance
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BR/DR/TH:sm

Enclosures: Two hard copies with electronic files – Investigation Report for the Former Los Alamos Inn Property Sites within the Upper Los Alamos Canyon Aggregate Area (EP2016-0147)

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Investigation Report for the Former Los Alamos Inn Property Sites within the Upper Los Alamos Canyon Aggregate Area

Prepared by the Associate Directorate for Environmental Management

Los Alamos National Laboratory, operated by Los Alamos National Security, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC52-06NA253 and under DOE Office of Environmental Management Contract No. DE-EM0003528, has prepared this document pursuant to the Compliance Order on Consent, signed June 24, 2016. The Compliance Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

EP2016-0147

Investigation Report for the Former Los Alamos Inn Property Sites within the Upper Los Alamos Canyon Aggregate Area

January 2017

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EXECUTIVE SUMMARY

This investigation report evaluates the nature and extent of contamination and potential human health and ecological risks for nine solid waste management units (SWMUs) and one area of concern (AOC) in the Upper Los Alamos Canyon Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). The SWMUs and AOC addressed in this report are located in Technical Area 01 (TA-01) and are partially or wholly within the boundary of the private property located at 2201 Trinity Drive, Los Alamos, New Mexico, referred to as the former Los Alamos (LA) Inn property. These sites were initially investigated in 2008 and 2009, and the investigation results were documented in the revised Upper Los Alamos Canyon Aggregate Area investigation report, submitted to the New Mexico Environment Department (NMED) in February 2010. The approved investigation report concluded that additional sampling to define the extent of contamination was needed and remediation was recommended for one site. A Phase II investigation work plan was developed, approved by NMED, and implemented in 2012. Subsequent characterization and bounding sampling and remediation and sampling were conducted in 2012, 2013, 2015, and 2016 as part of the Upper Los Alamos Canyon Aggregate Area investigations.

After the investigation report and Phase II investigation work plan had been approved, NMED and the U.S. Department of Energy (DOE) entered into a framework agreement for the realignment of environmental priorities at the Laboratory. Under the framework agreement, NMED and DOE agreed to review characterization efforts undertaken to date pursuant to the Compliance Order on Consent to identify those sites where the nature and extent of contamination have been adequately characterized. Pursuant to the framework agreement, the Laboratory reviewed its data evaluation process with respect to U.S. Environmental Protection Agency (EPA) guidance and the framework agreement principles and concluded that the process could be revised to complete site characterization more efficiently, while providing full protection of human health and the environment. Specifically, the process for evaluating data to define the extent of contamination was revised to provide a greater emphasis on risk reduction, consistent with EPA guidance.

The decision-level investigation data for the sites were evaluated using the revised process. Based on the evaluation of investigation results using the revised process, the extent of contamination has been defined (or no further sampling for extent is warranted) at the 10 sites within the former LA Inn property. Three SWMUs within the former LA Inn property were also remediated. The risk-screening assessment results indicate no potential unacceptable risks or doses from chemicals of potential concern for the industrial, construction worker, and residential scenarios and no potential ecological risks to populations or threatened and endangered species at the 10 sites.

Based on the results of data evaluations presented in this investigation report, the Laboratory recommends the following:

- Corrective action complete without controls is recommended for 10 sites for which extent is defined and which pose no potential unacceptable human health risk or dose under any scenario and no unacceptable ecological risk.

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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 approximately 39 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas that are separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 ft to 7800 ft above mean sea level.

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

This investigation report addresses SWMUs and AOC in the Upper Los Alamos Canyon Aggregate Area that are within the former Los Alamos (LA) Inn property boundary. According to the Los Alamos County Assessor's Office, the specific legal description of the property is: Subdivision: Los Alamos Inn; Lot: 1-R-1, Los Alamos Inn Complex–Phase 5 Tract 1-R-1, being a consolidation of Tract 1-R, Complex Phase 3 and Tract 3-R S: 16 T: 19N R: 6E. The property location is 2201 Trinity Drive, Los Alamos, New Mexico.

The SWMUs and AOC within the property and evaluated in this report are potentially contaminated with both hazardous and radioactive components. Corrective actions at the Laboratory are subject to a Compliance Order on Consent (the Consent Order). The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 435.1, Radioactive Waste Management and DOE Order 458.1, Administrative Change 1, Radiation Protection of the Public and the Environment. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

1.1 General Site Information

The former LA Inn property contains all or parts of 16 SWMUs and AOCs located at former Technical Area 01 (TA-01) within the Upper Los Alamos Canyon Aggregate Area (Figure 1.1-1). Of these 16 sites, 6 have received certificates of completion or no further action designation: they include SWMUs 01-001(c), 01-001(t), and 01-006(d), and AOCs 01-004(b), 01-006(g), and 01-007(k). SWMUs 01-006(b), 01-006(c), 01-006(n), 01-007(a), and 01-007(b) were evaluated in their entirety in this report, while the portions of SWMUs 01-001(d), 01-001(s), 01-002(a)-00, and 01-006(h) and AOC 01-003(b) within the former LA Inn property were evaluated. The locations of former buildings at former TA-01 are presented in Figure 1.1-2.

To facilitate the completion of corrective actions on the former Los Alamos Inn property SWMUs and AOC, a request for modification of LANL's Hazardous Waste Facility Permit was submitted to NMED on October 27, 2016 (LANL 2016, 601921). The requested permit modification split the SWMUs and AOC located on former LA Inn property and other property into separate SWMUs and AOCs based on property ownership. The permit modification was approved by NMED on November 9, 2016, and allows the

Laboratory to expedite the requests for certificates of completion for the newly designated SWMUs and AOC once corrective actions are completed (NMED 2016, 601988). The five newly designated sites within the former LA Inn property are SWMUs 01-001(d1), 01-001(s1), 01-002(a1)-00, and 01-006(h1) and AOC 01-003(b1). The portions of these sites outside the former Los Alamos Inn property are now designated as SWMUs 01-001(d2), 01-001(d3), 01-001(s2), 01-002(a2)-00, 01-006(h2), and 01-006(h3) and AOC 01-003(b2) (NMED 2016, 601988) and will be evaluated as part of the Upper Los Alamos Canyon Aggregate Area. Table 1.1-1 lists the sites within the former LA Inn property and provides a brief description, investigation activities, and status for each.

1.2 Purpose of Investigation

The SWMUs and AOC in the Upper Los Alamos Canyon Aggregate Area and within the former LA Inn property boundary were evaluated because these sites are potentially contaminated with hazardous chemicals and/or radionuclides, and final assessments of site contamination, associated risks, and recommendations for additional corrective actions are incomplete. For each site, the objectives of the investigation were to (1) establish the nature and extent of contamination; (2) determine whether current site conditions pose a potential unacceptable risk to human health or the environment; and (3) assess whether any additional sampling and/or corrective actions are required.

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

1.3 Document Organization

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

Appendixes include acronyms, a metric conversion table, and definitions of the data qualifiers used in this report (Appendix A); field methods (Appendix B); investigation-derived waste (IDW) management (Appendix C); analytical program description and summaries of data quality (Appendix D); analytical suites and results and analytical reports (Appendix E); box plots and statistical results (Appendix F); risk-screening assessments (Appendix G); and site photographs (Appendix H).

2.0 SITE CONDITIONS

2.1 Surface Conditions

Former TA-01 is a residential, commercial, and industrial-use area made up of private, Los Alamos County, and DOE lands. It includes both mesa-top and canyon-slope areas.

The TA-01 sites in this investigation are located on or next to county, commercial, and private property as well as DOE property. Many sites are paved with either concrete or asphalt, are under buildings, or are next to private residences. Some sites are located on both the mesa-top and south-facing slope in Los Alamos Canyon, while others are entirely on the mesa-top (Plate 1).

2.1.1 Soil

Soil on the Pajarito Plateau was initially mapped and described by Nyhan et al. (Nyhan et al. 1978, 005702). The soil on the slopes between the mesa tops and canyon floors was mapped as mostly steep rock outcrops consisting of approximately 90% bedrock outcrop and patches of shallow, weakly developed colluvial soil. South-facing canyon walls are generally 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).

Much of the natural mesa-top soil in former TA-01 has been replaced by fill material during various remediation, construction, and landscaping activities (LANL 2006, 091915; LANL 2006, 091916). The canyon slope consists mainly of bare tuff with only small, isolated pockets of soil and sediment. Media encountered during surface and near-surface sampling at former TA-01 included soil, fill, sediment, and tuff.

Vegetation at mesa-top sites consists of nonnative grasses, trees, and shrubs planted by property owners. Vegetation on the canyon slope and in the canyon bottom consists of widely scattered native trees and shrubs, including ponderosa pine, piñon pine, juniper, and an understory of native grasses.

The soil on the mesa top in the Upper Los Alamos Canyon Aggregate Area generally belongs to either the Carjo or Pogna soil series (Nyhan et al. 1978, 005702). Carjo soil consists of moderately deep, well-drained, and moderately developed soil. Soil textures can range from clay loams to fine, sandy loams. The Pogna soil consists of shallow, well-drained, and weakly developed soil. The soil texture of Pogna soil is usually fine sandy loam. The parent material of the soil may range from Bandelier Tuff to sequences of alluvium/colluvium interstratified with moderately developed to well-developed buried soil.

A majority of the natural mesa-top surface soil has been altered by anthropogenic activities. Excavation and fill, paved roads, parking lots, parks, landscaped yards, and buildings have changed the natural soil landscape considerably.

2.1.2 Surface Water

The Rio Grande is the primary river in north-central New Mexico. All surface-water drainage and groundwater discharge from the plateau ultimately arrive at the Rio Grande. 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.

Perennial flow occurs in the upper reaches of Los Alamos Canyon (west of the Los Alamos Reservoir). Typically, the overflow of water from the reservoir during spring snowmelt results in nearly continuous surface-water flow between the western Laboratory boundary and TA-02 for several weeks to several

months each year (LANL 1995, 050290). Surface water in Los Alamos Canyon rarely flows across the entire length of the Laboratory. Most often, surface waters are depleted by infiltration into canyon alluvium, creating saturated zones of seasonally variable extent (LANL 1995, 050290).

The mesa-top portion of former TA-01 is now a commercially developed area. No natural surface water is present at the mesa-top sites. Ashley Pond is a closed water body maintained as a Los Alamos County beautification project. During summer thunderstorms and spring snowmelt, runoff flows from the mesa top down the hillsides and into the ephemeral stream in Los Alamos Canyon. Surface runoff from the former TA-01 mesa top enters Los Alamos Canyon by way of several drainages. Laboratory studies have indicated that relatively little surface water has infiltrated the underlying tuff because of low infiltration and high evaporation rates (LANL 1992, 043454, pp. 3-6, 3-7).

No surface water sampling or other surface water investigations were included in the scope of this investigation.

2.1.3 Land Use

Currently, the mesa-top portion of the former LA Inn property is an industrially and commercially developed area. It is anticipated that the former LA Inn property will remain industrial and commercial but perhaps may include residential uses in the future.

Property transfer of land from DOE to Los Alamos County and private parties began in 1976. Since then, former TA-01 has been regraded and recontoured and has undergone significant coverage from backfill and construction. These activities have greatly altered the landscape, and few exposed areas of native soil or tuff are evident on the mesa top. No remnant evidence of former TA-01 Laboratory structures exists in the area. The Los Alamos Community Center (formerly the Laboratory Communication Center), located east of Ashley Pond, is the only building remaining from TA-01.

2.2 Subsurface Conditions

The stratigraphy of the Upper Los Alamos Canyon Aggregate Area is described in more detail in the approved work plan (LANL 2006, 091916; NMED 2006, 095460).

Subsurface structures encountered included numerous utilities, which had been marked out before sampling began. The investigation of almost all mesa-top sites was complicated by the high density of utilities (electrical, gas, sewer, water, and communication) supplying the businesses and residences. The known utility lines are shown on the site maps showing the sampling locations for each site.

2.2.1 Stratigraphic Units

The stratigraphy of the Upper Los Alamos Canyon Aggregate Area is summarized in this section. Additional information on the geologic setting of the area and information on the Pajarito Plateau can be found in the hydrogeologic conceptual site model for the Laboratory (Collins et al. 2005, 092028).

The bedrock at or near the surface of the mesa top is the Bandelier Tuff. There are approximately 1250 ft of volcanic and sedimentary materials between any potential contaminant-bearing units at the mesa surface and the regional aquifer. The stratigraphy of the upper rock units (tuff) can be observed directly in excellent exposures of outcrops on canyon walls and slopes to the south of TA-01. The descriptions begin with the oldest (deepest) outcrops and proceed to the youngest (topmost). The stratigraphic units encountered during investigation of the Upper Los Alamos Canyon Aggregate Area are described briefly in the following sections and are shown in Figure 2.2-1.

The Bandelier Tuff

The Bandelier Tuff consists of the Otowi and Tshirege members, which are stratigraphically separated in many places by the tephra and volcaniclastic sediment of the Cerro Toledo interval. The Bandelier Tuff was emplaced during cataclysmic eruptions of the Valles Caldera between 1.61 and 1.22 Ma. The tuff is composed of pumice, minor rock fragments, and crystals supported in an ashy matrix. It is a prominent cliff-forming unit because of its generally strong consolidation (Broxton and Reneau 1995, 049726).

Otowi Member. Griggs (1964, 092516); Smith, and Bailey (1966, 021584); Bailey et al. (1969, 021498); and Smith et al. (1970, 009752) describe the nature and extent of 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 Guaje Pumice Bed occurs at the base of the Otowi Member, making a significant and extensive marker horizon. The Guaje Pumice Bed (Bailey et al. 1969, 021498; Self et al. 1986, 021579) contains well-sorted pumice fragments whose mean size varies between 0.8 and 1.6 in. Its thickness averages approximately 28 ft below most of the plateau, with local areas of thickening and thinning. Its distinctive white color and texture make it easily identifiable in borehole cuttings and core, and it is an important marker bed for the base of the Bandelier Tuff.

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). Outcrops of the Cerro Toledo interval generally occur wherever the top of the Otowi Member appears in Los Alamos Canyon and in canyons to the north. 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 varies, 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 that 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, they 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).

Tshirege Member. The Tshirege Member is the upper member of the Bandelier Tuff and is the most widely exposed bedrock unit of the Pajarito Plateau (Griggs 1964, 008795; 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 Ma (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 chemical cooling unit whose physical properties vary vertically and laterally. The consolidation in this member is largely from compaction and

welding at high temperatures after the tuff was emplaced. Its light brown, orange-brown, purplish, and white cliffs have numerous, mostly vertical fractures that may extend from several feet up to several tens of feet. The Tshirege Member includes thin but distinctive layers of bedded, sand-sized particles called surge deposits that demark separate flow units within the tuff. The Tshirege Member is generally over 200 ft thick.

The Tshirege Member differs from the Otowi Member most notably in its generally greater degree of welding and compaction. Time breaks between the successive emplacement of flow units caused the tuff to cool as several distinct cooling units. For this reason, the Tshirege Member consists of at least four cooling subunits that display variable physical properties vertically and horizontally (Smith and Bailey 1966, 021584; Crowe et al. 1978, 005720; Broxton et al. 1995, 050121). The welding and crystallization variability in the Tshirege Member produces 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.

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

Subunit Qbt 1g is the lowermost tuff subunit of the Tshirege Member. It consists of porous, nonwelded, and poorly sorted ash-flow tuffs. 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 tuffs. A thin (4 to 10 in.) pumice-poor surge deposit commonly occurs at the base of this unit.

Subunit Qbt 1v forms alternating clifflike and sloping outcrops composed of porous, nonwelded, crystallized tuffs. The base of this unit is a thin, horizontal zone of preferential weathering that marks the abrupt transition from glassy tuffs below (in Unit Qbt 1g) to the crystallized tuffs above. This feature forms a widespread marker horizon (locally termed the vapor-phase notch) throughout the Pajarito Plateau, which is readily visible in canyon walls in parts of Los Alamos Canyon. 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 tuffs of Qbt 1v are commonly nonwelded (pumices and shards retain their initial equant shapes) and have an open, porous structure.

Subunit Qbt 2 forms a distinctive, medium-brown, vertical cliff that stands out in marked contrast to the slope-forming, lighter-colored tuffs 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.

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

2.2.2 Hydrogeology

The hydrogeology of the Pajarito Plateau is generally separable in terms of mesas and canyons forming the plateau. Mesas are generally devoid of water, both on the surface and within the rock forming the mesa. Canyons range from wet to relatively dry; the wettest canyons contain continuous streams and contain perennial groundwater in the canyon-bottom alluvium. Dry canyons have only occasional 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 400 ft (30 and 122 m). The regional aquifer is found at depths of about 600 to 1200 ft (180 and 360 m).

The hydrogeologic conceptual model for the Laboratory (LANL 2016, 601506) 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 deeper into mesas, further inhibiting downward flow.

2.2.2.1 Groundwater

At mesa-top sites of the Upper Los Alamos Canyon Aggregate Area, the surface is separated from the regional aquifer by an unsaturated zone that is approximately 1000 to 1300 ft thick. Sampling locations near the bottom of Los Alamos Canyon are approximately 700 ft or more above the regional aquifer. Alluvial groundwater could be present in Los Alamos Canyon in the region of the Upper Los Alamos Canyon Aggregate Area. No groundwater sampling or other groundwater investigations were included in the scope of this investigation.

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 2016, 601506) details the implementation of extensive groundwater characterization across the Pajarito Plateau within an area potentially affected by past and present Laboratory operations.

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 sands, gravels, pebbles, cobbles, and boulders derived from the Tschicoma Formation and Bandelier Tuff. The alluvium in canyons on the plateau is comparatively finer grained, consisting of clays, silts, sands, and gravels derived from the Bandelier Tuff.

In contrast to the underlying volcanic tuff and sediment, alluvium is relatively permeable. Ephemeral runoff in some canyons infiltrates the alluvium until downward movement is impeded by the less permeable tuff and sediment, which results in the buildup of a shallow alluvial groundwater body. Depletion by evapotranspiration and movement into the underlying rocks 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.

Two saturated zones are known to exist in the alluvium of Los Alamos Canyon. The first is in the upper part of Los Alamos Canyon and extends eastward from the Los Alamos Reservoir to the vicinity of observation well LAO-4.5, west of NM 4. The second is in the lower part of Los Alamos Canyon and extends from Basalt Spring to the Rio Grande. In middle and upper Los Alamos Canyon, the saturated thickness in the alluvium varies seasonally from a few feet in the winter months to 25 ft in the spring and summer months when recharge is the greatest (LANL 1994, 052951.71).

Perched-Intermediate Water

Two perched-intermediate zones (between the alluvial water and the regional aquifer), one beneath the other, have been encountered in Los Alamos Canyon between TA-02 and the confluence with DP Canyon. The upper perched-intermediate zone occurs within the Guaje Pumice Bed. This zone was encountered in boreholes LADP-3 (at 325 ft) and LAOI(A)-1.1 (at 295 ft) (Broxton et al. 1995, 050119; Longmire et al. 1996, 054168). The saturated thickness of this zone decreases from west to east, ranging between 22 ft at LAOI(A)-1.1 and 5 ft at LADP-3. A deeper perched-intermediate zone was encountered in LAOI(A)-1.1 in the Puye Formation at approximately 317 ft. However, no deeper perched-intermediate zone was found at LADP-3 in the approximately 19 ft of the Puye Formation that was penetrated. Although no perched aquifers are known to exist in the immediate vicinity of TA-01, a perched aquifer has been located at an intermediate depth (325 ft below Los Alamos Canyon) in drill hole LADP-3 at TA-21, approximately 2 mi east of the site (Broxton et al. 1995, 050119; Longmire et al. 1996, 054168).

Regional Aquifer

The regional aquifer of the Los Alamos area is the only aquifer capable of a large-scale municipal water supply (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 depth to groundwater below the mesa tops range between about 1200 ft along the western margin of the plateau and about 600 ft at the eastern margin. The location of wells and generalized water-level contours on top of the regional aquifer are described in the annual Interim Facility-Wide Groundwater Monitoring Plan (LANL 2016, 601506). The regional aquifer is typically separated from the alluvial groundwater and perched-intermediate zone groundwater by 350 to 620 ft of tuff, basalt, and sediments (LANL 1993, 023249).

The regional aquifer beneath East Mesa is at an elevation of approximately 6000 ft in the sediment of the Puye and Totavi Formations. At mesa-top sites of the Upper Los Alamos Canyon Aggregate Area, the surface is separated from the regional aquifer by an unsaturated zone that is 1000 to 1300 ft thick.

The direction of groundwater flow in the regional aquifer is to the east-southeast toward the Rio Grande. The velocity of groundwater flow ranges from about 20 to 250 ft/yr (LANL 1998, 058841, p. 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).

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 relatively rapidly through fractures if nearly 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 in the tuff matrix.

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

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

3.0 SCOPE OF ACTIVITIES

The following sections describe the scope of activities conducted during the investigation and remediation of the former LA Inn property sites. Appendix B describes the methods and procedures used in completing the scope.

3.1 Geodetic Survey

Phase I, II, and 2013 geodetic surveys were conducted, in accordance with Standard Operating Procedure (SOP) 5028, Coordinating and Evaluating Geodetic Surveys. A Trimble global positioning system (GPS) 5700 or a Trimble R8 global navigation satellite system (GNSS) were used to mark the coordinates of the sampling locations. Horizontal accuracy of the on-site control points is within 0.1 ft. During sampling, if the planned location was offset because of surface or subsurface obstruction, the relocated sampling location was surveyed. The surveyed coordinates for sampling locations are presented in Table 3.1-1.

Geodetic surveys in 2016 were conducted with a Javad Triumph-1 GNSS coupled with a Juniper Allegro2 Controller. This system was used to stake sampling locations, locations to be left unexcavated (i.e., uncontaminated locations), locations excavated, excavation boundaries, and pre- and post-excavation topographic elevations. If a sampling location needed to be offset because of surface or subsurface obstructions, the relocated point was resurveyed. The surveyed coordinates for sampling locations are presented in Table 3.1-1.

3.2 Geophysical Survey

No geophysical surveys were performed during the investigation.

3.3 Excavations

SWMU 01-006(b)

During the Phase II investigation, soil and tuff containing elevated activities of plutonium-239/240 were excavated until activities were below the residential screening action level (SAL). Soil removal occurred at locations 00-604224, 00-604225, and 00-604237 to depths of 1.0 ft below ground surface (bgs) at location 00-604224, 4.0 ft bgs at location 00-604225, and 6.0 ft bgs at location 00-604237. Confirmation samples were collected following soil removal and analyzed for isotopic plutonium.

In 2016, additional soil and tuff containing elevated plutonium-239/240 activities were excavated so activities were below the residential SAL from 0.0 to 10.0 ft bgs. Approximately 50.6 yd^3 of plutonium-239/240–contaminated soil was removed from two areas. The larger, northern excavation, which included sampling locations 01-12, 01-13, 01-14, 01-208, and 00-604224, had final dimensions of 13 ft wide × 13 ft long × 10 ft deep. The excavation was bounded by locations 01-201, 01-203, 01-205, and 01-207. The smaller excavation, which contained location 01-204, had final dimensions of 2.5 ft × 4.5 ft × 5 ft. Confirmation samples or samples previously collected were used to verify the lateral and vertical extent of the excavations. In addition, topography, terrain, and vegetation often restricted access to areas on the canyon slope and determined the areas remediated. Further excavation laterally and downgradient of location 01-204 was restricted because of terrain and obstacles, such as trees and boulders, and the steep topography. The excavation was bounded to the north by location 01-254. Approximately 47.4 yd^3 of material was excavated from the larger, northern area, and approximately 3.2 yd^3 of material was excavated from the area at and around location 01-204.

A CAT 303.5E CR mini excavator was used to excavate the smaller area and initially used to excavate the larger, northern excavation. However, because of the requirement to reach the depth of 10 ft and the position of the excavator, a Kobelco ED160 excavator with extended reach was used to complete the excavation to the depth of 10.0 ft. Deeper excavation at the larger, northern area was restricted by the capability of the excavator as well as limited safe access to the site. The excavation area was on a steep canyon slope and required construction of an earthen pad to support the excavator. The 10.0-ft excavation depth was at the limit of the extended reach of the excavator and deeper excavation was not technically feasible or safe. Excavated material was placed in 1.77-yd^3 soft-sided IP-1 bags fitted with 10-mil inner plastic liners and supported in a loading frame. The filled waste bags were approved for closure by the radiological control technician (RCT), the inner liner was sealed per manufacturer's instructions, the bags were zipped shut, and the outside of bags was screened and released by an RCT. The bags were transferred to a flatbed for transit off-site.

Restoration at SWMU 01-006(b) was completed using clean fill compacted in 6-in. lifts up to 6 in. belowgrade. Topsoil was deposited above the fill after compaction testing was complete and then fertilizer, seed, and erosion-control matting were applied. Fertilizer and seed were applied in accordance with ADEP-SPEC-C-32-9219, Environmental Programs Specification for Seeding, and matting was installed in accordance with the March 2011 "Los Alamos National Laboratory Storm Water BMP [Best Management Practice] Manual" and the product's specifications.

SWMU 01-007(a)

In 2016, soil and tuff containing elevated activities of plutonium-239/240 were excavated so activities were below the residential SAL from 0.0 to 10.0 ft bgs. Approximately 31.75 yd^3 of plutonium-239/240 contaminated soil was removed from three areas using a CAT 303.5E CR mini excavator. The mini excavator removed material from each excavation and placed it in 1-yd^3 standalone bags set within the 1.77-yd^3 loading frame for ease of transport to the flatbed truck. An RCT was present during all excavations, screened each bag before sealing, and those sealing the bags wore Tyvek boot covers and

nitrile gloves. After the bags were sealed, an RCT screened and released the outside of the bags before they were transferred to a flatbed trailer for transit off-site.

The area at and around location 00-604231 was excavated to 10 ft × 10 ft × 1 ft; at and around location 01-227 was excavated to 2 ft 3 in. × 2 ft 3 in. × 1 ft; and locations 00-604233 and 01-231 were excavated to 31 ft × 26 ft × 1 ft. The excavation at and around location 00-604231 was bounded by locations 01-221, 01-222, 01-228, and 01-229. Location 00-604233 was on a boulder without a clear indication of a sampled location within 1.0 ft. Thus, uncontaminated locations 01-226, 01-230, and 01-225 were used as south-, west-, and north-bounding locations for the larger excavation and the eastern bound of the excavation was 1.0 ft east of location 01-231. Confirmation samples or samples previously collected were used to verify the lateral and vertical extent of the excavations. In addition, topography, terrain, and vegetation often restricted access to areas on the canyon slope and determined the areas remediated. Further excavation to the east of location 01-231 was restricted because of terrain and obstacles such as trees and boulders. Approximately 3.75 yd^3 of material was excavated from location 00-603231; approximately 0.25 yd^3 was excavated from at and around location 01-227; and approximately 27.75 yd^3 was excavated from the area around locations 00-604233 and 01-231.

Restoration at 00-604231 was completed using 1.5 yd^3 of clean fill compacted in one 6-in. lift, and 1.5 yd^3 of topsoil was deposited to bring the excavation level to grade. Topsoil was raked, seeded, and fertilized before erosion-control matting was installed. Restoration associated with locations 01-227, 00-604233, and 01-231 was accomplished using only local, native materials (e.g., cobbles, brush, and logs).

SWMU 01-007(b)

In 2016, soil and tuff containing elevated activities of plutonium-239/240 were excavated so activities were below the residential SAL from 0.0 to 10.0 ft bgs. Approximately 7 yd^3 of plutonium-239/240–contaminated soil was removed from four areas at SWMU 01-007(b). The excavation at the cliff base and associated locations 01-233 and 00-603787 was 19 ft × 12 ft × 1 ft; at and around location 00-603790 was excavated to 3.5 ft × 3.5 ft × 1 ft; at and around location 00-603785 was excavated to 3 ft × 3 ft × 1 ft; and at and around location 01-235 was excavated to 3 ft × 5.5 ft × 6 ft. Confirmation samples or samples previously collected were used to verify the lateral and vertical extent of the excavations. In addition, topography, terrain, and vegetation often restricted access to areas on the canyon slope and determined the areas remediated. A CAT 303.5E CR mini excavator was used to excavate at locations 00-603790 and 01-235. Hand tools (shovels and spades) were used at locations 01-233, 00-603787, and 00-603785. Excavated material was placed in 1-yd^3 standalone bags, approved for sealing by the RCT, sealed, and the outside of bag screened and released by RCT. The bags were transferred to a flatbed for transit off-site.

Restoration at three of four locations was completed using only local, native materials (e.g., cobbles, brush, and logs) for all 1-ft-deep excavations. At location 01-235, 3.25 yd^3 of clean fill was compacted in 6-in. lifts up to 6 in. belowgrade, and local dirt was used to bring the excavated area to grade without changing the slope of the overall area or leaving a dip in the road.

3.4 Collection of Soil, Fill, Tuff, and Sediment Samples

Phase I and II samples were collected according to the approved work plans (LANL 2006, 091916; NMED 2006, 095460; LANL 2010, 110860; NMED 2011, 111674). Subsequent samples were collected based on the Phase I and Phase II sampling results. The sample collection tools (split-spoon, auger bucket, core barrel, hand auger, bowl, and scoop) were decontaminated immediately before each sample was collected in accordance with the most current version of EP-ERSS-SOP-5061, Field Decontamination of Equipment or TPMC-SOP-7007, Field Decontamination of Equipment (equivalent to EP-ERSS-SOP-5061).

Surface and shallow subsurface samples were collected using a stainless-steel hand auger in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler. A stainless-steel scoop and bowl were used to transfer samples to sterile sample collection jars or bags for transport to the Sample Management Office (SMO). Samples were shipped from the SMO to off-site contract analytical laboratories for analysis.

In areas where the hand auger met refusal or sampling depths were too great, subsurface samples were collected using a hollow-stem auger drill rig with a stainless-steel core barrel to retrieve material from the advancing hole in accordance with SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials. In 2013, at locations where hand auger refusal was encountered, a truck-mounted mechanical auger or mobile mechanical auger was used to reach sample collection depth. A hand auger was then used to collect samples in accordance with the most current version of SOP-06.10. The material was transferred to a stainless-steel bowl and broken into smaller pieces using a stainless-steel spoon, if necessary, to transfer the material to sterile sample collection jars or bags for transport to the SMO. Samples for volatile organic compound (VOC) analysis were collected before any other samples and before the core material was broken into smaller pieces for containerization. Containers with samples for VOC analysis were filled as completely as possible to minimize headspace and potential VOC loss.

In 2016, samples were collected using either a hand auger, chisel, or hollow-stem auger rig in accordance with TPMC SOP-20069, equivalent to ER-SOP-20069, Soil, Tuff, and Sediment Sampling (this SOP incorporates all previous sampling method SOPs). At AOC 01-003(b1) and SWMU 01-007(b), a stainless-steel hand auger was used to collect material in approximately 6-in. increments. A stainless-steel bowl and scoop were used to capture the sample from the hand auger, then transferred to sterile sample collection jars for transport to the SMO. At SWMUs 01-001(d1), 01-001(s1), 01-006(h1), and 01-007(a), subsurface samples were collected using a hollow-stem Gefco Strata Star 10 auger rig. The sample material was transferred from the split-spoon to a stainless-steel bowl, then transferred to sterile sample collection jars for transport to the SMO. Samples for VOC analysis were collected before any other samples and before the core material was broken into smaller pieces for containerization. Containers with samples for VOC analysis were filled as completely as possible to minimize headspace and potential VOC loss.

Details of the methods used for collecting, packaging, documenting, and transporting samples are provided in Appendix B.

Quality assurance/quality control samples included field duplicate samples collected in accordance with SOP-5059, Field Quality Control Samples, or TPMC SOP-20235, adapted from ER-SOP-20235, Sample Containers, Preservation, and Field Quality Control. Field duplicate samples were collected at a minimum rate of 1 per 10 investigation samples or 1 per day. Rinsate blanks were collected at a minimum rate of 1 per 10 investigation samples or at a frequency of at least 1 per day for samples collected in 2016 to confirm decontamination of sampling equipment. Field trip blank samples were collected in conjunction with investigation samples to be analyzed for VOCs at a minimum rate of 1 per day when VOC samples were being collected.

3.5 Exploratory Drilling

No exploratory drilling was conducted at the sites. All drilling was performed for the purpose of collecting investigation samples.

3.6 Field Screening of Samples

Samples were screened in the field for organic vapors and for radioactivity. Samples collected by hand methods (hand auger or spade and scoop) were screened in the collection bowl or sample container after the sample was collected. Cores collected by split-spoon core barrel were screened immediately after the core barrel was opened. Screening results were recorded on the corresponding sample collection log (SCL)/chain-of-custody (COC) forms at the time of sample collection.

Each sample was field-screened for organic vapors using a MiniRae 2000 or Ion Science PhoCheck 2000+ photoionization detector (PID) with 11.7-electronvolt lamp. The PID was subject to bench calibration yearly by the vendor and field calibrated daily by field personnel using a standard source of 100 ppm isobutylene. All daily calibration procedures for the PID met the manufacturer's specifications for standard reference gas calibration and the requirements of SOP-5006, Control of Measuring and Test Equipment. Results of PID screening for each sample are presented in Table 3.6-1.

Each sample was also field screened for gross-alpha and beta/gamma radiation using an Eberline E-600 with an SHP-380AB alpha/beta scintillation detector or a ThermoFisher Model SHP-380 with Eberline Model E600 Geiger Counter held within 1 in. of the sample. Radiological field screening of all samples was conducted by Laboratory RCTs using appropriately calibrated instruments. Calibration of radiological instruments was performed and documented by the RCTs. All calibrations performed met the manufacturer's specifications, the requirements of SOP-5006, and the applicable radiation detection instrument manual. Field radiation-screening results are presented in Table 3.6-1.

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. No changes to sampling or other activities occurred as a result of field-screening results.

3.7 Chemical and Radiological Sample Analyses

All samples were shipped by the SMO to contract analytical laboratories for the requested analyses. The Phase I samples were analyzed for all or a subset of the following: target analyte list (TAL) metals, total cyanide, nitrate, perchlorate, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), VOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium. Phase II and subsequent samples were collected to define extent, characterize or bound areas of elevated concentrations or activities, or to confirm whether sites or areas had been sufficiently remediated. As a result, these latter samples were analyzed for specific analytes (e.g., isotopic plutonium).

3.8 Equipment Decontamination

All sampling equipment was decontaminated before each sample was collected to avoid cross-contamination of samples. Equipment was also decontaminated before moving to another sampling location. Residual material adhering to the equipment was removed using dry decontamination methods, in accordance with SOP-5061, Field Decontamination of Equipment, and EP-ERSS-SOP-5059, Field Quality Control Samples, or TPMC-SOP-7007, Field Decontamination of Equipment (equivalent to EP-ERSS-SOP-5061) and TPMC-SOP-20235, Sample Containers, Preservation, and Field Quality Control (equivalent to ER-SOP-20235). All parts of the equipment were thoroughly cleaned with Fantastik and clean paper towels. To verify the effectiveness of equipment decontamination, equipment rinsate blanks were collected from the sampling equipment at a frequency of 1 rinsate blank for every 10 investigation samples. At sites where a drill rig was used, the drill rig was surveyed by RCTs and certified for release before it was moved from the site. The drill rig was also inspected before it was brought on-site and surveyed by RCTs.

3.9 Sample Documentation and Handling

Field personnel completed a SCL/COC form for each sample. Sample containers were sealed with signed COC seals and placed in coolers at approximately 4°C. Samples were preserved as required, handled and shipped in accordance with the most current versions of EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples, and EP-ERSS-SOP-5056, Sample Containers and Preservation or TPMC SOP-20236, Handling, Packaging, and Transporting Field Samples (equivalent to ER-SOP-20236, Handling, Packaging, and Transporting Field Samples) and TPMC SOP-20235, Sample Containers, Preservation, and Field Quality Control (equivalent to ER-SOP-20235). Samples were transported to the SMO in sealed coolers containing ice packs, and shipped from the SMO to the analytical laboratory. The SMO personnel reviewed and approved the SCL/COC forms before taking custody of the sample.

3.10 Storage and Disposal of IDW

The IDW generated as a result of field-investigation activities included drill cuttings; excavated material (soil, asphalt and concrete pavement removed to access the material below, cast iron pipe); used personal protective equipment (PPE); and miscellaneous materials used during dry decontamination of sampling equipment (e.g., paper towels and nitrile gloves). The IDW was characterized as specified in the approved waste characterization strategy form (WCSF). The IDW was managed in accordance with the TPMC-SOP-7016, Characterization and Management of Environmental Program Waste, equivalent to EP-DIR-SOP-10021, R1, Characterization and Management of Environmental Programs Waste. The management of IDW is described in Appendix C. All available waste documentation, including WCSFs, WCSF amendments, and waste profile forms, is provided in Appendix C.

4.0 REGULATORY CRITERIA

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

Human health risk-screening evaluations were conducted for the sites using NMED guidance (NMED 2015, 600915). Ecological risk-screening assessments were performed using Laboratory guidance (LANL 2015, 600982).

4.1 Current and Future Land Use

The specific screening levels used in the risk evaluation and corrective action decision process at a site depend on the current and reasonably foreseeable future land use. The current and reasonably foreseeable future land use for a site determines the receptors and exposure scenarios used to select screening and cleanup levels. The land uses within the former LA Inn property are currently industrial/commercial and are expected to remain so for the reasonably foreseeable future. However, residential use may also be a future land use for this area. The construction worker scenario is evaluated because underground utility lines are present near or within the boundaries of the sites, and maintenance or repair on these lines is a reasonable possibility in the foreseeable future.

4.2 Screening Levels

Human health risk-screening evaluations were conducted for the solid media at sites within the former LA Inn property. The human health screening assessments (Appendix G) 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 2015, 600915). Radionuclides were assessed using the Laboratory SALs (LANL 2015, 600929). When an NMED SSL was not available for a COPC, SSLs were obtained from the U.S. Environmental Protection Agency's (EPA's) May 2016 regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) (adjusted to a risk level of 1×10^{-5} for carcinogens). Surrogate SSLs were used for some COPCs based on structural similarity or breakdown products.

NMED guidance includes total chromium SSLs for the residential, industrial, and construction worker scenarios (NMED 2015, 600915). Because the toxicity of chromium strongly depends on its oxidation state, NMED and EPA also have SSLs for trivalent chromium and hexavalent chromium. For screening purposes, the NMED SSLs for total chromium are used for comparison unless there is a known or suspected source of hexavalent chromium at the SWMU/AOC or site conditions could alter the speciation of chromium in the environment. Total chromium screening levels are appropriate for low-level releases to soil from sources not associated with hexavalent chromium. However, NMED and EPA recommend collecting valence-specific data for chromium if chromium is likely to be an important contaminant at a site and when hexavalent chromium may exist (NMED 2015, 600915; http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

The SWMUs and AOC included in this investigation report are not known or suspected to be sources of hexavalent chromium. Samples from all sites were analyzed for total chromium and screened using the NMED total chromium SSLs. The sampling and analysis approach was presented and approved in the investigation work plan (LANL 2006, 091916; NMED 2006, 095460).

4.3 Ecological Screening Levels

The ecological risk-screening assessments (Appendix G) were conducted using ecological screening levels (ESLs) obtained from the Laboratory's ECORISK Database, Version 3.3 (LANL 2015, 600921). 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, is presented in the ECORISK Database, Version 3.3 (LANL 2015, 600921).

4.4 Cleanup Standards

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

The cleanup goals specified in the Consent Order are a target risk of 1×10^{-5} for carcinogens or a hazard index (HI) of 1 for noncarcinogens. For radionuclides, the target dose is 25 mrem/yr as authorized by DOE Order 458.1. The SSLs/SALs used in the risk-screening assessments in Appendix G are based on these cleanup goals.

5.0 DATA REVIEW METHODOLOGY

The purpose of the data review is to define the nature and extent of contaminants for each SWMU or AOC in the former LA Inn property. The nature of a contaminant refers to the specific contaminants that are present, the affected media, and associated concentrations. The nature of contamination is defined

through identification of COPCs, which is discussed in section 5.1. The identification of a chemical or radionuclide as a COPC does not mean the constituent(s) is related to the site and is a result of site operations. A COPC is identified because it is present at a site based on the criteria discussed below but may be present because of adjacent and/or upgradient operations, and/or infrastructure typical of industrial and metropolitan development. If such origins are evident, the constituents may be excluded from the data analyses and risk assessments. The extent of contamination refers to the spatial distribution of COPCs, with an emphasis on the distribution of COPCs potentially posing a risk or requiring corrective action. The process for determining the extent of contamination and for concluding no further sampling for extent is warranted is discussed in section 5.2.

5.1 Identification of COPCs

The COPCs are chemicals and radionuclides that may be present as a result of releases from SWMUs or AOCs. Inorganic chemicals and some radionuclides occur naturally and inorganic chemicals and radionuclides detected because of natural background are not considered COPCs. Similarly, some radionuclides may be present as a result of fallout from historical nuclear weapons testing and these radionuclides are also not considered COPCs. The Laboratory has collected data on background concentrations of many inorganic chemicals, naturally occurring radionuclides and fallout radionuclides. These data have been used to develop media-specific background values (BVs) and fallout values (FVs) (LANL 1998, 059730). For inorganic chemicals and radionuclides for which BVs or FVs exist, identification of COPCs involves background comparisons, which are described in sections 5.1.1 and 5.1.2. If no BVs or FVs are available or if samples are collected where FVs are not appropriate (i.e., greater than 1-ft depth or in rock), COPCs are identified based on detection status (i.e., if the inorganic chemical or radionuclide is detected, it is identified as a COPC unless available information indicates it is not present as a result of a release from the SWMU or AOC).

Organic chemicals may also be present as a result of anthropogenic activities unrelated to the SWMU or AOC or, to a lesser extent, from natural sources. Because no background data for organic chemicals are available, background comparisons cannot be performed in the same manner as for inorganic chemicals or radionuclides. Therefore, organic COPCs are identified on the basis of detection status (i.e., the organic chemical is detected). When assessing the nature of contamination, the history of site operations may be evaluated to determine whether an organic COPC is present because of a release from a SWMU or AOC or is present from non-site-related sources. Organic chemicals that are present from sources other than releases from a SWMU or AOC may be eliminated as COPCs and are not evaluated further.

5.1.1 Inorganic Chemical and Radionuclide Background Comparisons

The COPCs are identified for inorganic chemicals and radionuclides following EP-SOP-10071, Background Comparisons for Inorganic Chemicals, and EP-SOP-10073, Background Comparisons for Radionuclides. Inorganic COPCs are identified by comparing site data with BVs, maximum concentrations in a background data set, statistical comparisons, and other lines of evidence, as applicable (LANL 1998, 059730). Radionuclides are identified as COPCs based on background comparisons, statistical methods if BVs or FVs are available or based on detection status if BVs or FVs have not been established, and other lines of evidence, as applicable.

Background data are generally available for inorganic chemicals in soil, sediment, and tuff (LANL 1998, 059730). However, some analytes (e.g., nitrate and perchlorate) have no BVs. A BV may be either a calculated value from the background data set (upper tolerance limit [UTL] 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.

For inorganic chemicals, data are evaluated by sample media to facilitate the comparison with media-specific background data. To identify inorganic COPCs, the first step is to compare the sampling result with BVs. If sampling results are above the BV and sufficient data are available (eight or more sampling results and five or more detections), statistical tests are used to compare the site sample data with the background data set for the appropriate media. If statistical tests cannot be performed because of insufficient data or a high percentage of nondetections, the sampling results are compared with the BV and the maximum background concentrations for the appropriate media. If concentrations are above the BV but no results are greater than the maximum background concentration(s), other lines of evidence may be used to determine whether the inorganic chemical is a COPC. If at least one sampling result is above the BV and the maximum background concentration, the inorganic chemical is identified as a COPC. The same evaluation is performed using DLs when an inorganic chemical is not detected but has a DL above the BV. If no BV is available, detected inorganic chemicals are identified as COPCs.

Radionuclides are identified as COPCs based on comparisons to BVs for naturally occurring radionuclides or to FVs for fallout radionuclides. Thorium-228, thorium-230, thorium-232, uranium-234, uranium-235/236, and uranium-238 are naturally occurring radionuclides. Americium-241, cesium-137, plutonium-238, plutonium-239/240, strontium-90, and tritium are fallout radionuclides.

Naturally occurring radionuclides detected at activities above their respective BVs are identified as COPCs. These radionuclides have no background data sets. If there is no associated BV or FV and the radionuclide is detected, it is retained as a COPC.

The FVs for the fallout radionuclides apply to the top 0.0 to 1.0 ft of soil and fill and to sediment regardless of depth. If a fallout radionuclide is detected in a soil or fill sample collected below 1.0 ft or in tuff samples, the radionuclide is identified as a COPC. For soil and fill samples from 1.0 ft bgs or less, if the activity of a fallout radionuclide is greater than the FV, comparisons of the top 0.0 to 1.0 ft sampling data are made with the fallout data set and the radionuclide is eliminated as a COPC if activities are similar to fallout activities is based on statistical comparisons or comparisons to the maximum fallout concentration. Sediment results are evaluated in the same manner, although all data are included, not only the data from 0.0 to 1.0 ft bgs.

The FV for tritium in surface soil (LANL 1998, 059730) is in units of pCi/mL. This FV requires using sample percent moisture to convert sample tritium data from pCi/g (as provided by analytical laboratories) to the corresponding values in units of pCi/mL. Because sample percent moisture historically has been determined using a variety of methods, often undocumented, the Laboratory has adopted the conservative approach of identifying tritium in soil as a COPC based on detection status.

Sample media encountered during investigations include soil (all soil horizons, designated by the media code ALLH or SOIL); fill material (media code FILL); sediment (media code SED); and Bandelier Tuff (media codes Qbt 1g, Qct, Qbo, Qbt 2, Qbt 3, and Qbt 4). Because no separate BVs are available for fill material, fill samples are evaluated by comparison with soil BVs (LANL 1998, 059730). In this report, the discussions of site contamination in soil include fill samples with soil samples in sample counts and comparisons to background. Fill samples are not discussed separately from soil. The units of the Bandelier Tuff (Qbt 2, Qbt 3, and Qbt 4 and Qbt 1g, Qct, Qbo) are likewise evaluated together with respect to background (LANL 1998, 059730).

5.1.2 Statistical Methods Overview

A variety of statistical methods may be applied to each of the data sets. The use of any of these methods depends on how appropriate the method is for the available data. The results of the statistical tests are presented in Appendix F.

5.1.2.1 Distributional Comparisons

Comparisons between site-specific data and Laboratory background data are performed using a variety of statistical methods. These methods begin with a simple comparison of site data with an UTL estimated from the background data (UTL or the 95% upper confidence bound on the 95th quantile). The UTLs are used to represent the upper end of the concentration distribution and are referred to as BVs. The UTL comparisons are then 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 elevated above background levels). Nonparametric tests most commonly performed include the Gehan test (modification of the Wilcoxon Rank Sum test) and the quantile test (Gehan 1965, 055611; Gilbert and Simpson 1990, 055612).

The Gehan test is recommended when between 10% and 50% of the data sets are nondetections. It handles data sets with nondetections reported at multiple DLs in a statistically robust manner (Gehan 1965, 055611; Millard and Deverel 1988, 054953). The Gehan test is not recommended if either of the two data sets has more than 50% nondetections. If there are no nondetected concentrations in the data, the Gehan test is equivalent to the Wilcoxon Rank Sum test. The Gehan test is the preferred test because of its applicability to a majority of environmental data sets, and its recognition and recommendation in EPA-sponsored workshops and publications.

The quantile test is better suited to assessing shifts in a subset of the data. The quantile test determines whether more of the observations in the top chosen quantile of the combined data set come from the site data set than would be expected by chance, given the relative sizes of the site and background data sets. If the relative proportion of the two populations being tested is different in the top chosen quantile of the data than in the remainder of the data, the distributions may be partially shifted because of a subset of site data. This test is capable of detecting a statistical difference when only a small number of concentrations are elevated (Gilbert and Simpson 1992, 054952). The quantile test is the most useful distribution shift test where samples from a release represent a small fraction of the overall data collected. The quantile test is applied at a prespecified quantile or threshold, usually the 80th percentile. The test cannot be performed if more than 80% (or, in general, more than the chosen percentile) of the combined data are nondetected values. It can be used when the frequency of nondetections is approximately the same as the quantile being tested. For example, in a case with 75% nondetections in the combined background and site data set, application of a quantile test comparing 80th percentiles is appropriate. However, the test cannot be performed if nondetections occur in the top chosen quantile. The threshold percentage can be adjusted to accommodate the detection rate of an analyte, or to look for differences further into the distribution tails. The quantile test is more powerful than the Gehan test for detecting differences when only a small percentage of the site concentrations is elevated.

Occasionally, if the differences between two distributions appear to occur far into the tails, the slippage test may be performed. This test evaluates the potential for some of the site data to be greater than the maximum concentration in the background data set if, in fact, the site data and background data came from the same distribution. This test is based on the maximum concentration in the background data set and the number (“n”) of site concentrations that exceed the maximum concentration in the background set (Gilbert and Simpson 1990, 055612, pp. 5–8). The result (p-value) of the slippage test is the probability that “n” (or more) site samples exceed the maximum background concentration by chance alone. The test accounts for the number of samples in each data set (number of samples from the site and number of samples from background) and determines the probability of “n” (or more) exceedances if the two data sets came from identical distributions. This test is similar to the BV comparison in that it evaluates the largest site measurements but is more useful than the BV comparison because it is based on a statistical hypothesis test, not simply on a statistic calculated from the background distribution.

For all statistical tests, a p-value less than 0.05 was the criterion for accepting the null hypothesis that site sampling results are different from background (Appendix F).

5.1.2.2 Graphical Presentation

Box plots are provided for a visual representation of the data and to help illustrate the presence of outliers or other anomalous data that may affect statistical results and interpretations. The plots allow a visual comparison among data distributions. The differences of interest may include an overall shift in concentration (shift of central location) or, when the centers are nearly equal, a difference between the upper tails of the two distributions (elevated concentrations in a small fraction of one distribution). The plots may be used in conjunction with the statistical tests (distributional comparisons) described above. Unless otherwise noted, the nondetected concentrations are included in the plots at their reported DL.

The box plots produced in Appendix F of this report consist 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, 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 extend to the most extreme point that is not considered an outlier, with a maximum whisker length of 1.5 times the interquartile range, outside of which data may be evaluated for their potential to be outliers. The concentrations are plotted as points overlying 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.

5.2 Extent of Contamination

Spatial concentration trends are initially used to determine whether the extent of contamination is defined. Evaluation of spatial concentration data considers the conceptual site model of the release and subsequent migration. Specifically, the conceptual site model should define where the highest concentrations would be expected if a release had occurred and how these concentrations should vary with distance and depth. If the results are different from the conceptual site model, it could indicate no release has occurred or there are other sources of contamination.

In general, both laterally and vertically decreasing concentrations are used to define extent. If concentrations are increasing or not changing, other factors are considered to determine whether extent is defined or if additional extent sampling is warranted. These factors include

- the magnitude of concentrations and rate of increase compared with SSLs/SALs,
- the magnitude of concentrations of inorganic chemicals or radionuclides compared with the maximum background concentrations for the medium,
- concentrations of organic chemicals compared with estimated quantitation limits (EQLs), and
- results from nearby sampling locations.

The primary focus for defining the extent of contamination is characterizing contamination that potentially poses a potential unacceptable risk and may require additional corrective actions. As such, comparison with SSLs/SALs is used as an additional step following a determination of whether extent is defined by decreasing concentrations with depth and distance and whether concentrations are below EQLs or DLs. The initial SSL/SAL comparison is conducted using the residential SSL/SAL (regardless of whether the current and reasonably foreseeable future land use is residential) because this value is typically the most protective. If the current and reasonably foreseeable future land use is not residential, comparison with

the relevant SSL/SAL may also be conducted if the residential SSL/SAL is exceeded or otherwise similar to COPC concentrations. For the SWMUs and AOC within the former LA Inn property, the current and reasonably foreseeable future land uses are industrial/commercial and residential (section 4.1).

The SSL/SAL comparison is not necessary if all COPC concentrations are decreasing with depth and distance. If, however, concentrations increase with depth and distance or do not display any obvious trends, the SSLs/SALs are used to determine whether additional sampling for extent is warranted. If the COPC concentrations are sufficiently below the SSL/SAL (e.g., the residential and/or industrial SSL/SAL is 10 times [an order of magnitude] or more than all concentrations), the COPC does not pose a potential unacceptable risk, and no further sampling for extent is warranted. The validity of the assumption that the COPC does not pose a risk is confirmed using the results of the risk-screening assessment. The calculation of risk also assists in determining whether additional sampling is warranted to define the extent of contamination needing additional corrective actions.

Calcium, magnesium, potassium, and sodium may be COPCs for some sites. These constituents are essential nutrients and their maximum concentrations are compared with NMED's essential nutrient screening levels (NMED 2015, 600915). If the maximum concentration is less than the screening level(s), no additional sampling for extent is warranted and the inorganic chemical is eliminated from further evaluation in the risk assessment.

6.0 FORMER TA-01 SITE INVESTIGATIONS

6.1 Background

Former TA-01 is located on the southern portion of East Mesa and encompasses a portion of present-day Los Alamos townsite, roughly demarcated by Los Alamos Canyon (on the southern boundary), Central Avenue (on the northern boundary), 15th Street (on the eastern boundary), and the western reach of Timber Ridge Road (on the western boundary). The approximately 50-acre mesa-top area was the location of the initial Los Alamos Scientific Laboratory (LASL) from 1943 to 1965.

SWMUs 01-001(c), 01-001(t), 01-006(d), and 01-006(g) and AOCs 01-004(b) and 01-007(k) have received certificates of completion or no further action designation and are not part of this report. The following is a brief description of the sites within the former LA Inn property boundaries that are evaluated in this report.

- SWMU 01-001(d1) is the waste line to a septic tank and SWMU 01-001(s1) is a portion of a sanitary waste line. SWMUs 01-001(d1) and 01-001(s1) are those portions of SWMUs 01-001(d) and 01-001(s) located within the former LA Inn property.
- SWMU 01-002(a1)-00 is a portion of an industrial waste line. It consisted of an extensive network of underground drains and pipelines that collected fluids from process buildings. SWMU 01-002(a1)-00 is that portion of SWMU 01-002(a)-00 located within the former LA Inn property.
- AOC 01-003(b1) is a portion of a surface-disposal site for construction debris that may have been below the north rim of Los Alamos Canyon. AOC 01-003(b1) is that portion of AOC 01-003(b) located within the former LA Inn property.
- SWMUs 01-006(b,c,h1,n) are drainlines or storm drains and outfalls. SWMUs 01-006(b and c) are drainlines, and SWMUs 01-006(h1 and n) are storm drains or a portion of a storm drain. They either discharged directly into Los Alamos Canyon or released effluent onto the ground surface near the buildings they served. SWMU 01-006(h1) is that portion of SWMU 01-006(h) located within the former LA Inn property.

- SWMUs 01-007(a and b) are areas of suspected subsurface soil contamination. Much of these sites are currently beneath paved roads, parking lots, or commercial buildings. The suspected soil contamination might have resulted from original Laboratory operations or from demolition and removal of buildings.

The SWMUs and AOC investigated within the former Los Alamos Inn property are shown in Plate 1.

Starting in 1976, land located in former TA-01 was transferred from DOE to Los Alamos County and private parties. Except for the sites located on the slope of Los Alamos Canyon that are still on DOE land, the majority of these sites are located within the Los Alamos townsite on private land or county property. These sites have been backfilled, regraded, and recontoured and have undergone significant construction since the property transfer. No evidence of previous former TA-01 Laboratory structures exists in the area.

6.2 Operational History

The approximately 50-acre mesa-top area of former TA-01 was the location of the initial LASL from 1943 to 1965. During this time, research work on nuclear weapons was carried out. Operations at former TA-01 were gradually relocated to new TAs from 1945 to 1965. Phased decontamination and decommissioning activities began at former TA-01 in 1953 and continued through 1976 (Ahlquist et al. 1977, 005710, p. 2).

Activities to establish a nuclear weapon facility started on March 15, 1943. Section 4.1.1 of the historical investigation report presents more detailed information on the histories of operation, decommissioning, and decontamination of former TA-01 (LANL 2006, 091915). Basic chemical operations that occurred at former TA-01 included wet chemistry experimentation and wet and dry chemistry processing, including purification and recovery processes for uranium and plutonium. Former TA-01 also housed several physical operations, such as casting, machining, powder metallurgy, and metallurgical and solid materials procedures for shaping metals (radioactive as well as nonradioactive) and high explosives. The locations of former buildings at former TA-01 are presented in Figure 1.1-2.

Activities at former TA-01 generated various hazardous and radioactive wastes. The waste management practices during the early years of the Laboratory were conducted in accordance with standard practices of the time. The industrial liquid waste was collected by a dedicated industrial waste line that was separate from sanitary waste lines. The sanitary waste was collected by three sanitary systems that collectively served the western, northern, and eastern sections of former TA-01. Additionally, individual septic tanks served several of the outlying buildings and discharged into Los Alamos Canyon.

Nonradioactive solid waste was burned in two on-site incinerators at former TA-01. At least one incinerator located outside former TA-01 was used for combustion of nonradioactive solid waste. Noncombustible and nonradioactive solid waste was transported to a landfill located near the present-day Los Alamos Airport [SWMU 73-001(a)]. No record exists of any radioactive solid waste landfill on the mesa top within the perimeter of former TA-01.

6.3 Historical Releases

Releases from septic systems, the industrial waste line, drainlines, and storm water drainages occurred as a result of normal site operations (e.g., discharges from outfalls) and accidental spills or releases. No documentation exists to estimate the volumes or rates of the flow of the effluent from septic system outlet pipes, industrial waste line, drainlines, or storm water drainages to outfalls.

Releases from septic tanks and sanitary waste lines [SWMUs 01-001(d and s)] may have occurred as a result of leaks that may have caused subsurface contamination. Discharges from outfalls as a result of normal site operation may have caused surface and subsurface contamination on the hillside of Los Alamos Canyon.

Releases from the industrial waste line [SWMU 01-002(a)-00] may have occurred as a result of leaks and may have caused subsurface contamination. Although the entire industrial waste line had been removed, residual contamination may remain in the former location of the industrial waste line. The discharge location from the industrial waste line (former TA-45) falls within the Pueblo Canyon Aggregate Area.

Placement of contaminated materials at AOC 01-003(b) may have caused surface and subsurface contamination on the hillside of Los Alamos Canyon.

Contamination from drainlines, storm drains, and their outfalls [SWMUs 01-006(b,c,h,n)] may have occurred as a result of leaks and intentional discharges.

Contamination at the areas of suspected subsurface soil contamination [SWMUs 01-007(a and b)] may be a direct result of spills or releases that may have caused surface and subsurface contamination.

6.4 Summary of Previous Investigations

The Ahlquist radiological survey was conducted from 1974 to 1976 (Ahlquist et al. 1977, 005710). During the survey, all the septic tanks [including at SWMU 01-001(d)] were removed. In addition, an interim action was conducted at SWMU 01-001(d) in 1996–1997 to remove contaminated soil on the hillside (LANL 1997, 056908). A portion of the western sanitary waste line [SWMU 01-001(s)] was removed in the 1960s (Buckland 1973, 058138), and more was removed in 1994 and 1996 during Phase I Resource Conservation and Recovery Act facility investigation (RFI) (LANL 1997, 056660). It is possible some portions of SWMU 01-001(s) were removed during the construction of the Timber Ridge condominiums in the 1970s.

The main portion of the industrial waste line [SWMU 01-002(a)-00] was verified as completely removed, and a substantial amount of contaminated soil associated with the industrial waste line was removed during the Ahlquist radiological survey (Ahlquist et al. 1977, 005710, pp. 83, 90, 92, 94). In 1985, the last remnants of the industrial waste line between former TA-01 and the Acid Canyon outfall near former TA-45 were removed (Elder et al. 1986, 006666, p. 37). An interim action was conducted in 1990 at the route of former industrial waste line between Central Avenue and Rose Street at the Central School site in response to a request from Los Alamos schools (LANL 1990, 007501). No contamination was detected.

The drainlines of SWMUs 01-006(b and c) were also removed during the Ahlquist radiological survey. Storm drains [SWMUs 01-006(h and n)] were surveyed during the Ahlquist radiological survey and were removed after all the Laboratory buildings were demolished and the ground recontoured.

Contaminated soil at SWMUs 01-007(a and b) was also removed during the Ahlquist radiological survey.

Several Phase I RFIs were conducted for the sites in former TA-01 at various times from 1992 to 1996. Samples were collected and analyzed at both on- and off-site laboratories. Samples analyzed at off-site laboratories included various combinations of the following: metals, PCBs, pesticides, SVOCs, VOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium. Details of the investigations and interim and corrective actions as well as results were presented in the historical investigation report for Upper Los Alamos Canyon Aggregate Area (LANL 2006, 091915).

6.5 SWMU 01-001(d1), Waste Line for Septic Tank 138

6.5.1 Site Description and Operational History

SWMU 01-001(d1) is the sanitary waste line that connected former buildings K, V, and Y to septic tank 138 [SWMU 01-001(d2)] (Figure 1.1-2). SWMU 01-001(d1) is shown in Figure 6.5-1. The septic tank was constructed of reinforced concrete, installed in 1943, and located southeast of former building Y. Building K was a chemical stock room that contained a mercury still. Building V housed the original uranium and beryllium machine shop. Dry-grinding of boron was also conducted in building V. Building Y housed a physics laboratory that handled tritium, uranium-238, and polonium-210. The tank and surrounding soil were removed during the Ahlquist radiological survey (Ahlquist et al. 1977, 005710, p. 79). The outfall was located east of former building Y and discharged over the rim of Los Alamos Canyon. This outfall area is known as Hillside 138.

Currently, the location of the sanitary waste line is on privately owned and commercially developed land with an asphalt parking lot. Part of the line was under commercial buildings but is now accessible following removal of the building.

6.5.2 Relationship to Other SWMUs and AOCs

SWMU 01-001(d1) merges with SWMU 01-001(d2), which is septic tank 138. SWMU 01-001(d2) overlaps the footprint of SWMU 01-006(h2), with the two sites sharing the same hillside area [SWMU 01-001(d3)].

6.5.3 Summary of Previous Investigations

A Phase I RFI was conducted in 1992 and 1994, and both the canyon rim area and Hillside 138 were extensively sampled. However, most of the samples were analyzed at on-site laboratories.

An interim action was implemented in 1996 and 1997 to remove contaminated soil on Hillside 138 to reduce the potential migration of contaminants from the site to the storm water drainage and ultimately to Los Alamos Canyon (LANL 1997, 056908, p. 1).

Among the samples collected during the Phase I RFI, three soil samples were analyzed at off-site fixed laboratories. Samples were collected from two locations in the outfall at SWMU 01-001(d) at depths of 0.0 to 1.83 ft.

- One sample was analyzed only for mercury. Mercury was not detected at a concentration greater than the BV.
- Two samples were analyzed for isotopic plutonium. Analytical results indicated that plutonium-239 was detected greater than FV or at depths where FV does not apply between 0.0 and 1.83 ft bgs. Activities decreased with depth.

The Phase I RFI data are screening level data.

6.5.4 Site Contamination

6.5.4.1 Soil, Rock, and Sediment Sampling

As part of the investigation, the following characterization activities were conducted at SWMU 01-001(d1):

- For the Phase I investigation a total of two samples were collected from 3.5 to 5.0 ft bgs and 6.0 to 7.5 ft bgs at location 00-603799. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.
- In 2016 (following the demolition and removal of buildings), 25 samples were collected from 7 locations. Locations 01-61507, 01-61508, 01-61509, and 01-61510 were sampled at depths ranging from 13.0 to 33.0 ft bgs, locations LA-61499 and LA-61500 were sampled at depths ranging from 1.5 to 8.5 ft bgs, and location LA-61501 was sampled at depths ranging from 11.0 to 16.0 ft bgs. Samples were collected from the underlying tuff as the fill material does not represent environmental medium influenced by past Laboratory operations. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.

The sampling locations for SWMU 01-001(d1) are shown in Figure 6.5-1. Table 6.5-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.5.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.5.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-001(d1) consist of results from 27 samples (1 soil, 26 tuff) collected from 8 locations.

Inorganic Chemicals

Twenty-seven samples (1 soil, 26 tuff) were analyzed for TAL metals, nitrate, cyanide, and perchlorate. Because fewer than 8 soil samples were collected, statistical tests could not be performed on results for these media. Table 6.5-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.5-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Antimony was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had DLs (0.896 mg/kg to 1.19 mg/kg) above the BV in 25 samples. Antimony is retained as a COPC.

Barium was detected above the Qbt 2,3,4 BV (46 mg/kg) in three samples with a maximum concentration of 85.9 mg/kg. The Gehan and quantile tests indicated site concentrations of barium in tuff are not statistically different from background (Figure F-1 and Table F-1). Barium is not a COPC.

Calcium was detected above the Qbt 2,3,4 BV (2200 mg/kg) in three samples with a maximum concentration of 5440 mg/kg. The Gehan and quantile tests indicated site concentrations of calcium in tuff are not statistically different from background (Figure F-2 and Table F-1). Calcium is not a COPC.

Chromium was detected above the Qbt 2,3,4 BV (7.14 mg/kg) in one sample at a concentration of 7.9 mg/kg. The Gehan and quantile tests indicated site concentrations of chromium in tuff are not statistically different from background (Figure F-3 and Table F-1). Chromium is not a COPC.

Copper was detected above the soil and Qbt 2,3,4 BVs (14.7 mg/kg and 4.66 mg/kg) in one soil sample and one tuff sample with a maximum concentration of 17.9 mg/kg. The soil concentration was above the maximum soil background concentration (16 mg/kg). The Gehan and quantile tests indicated site concentrations of copper in tuff are not statistically different from background (Figure F-4 and Table F-1). Copper is retained as a COPC.

Cyanide was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had a DL (0.53 mg/kg) above the BV in one sample. The DL was only 0.03 mg/kg above the BV, and cyanide was not detected or was detected below BVs in the other 26 samples (detected below BV in 1 sample). Cyanide is not a COPC.

Lead was detected above the soil and Qbt 2,3,4 BVs (22.3 mg/kg and 11.2 mg/kg) in one soil sample and four tuff samples with a maximum concentration of 32.5 mg/kg. The soil concentration (22.6 mg/kg) was below or similar to the five highest soil background concentrations (22 mg/kg, 24 mg/kg, 25 mg/kg, 27 mg/kg, and 28 mg/kg). The Gehan and quantile tests indicated site concentrations of lead in tuff are not statistically different from background (Figure F-5 and Table F-1). Lead is not a COPC.

Mercury was detected above the Qbt 2,3,4 BV (0.1 mg/kg) in four samples with a maximum concentration of 1.4 mg/kg. Mercury is retained as a COPC.

Nitrate was detected in 25 samples with a maximum concentration of 9.89 mg/kg. Nitrate is naturally occurring and the concentrations likely reflect naturally occurring levels. Nitrate is not a COPC.

Perchlorate was detected in 12 samples with a maximum concentration of 0.0051 mg/kg. Perchlorate is retained as a COPC.

Selenium was detected above the Qbt 2,3,4 BV (0.3 mg/kg) in 25 samples with a maximum concentration of 1.51 mg/kg. Selenium is retained as a COPC.

Thallium was detected above the Qbt 2,3,4 BV (1.1 mg/kg) in one sample at a concentration of 1.45 mg/kg. The quantile and slippage tests indicated site concentrations of thallium in tuff are not statistically different from background (Figure F-6 and Table F-1). Thallium is not a COPC.

Organic Chemicals

Twenty-seven samples (1 soil, 26 tuff) were analyzed for VOCs, SVOCs, and PCBs. Table 6.5-3 presents the organic chemicals detected. Figure 6.5-3 shows the spatial distribution of organic chemicals detected.

The organic chemicals detected at SWMU 01-001(d1) include Aroclor-1242, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, and methylene chloride. The detected organic chemicals are retained as COPCs.

Radionuclides

Twenty-seven samples (1 soil, 26 tuff) were analyzed for americium-241, isotopic plutonium, isotopic uranium, strontium-90, tritium, and gamma-emitting radionuclides. Table 6.5-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.5-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Plutonium-239/240 was detected in one soil sample below 1.0 ft bgs at an activity of 0.97 pCi/g. Plutonium-239/240 is retained as a COPC.

Uranium-235/236 was detected above the Qbt 2,3,4 BV (0.09 pCi/g) in 12 samples with a maximum activity of 0.425 pCi/g. Uranium-235/236 is retained as a COPC.

6.5.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at SWMU 01-001(d1) are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-001(d1) include antimony, copper, mercury, perchlorate, and selenium.

Antimony was not detected above the Qbt 2,3,4 BV but had DLs (0.896 mg/kg to 1.19 mg/kg) above the BV in 25 samples. The residential SSL was approximately 26 times the maximum DL. Further sampling for extent of antimony is not warranted.

Copper was detected above the soil and Qbt 2,3,4 BVs in one soil sample and one tuff sample with a maximum concentration of 17.9 mg/kg. Concentrations decreased with depth and decreased downgradient. The lateral and vertical extent of copper are defined.

Mercury was detected above the Qbt 2,3,4 BV in four samples with a maximum concentration of 1.4 mg/kg. Concentrations decreased with depth at locations LA-61500 and LA-61501 and increased with depth at location 00-603799. The residential SSL was approximately 74 times the maximum concentration at location 00-603799. Concentrations decreased downgradient. The lateral extent of mercury is defined, and further sampling for vertical extent is not warranted.

Perchlorate was detected in 12 samples with a maximum concentration of 0.0051 mg/kg. Concentrations did not change substantially (0.00071 mg/kg, 0.00019 mg/kg, and 0.0041 mg/kg) with depth at any location and did not change substantially (0.0041 mg/kg) downgradient. The residential SSL was approximately 10,745 times the maximum concentration. Further sampling for extent of perchlorate is not warranted.

Selenium was detected above the Qbt 2,3,4 BV in 25 samples with a maximum concentration of 1.51 mg/kg. Concentrations did not change substantially (0.02 mg/kg to 0.45 mg/kg) with depth at any location and did not change substantially (0.7 mg/kg) downgradient. The residential SSL was approximately 259 times the maximum concentration. Further sampling for extent of selenium is not warranted.

Organic Chemicals

Organic COPCs at SWMU 01-001(d1) include Aroclor-1242, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, and methylene chloride.

Aroclor-1242 was detected in one sample at a concentration of 0.00559 mg/kg. Concentrations decreased with depth at location LA-61501 and decreased downgradient. The lateral and vertical extent of Aroclor-1242 are defined.

Bis(2-ethylhexyl)phthalate was detected in one sample at a concentration of 0.18 mg/kg. The concentration was below the EQL, decreased with depth at location 01-61509, and decreased downgradient. The lateral and vertical extent of bis(2-ethylhexyl)phthalate are defined.

Di-n-butylphthalate was detected in one sample at a concentration of 0.058 mg/kg. The concentration was below the EQL, decreased with depth at location 00-603799, and decreased downgradient. The lateral and vertical extent of di-n-butylphthalate are defined.

Methylene chloride was detected in one sample at a concentration of 0.00213 mg/kg. The concentration was below the EQL, decreased with depth at location 01-61507, and increased downgradient. The residential SSL was approximately 192,000 times the maximum concentration. The vertical extent of methylene chloride is defined, and further sampling for lateral extent is not warranted.

Radionuclides

Radionuclide COPCs at SWMU 01-001(d1) include plutonium-239/240 and uranium-235/236.

Plutonium-239/240 was detected in one soil sample below 1.0 ft bgs at an activity of 0.97 pCi/g. Activities decreased with depth at location 00-603799 and decreased downgradient. The lateral and vertical extent of plutonium-239/240 are defined.

Uranium-235/236 was detected above the Qbt 2,3,4 BV in 12 samples with a maximum activity of 0.425 pCi/g. Activities decreased with depth at location 01-61507, did not change substantially (0.3 pCi/g, 0.025 pCi/g, and 0.008 pCi/g) with depth at locations 01-61508, 01-61509, and 01-61510, and did not change substantially (0.3 pCi/g) downgradient. The residential SAL was approximately 99 times the maximum activity. Further sampling for extent of uranium-235/236 is not warranted.

6.5.5 Summary of Human Health Risk Screening

Industrial Scenario

The surface of SWMU 01-001(d1) is covered by asphalt because it is part of a parking lot for the adjacent buildings or was sampled at depths greater than 0.0 to 1.0 ft bgs. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest sample collected.

No carcinogenic COPCs were identified in the shallowest sample. The industrial HI is 0.004, which is below the NMED target HI of 1 (NMED 2015, 600915). No radionuclides COPCs were identified in the shallowest sample.

Construction Worker Scenario

No carcinogenic COPCs were identified in the 0.0- to 10.0-ft depth interval. The construction worker HI is 0.02, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

No carcinogenic COPCs were identified in the 0.0- to 10.0-ft depth interval. The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.3 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

6.5.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for threatened and endangered [T&E] species), and LOAEL analyses, no potential ecological risks exist at SWMU 01-001(d1).

6.6 SWMU 01-001(s1), Portion of the Western Sanitary Waste Line

6.6.1 Site Description and Operational History

SWMU 01-001(s1) is the part of the western sanitary waste line (WSWL) located within the former LA Inn property (Figure 6.6-1). The buildings that were served by SWMU 01-001(s1) housed most of the processing and production operations in the early days of the Laboratory. The WSWL served former buildings A, B; former Boiler House 2; and former buildings C, D, G, M, V, and Sigma (Figure 1.1-2).

- Building A housed administrative offices.
- Building B had administrative offices and electronic and metallurgical laboratories. Small amounts of radionuclide foils were stored in a concrete vault in the building (Ahlquist et al. 1977, 005710, p. 128).
- Boiler House 2 supplied steam to TA-01 buildings.
- Building C housed a uranium machine shop and other machining (e.g., graphite machining) operations. Before its removal in 1964, building C was found to be free of radioactive contamination, except for the concrete building pad. The contaminated concrete pad was removed to an unspecified material disposal area (MDA).
- Building D was used to process plutonium.
- Building G housed the Sigma Pile, a small pile of graphite and uranium. Leak-testing of radium sources was also performed in building G. In 1959, the building structure was found to be uncontaminated and was removed. The concrete floor was found to be slightly contaminated with radioactivity and, along with drainlines, was taken to an unspecified MDA (Ahlquist et al. 1977, 005710, p. 125).
- Building M was used to process and recover enriched uranium.
- Building V contained offices and a toolmaker's shop. It was the original machine shop for machining uranium and beryllium and for dry-grinding boron at TA-01.
- The Sigma Building was used for machining radionuclides for casting and powder metallurgy.

SWMU 01-001(s1) exited from building D, ran parallel to most of the main industrial waste line [SWMU 01-002(a)-00], and passed near the southwest corner of building C. It then proceeded west along the former Finch Street and turned north between buildings T-221 and T-225 [SWMU 01-001(s2)]. This sanitary waste line connected to a septic tank [SWMU 00-030(g)] and discharged into Acid Canyon. The portion of the WSWL leading from building C to the east end of the eastern building of the Trinity Village apartments had been removed in the 1960s (Buckland 1973, 058138). The lines beneath the central and western Trinity Village buildings were probably removed before building construction, but the line beneath the eastern building may still be there.

Currently, the area has been developed and the line is under an asphalt parking lot.

6.6.2 Relationship to Other SWMUs and AOCs

SWMU 01-001(s1) ran parallel to a portion of SWMU 01-002(a1)-00 within the former LA Inn property.

6.6.3 Summary of Previous Investigations

A Phase I RFI was conducted in 1994 and 1996. Thirteen locations were physically accessible for field investigation (LANL 1993, 038753, pp. 8–9). Geophysical surveys were conducted and boreholes were drilled to assess contamination associated with soil outside of the WSWL (LANL 1997, 056660, pp. 9, 58). A 210-ft portion of the WSWL from near Timber Ridge to Trinity Drive was removed in 1994 (LANL 1995, 066456, p. iii, Section 3.0). In 1996, approximately 262 ft of the WSWL was removed (LANL 1996, 062538, p. 3).

The RFI samples analyzed at off-site fixed laboratories included four soil samples collected from four locations along the pipeline path at SWMU 01-001(s) at depths of 0.0 to 7.5 ft.

- Samples from three locations were analyzed for metals. Analytical results indicated that copper, lead, and mercury were detected at concentrations greater than BVs in at least one sample between 0.0 and 7.5 ft bgs. Lead was detected at a concentration within the range of the background concentrations. Copper was detected at a concentration greater than the range of the background concentrations.
- The sample from one location was analyzed for PCBs and pesticides; the sample from another location was analyzed for PCBs, pesticides, and SVOCs. No organic chemicals were detected.
- Samples from two locations were analyzed for isotopic plutonium and isotopic uranium, and one sample was analyzed by gamma spectroscopy for isotopic plutonium, isotopic uranium, and tritium. Analytical results indicated that plutonium-238 and plutonium-239 were detected at depths where FVs do not apply, and uranium-234 was detected at an activity greater than BV in at least one sample between 0.0 and 6.5 ft bgs. Uranium-234 was detected at an activity greater than the range of the background activities in one sample.

The Phase I RFI data are screening level data.

6.6.4 Site Contamination

6.6.4.1 Soil, Rock, and Sediment Sampling

As part of the investigation, the following characterization activities were conducted at SWMU 01-001(s1):

- For the Phase I investigation a total of two samples were collected from location 03-603871. In addition, two samples from location 00-603899 associated with the industrial waste line [SWMU 01-002(a1)-00] were collected. The industrial waste line ran parallel to SWMU 01-001(s1) within the former LA Inn property. Samples were collected from 1.5 to 2.5 ft bgs and 3.5 to 4.5 ft bgs and 1.25 to 2.25 ft bgs and 3.25 to 4.25 ft bgs, respectively, and were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.
- In 2016, two samples were collected at location LA-61502 from depths of 7.5 to 8.5 ft bgs and 9.5 to 10.5 ft bgs. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.

The sampling locations for SWMU 01-001(s1) are shown in Figure 6.6-1. Table 6.6-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.6.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.6.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-001(s1) consist of results from six tuff samples collected from three locations.

Inorganic Chemicals

Six tuff samples were analyzed for TAL metals, nitrate, cyanide, and perchlorate. Because fewer than eight tuff samples were collected, statistical tests could not be performed on results for these media. Table 6.6-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.6-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Antimony was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had DLs (0.61 mg/kg and 1.06 mg/kg) above the BV in five samples. Antimony is retained as a COPC.

Chromium was detected above the Qbt 2,3,4 BV (7.14 mg/kg) in three samples with a maximum concentration of 20.4 mg/kg. The concentrations were above the maximum Qbt 2,3,4 background concentration (13 mg/kg). Chromium is retained as a COPC.

Copper was detected above the Qbt 2,3,4 BV (4.66 mg/kg) in one sample at a concentration of 6.52 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (6.2 mg/kg). Copper is retained as a COPC.

Cyanide was detected above the Qbt 2,3,4 BV (0.5 mg/kg) in two samples with a maximum concentration of 0.84 mg/kg. Cyanide is retained as a COPC.

Lead was detected above the Qbt 2,3,4 BV (11.2 mg/kg) in two samples with a maximum concentration of 15.7 mg/kg. One concentration was above the maximum Qbt 2,3,4 background concentration (15.5 mg/kg). Lead is retained as a COPC.

Mercury was detected above the Qbt 2,3,4 BV (0.1 mg/kg) in one sample at a concentration of 0.109 mg/kg. The concentration was only 0.009 mg/kg above the BV, and mercury was not detected or was detected below BV in the other five samples (detected below BV in three samples). Mercury is not a COPC.

Nickel was detected above the Qbt 2,3,4 BV (6.58 mg/kg) in two samples with a maximum concentration of 10.7 mg/kg. The concentrations were above the maximum Qbt 2,3,4 background concentration (7 mg/kg). Nickel is retained as a COPC.

Nitrate was detected in four samples with a maximum concentration of 0.832 mg/kg. Nitrate is naturally occurring and the concentrations likely reflect naturally occurring levels. Nitrate is not a COPC.

Selenium was detected above the Qbt 2,3,4 BV (0.3 mg/kg) in two samples with a maximum concentration of 0.873 mg/kg and had DLs (0.61 mg/kg) above the BV in two samples. Selenium is retained as a COPC.

Organic Chemicals

Six tuff samples were analyzed for VOCs, SVOCs, and PCBs. Table 6.6-3 presents the organic chemicals detected. Figure 6.6-3 shows the spatial distribution of organic chemicals detected.

The organic chemicals detected at SWMU 01-001(s1) include butylbenzylphthalate and methylene chloride. The detected organic chemicals are retained as COPCs.

Radionuclides

Six tuff samples were analyzed for americium-241, isotopic plutonium, isotopic uranium, strontium-90, tritium, and gamma-emitting radionuclides. Table 6.6-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.6-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Plutonium-238 was detected in one tuff sample at an activity of 0.117 pCi/g. Plutonium-238 is retained as a COPC.

Plutonium-239/240 was detected in two tuff samples with a maximum activity of 0.122 pCi/g. Plutonium-239/240 is retained as a COPC.

Tritium was detected in one tuff sample at an activity of 0.94 pCi/g. Tritium is retained as a COPC.

Uranium-235/236 was detected above the Qbt 2,3,4 BV (0.09 pCi/g) in one sample at an activity of 0.167 pCi/g. Uranium-235/236 is retained as a COPC.

6.6.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at SWMU 01-001(s1) are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-001(s1) include antimony, chromium, copper, cyanide, lead, nickel, and selenium.

Antimony was not detected above the Qbt 2,3,4 BV but had DLs (0.61 mg/kg and 1.06 mg/kg) above the BV in five samples. The residential SSL was approximately 30 times the maximum DL. Further sampling for the extent of antimony is not warranted.

Chromium was detected above the Qbt 2,3,4 BV in three samples with a maximum concentration of 20.4 mg/kg. Concentrations increased with depth at location 00-603899, did not change with depth at location 03-603871, and increased laterally at location 03-603871. The residential and industrial total chromium SSLs were approximately 7 times and 37 times the concentration at location 00-603899 and 5 times and 25 times the maximum concentration. Because there was no known use of hexavalent chromium at this site, and site conditions would not have produced or promoted the formation of hexavalent chromium, the vast majority, if not all, of the total chromium detected consists of trivalent chromium. Given the preponderance of trivalent chromium versus hexavalent chromium, it is appropriate to use the trivalent chromium SSL in evaluating the total chromium results. The residential SSL for

trivalent chromium was approximately 5735 times the maximum concentration. In addition, the residential cancer risk for chromium and the total excess cancer risk for the site were approximately 2×10^{-6}. Further sampling for extent of chromium is not warranted.

Copper was detected above the Qbt 2,3,4 BV in one sample at a concentration of 6.52 mg/kg. Concentrations increased with depth at location LA-61502. The concentration was only 0.32 mg/kg above the maximum Qbt 2,3,4 background concentration (6.2 mg/kg) and the residential SSL was approximately 480 times the concentration. Further sampling for extent of copper is not warranted.

Cyanide was detected above the Qbt 2,3,4 BV in two samples with a maximum concentration of 0.84 mg/kg. Concentrations decreased with depth at locations 00-603899 and 03-603871 and did not change substantially (0.01 mg/kg) laterally at location 03-603871. The residential and industrial SSLs were approximately 13 times and 75 times the maximum concentration. The vertical extent of cyanide is defined, and further sampling for lateral extent is not warranted.

Lead was detected above the Qbt 2,3,4 BV in two samples with a maximum concentration of 15.7 mg/kg. Concentrations decreased with depth at locations 00-603899 and 03-603871 and increased laterally. The residential and industrial SSLs were approximately 25 times and 51 times the maximum concentration. The vertical extent of lead is defined, and further sampling for lateral extent is not warranted.

Nickel was detected above the Qbt 2,3,4 BV in two samples with a maximum concentration of 10.7 mg/kg. Concentrations did not change substantially (1.4 mg/kg) with depth at location 03-603871 and increased laterally. The residential SSL was approximately 146 times the maximum concentration. Further sampling for extent of nickel is not warranted.

Selenium was detected above the Qbt 2,3,4 BV in two samples with a maximum concentration of 0.873 mg/kg and had DLs (0.61 mg/kg) above the BV in two samples. Concentrations did not change substantially (0.05 mg/kg) with depth at location LA-61502. The residential SSL was approximately 448 times the maximum concentration and 641 times the maximum DL. Further sampling for extent of selenium is not warranted.

Organic Chemicals

Organic COPCs at SWMU 01-001(s1) include butylbenzylphthalate and methylene chloride.

Butylbenzylphthalate was detected in one sample at a concentration of 0.09 mg/kg. Concentrations decreased with depth at location 03-603871 and increased laterally. The residential SSL was approximately 32,222 mg/kg times the concentration. Further sampling for extent of butylbenzylphthalate is not warranted.

Methylene chloride was detected in four samples with a maximum concentration of 0.0033 mg/kg. Concentrations did not change substantially (0.0002 mg/kg and 0.0017 mg/kg) with depth at locations 00-603899 and 03-603871 and laterally (0.0007 mg/kg) at location 03-603871. The residential SSL was approximately 124,000 times the maximum concentration. Further sampling for extent of methylene chloride is not warranted.

Radionuclides

Radionuclide COPCs at SWMU 01-001(s1) include plutonium-238, plutonium-239/240, tritium, and uranium-235/236.

Plutonium-238 was detected in one tuff sample at an activity of 0.117 pCi/g. Activities increased with depth at location 00-603899 and decreased laterally. The residential SAL was approximately 718 times the activity. The lateral extent of plutonium-238 is defined, and further sampling for vertical extent is not warranted.

Plutonium-239/240 was detected in two tuff samples with a maximum activity of 0.122 pCi/g. Activities increased with depth at locations 00-603899 and LA-61502 and decreased laterally. The residential SAL was approximately 648 times the maximum activity. The lateral extent of plutonium-239/240 is defined, and further sampling for vertical extent is not warranted.

Tritium was detected in one tuff sample at an activity of 0.94 pCi/g. Activities decreased with depth at location 03-603871 and increased laterally. The residential SAL was approximately 1809 times the activity. The vertical extent of tritium is defined, and further sampling for lateral extent is not warranted.

Uranium-235/236 was detected above the Qbt 2,3,4 BV in one sample at an activity of 0.167 pCi/g. Activities decreased with depth at location 00-603899 and decreased laterally. The lateral and vertical extent of uranium-235/236 are defined.

6.6.5 Summary of Human Health Risk Screening

Industrial Scenario

The surface of SWMU 01-001(s1) is covered by asphalt as it is part of a parking lot for the adjacent buildings. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest samples collected beneath the asphalt.

The total excess cancer risk for the industrial scenario is 4×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.03, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.00001 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

No carcinogenic COPCs were identified for the construction worker scenario. The construction worker HI is 0.3, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.06 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Based on the risk-screening assessment results, no potential unacceptable risks and doses exist for the industrial, construction worker, and residential scenarios at SWMU 01-001(s1).

6.6.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), and LOAEL analyses, no potential ecological risks exist at SWMU 01-001(s1).

6.7 SWMU 01-002(a1)-00, Industrial Waste Line

6.7.1 Site Description and Operational History

SWMU 01-002(a1)-00 is part of an industrial waste line located in the southern and western portion of former TA-01. SWMU 01-002(a1)-00 is the portions of the industrial waste line located within the former LA Inn property on the mesa top (Figure 6.7-1). From 1943 to 1951, chemical and radioactive process wastes passed through this section of pipe en route to discharge to Acid Canyon [SWMU 01-002(b)-00], a small branch of Pueblo Canyon. SWMU 01-002(a2)-00 includes the area around former Boiler House 2, former buildings D, H, J-2, M, ML, Q, Sigma, and several properties north of Trinity Drive extending to Canyon Road (near the location of former TA-45) (Figure 1.1-2). These former buildings were the sources of major process discharges from former TA-01 (Ahlquist et al. 1977, 005710, p. 15).

- Boiler House 2 supplied steam for TA-01.
- Building D was used to process plutonium.
- Building H was used for source preparation of polonium-210.
- Building J-2 was used for radiochemistry work.
- Building M was used to recover enriched uranium-235.
- Building ML was a medical laboratory.
- Building Q was used to calibrate laboratory equipment using radium-226 as a check source.
- Sigma Building was used for machining radionuclides for casting and powder metallurgy.

The industrial waste line consisted of two sections: the main industrial waste line south of Trinity Drive ran from former building D and the western industrial waste line ran from former building J-2 to its junction with the main industrial waste line outside the former TA-01 boundary. From the junction, the line ran north as a single unit to the former TA-45 waste treatment plant.

Currently, the area is developed and the SWMU is under an asphalt parking lot.

6.7.2 Relationship to Other SWMUs and AOCs

A portion of SWMU 01-002(a1)-00 ran parallel to SWMU 01-001(s1) within the former LA Inn property. Another portion of SWMU 01-002(a1)-00 lies within the boundaries of SWMU 01-007(a) and is close to where the drainline for SWMU 01-006(b) exited the southwest side of former building D, which was used to process plutonium.

6.7.3 Summary of Previous Investigations

The industrial waste line in former TA-01 was completely removed along with a substantial amount of contaminated soil associated with the industrial waste line during the Ahlquist radiological survey (Ahlquist et al. 1977, 005710, pp. 83, 90, 92, 94). In 1985, the last remnants of the industrial waste line between former TA-01 and the Acid Canyon outfall near former TA-45 were removed (Elder et al. 1986, 006666, p. 37). An interim action was conducted in 1990 at the route of the former industrial waste line

between Central Avenue and Rose Street at the Central School site in response to a request from Los Alamos schools (LANL 1990, 007501). No contamination was found.

A Phase I RFI was conducted in 1993 and 1994, and subsurface samples were collected at former buildings D, U, M, and Z and Loma Vista Drive properties. Samples analyzed at off-site fixed laboratories included 17 soil, fill, and tuff samples collected from 11 locations along the path of the pipeline at SWMU 01-002(a)-00 at depths of 1.42 to 20.5 ft.

- Samples from eight locations were analyzed for metals. Analytical results indicated that barium, calcium, lead, mercury, uranium, zinc were detected at concentrations greater than BVs in at least one sample between 1.42 and 20.5 ft bgs. Uranium was detected at a concentration within the range of the background concentrations in the only sample analyzed for uranium at one location. Barium, calcium, lead, and zinc were detected at concentrations greater than the range of the background concentrations.
- Samples from six locations were analyzed for SVOCs. Analytical results indicated that only bis(2-ethylhexyl)phthalate was detected in the deepest depth interval sampled between 9.0 and 9.5 ft bgs.
- Samples from three locations were analyzed for isotopic plutonium and isotopic uranium and the sample from one location was analyzed by gamma spectroscopy. Analytical results indicated that only plutonium-239 was detected in one sample between 4.0 and 8.0 ft bgs.

The majority of the Phase I RFI data are screening level data.

6.7.4 Site Contamination

6.7.4.1 Soil, Rock, and Sediment Sampling

As part of the investigation, the following characterization activities were conducted at SWMU 01-002(a1)-00:

- For the Phase I investigation, a total of six samples were collected from three locations. Samples were collected at location 00-603899 [where it line ran parallel to part of SWMU 01-001(s1) within the former LA Inn property] at depths of 1.25 to 2.25 ft bgs and 3.25 to 4.25 ft bgs (beneath the asphalt), at location 00-603901 [associated with SWMU 01-007(a)] at depths of 17.5 to 19.0 ft bgs and 20.0 to 21.0 ft bgs, and at location 00-604223 [associated with SWMU 01-006(b)] at depths of 15.0 to 16.0 ft bgs and 17.0 to 18.0 ft bgs. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, pH, and gamma-emitting radionuclides.
- For the Phase II investigation, two samples were collected at location 00-604223 at depths of 18.0 to 19.0 ft bgs and 19.0 to 20.0 bgs and analyzed for isotopic plutonium.

The sampling locations at SWMU 01-002(a1)-00 are shown in Figure 6.7-1. Table 6.7-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.7.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.7.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-002(a1)-00 consist of results from eight tuff samples collected from three locations.

Inorganic Chemicals

Six tuff samples were analyzed for TAL metals, nitrate, cyanide, and perchlorate. Because fewer than eight tuff samples were collected, statistical tests could not be performed on results for these media. Table 6.7-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.7-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Antimony was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had DLs (0.54 mg/kg and 0.61 mg/kg) above the BV in two samples. The DLs were only 0.04 mg/kg and 0.11 mg/kg above the BV and antimony was not detected in any samples (DLs below BV in the other four samples). Antimony is not a COPC.

Chromium was detected above the Qbt 2,3,4 BV (7.14 mg/kg) in two samples with a maximum concentration of 29.9 mg/kg. The concentrations were above the maximum Qbt 2,3,4 background concentration (13 mg/kg). Chromium is retained as a COPC.

Cyanide was detected above the Qbt 2,3,4 BV (0.5 mg/kg) in one sample at a concentration of 0.83 mg/kg and had DLs (0.53 mg/kg and 0.54 mg/kg) above the BV in three samples. Cyanide is retained as a COPC.

Lead was detected above the Qbt 2,3,4 BV (11.2 mg/kg) in one sample at a concentration of 11.9 mg/kg. The concentration was only 0.5 mg/kg above the BV and below the two highest Qbt 2,3,4 background concentrations (14.5 mg/kg and 15.5 mg/kg). Lead was not detected above BV in the other five samples. Lead is not a COPC.

Nickel was detected above the Qbt 2,3,4 BV (6.58 mg/kg) in one sample at a concentration of 14 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (7 mg/kg). Nickel is retained as a COPC.

Nitrate was detected in five samples with a maximum concentration of 4.9 mg/kg. Nitrate is naturally occurring, and the concentrations likely reflect naturally occurring levels. Nitrate is not a COPC.

Perchlorate was detected in one sample at a concentration of 0.0027 mg/kg. Perchlorate is retained as a COPC.

Selenium was not detected above the Qbt 2,3,4 BV (0.3 mg/kg) but had DLs (0.53 mg/kg, 0.54 mg/kg, and 0.61 mg/kg) above the BV in three samples. Selenium is retained as a COPC.

Organic Chemicals

Six tuff samples were analyzed for VOCs, SVOCs, and PCBs. Table 6.7-3 presents the organic chemicals detected. Figure 6.7-3 shows the spatial distribution of organic chemicals detected.

The organic chemicals detected at SWMU 01-002(a1)-00 include Aroclor-1260; benzene; bis(2-ethylhexyl)phthalate; tert-butylbenzene; 4,6-dinitro-2-methylphenol; isopropylbenzene; and methylene chloride. The detected organic chemicals are retained as COPCs.

Radionuclides

Six tuff samples were analyzed for americium-241, isotopic uranium, strontium-90, tritium, and gamma-emitting radionuclides and eight tuff samples were analyzed for isotopic plutonium. 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.

Plutonium-238 was detected in one tuff sample at an activity of 0.117 pCi/g. Plutonium-238 is retained as a COPC.

Plutonium-239/240 was detected in two tuff samples with a maximum activity of 0.476 pCi/g. Plutonium-239/240 is retained as a COPC.

Uranium-235/236 was detected above the Qbt 2,3,4 BV (0.09 pCi/g) in one sample at an activity of 0.167 pCi/g. Uranium-235/236 is retained as a COPC.

6.7.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at SWMU 01-002(a1)-00 are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-002(a1)-00 include chromium, cyanide, nickel, perchlorate, and selenium.

Chromium was detected above the Qbt 2,3,4 BV in two samples with a maximum concentration of 29.9 mg/kg. Concentrations increased with depth at locations 00-603899 and 00-604223 and increased laterally at location 03-603871, which is associated with SWMU 01-001(s1) (Figure 6.6-2). The residential and industrial total chromium SSLs were approximately 7 times and 37 times the concentration at location 00-603899 and 3 times and 17 times the maximum concentration. Because there was no known use of hexavalent chromium at this site, and site conditions would not have produced or promoted the formation of hexavalent chromium, the vast majority, if not all, of the total chromium detected consists of trivalent chromium. Given the preponderance of trivalent chromium versus hexavalent chromium, it is appropriate to use the trivalent chromium SSL in evaluating the total chromium results. The residential SSL for trivalent chromium was approximately 3910 times the maximum concentration. In addition, the residential cancer risk for chromium and the total excess cancer risk for the site were approximately 1×10^{-6}. Further sampling for extent of chromium is not warranted.

Cyanide was detected above the Qbt 2,3,4 BV in one sample at a concentration of 0.83 mg/kg and had DLs (0.53 mg/kg and 0.54 mg/kg) above the BV in three samples. Concentrations decreased with depth at location 00-603899 and did not change substantially (0.01 mg/kg) laterally at location 03-603871, which is associated with SWMU 01-001(s1) (Figure 6.6-2). The residential and industrial SSLs were approximately 14 times and 76 times the concentration and the residential SSL was approximately 21 times the maximum DL. Further sampling for extent of cyanide is not warranted.

Nickel was detected above the Qbt 2,3,4 BV in one sample at a concentration of 14 mg/kg. Concentrations increased with depth at location 00-604223 and decreased laterally. The residential SSL was approximately 111 times the concentration. Further sampling for extent of nickel is not warranted.

Perchlorate was detected in one sample at a concentration of 0.0027 mg/kg. Concentrations decreased with depth at location 00-603901 and increased laterally. The residential SSL was approximately 21,000 times the concentration. Further sampling for extent of perchlorate is not warranted.

Selenium was not detected above the Qbt 2,3,4 BV but had DLs (0.53 mg/kg, 0.54 mg/kg, and 0.61 mg/kg) above the BV in three samples. The residential SSL was approximately 641 times the maximum DL. Further sampling for extent of selenium is not warranted.

Organic Chemicals

Organic COPCs at SWMU 01-002(a1)-00 include Aroclor-1260; benzene; bis(2-ethylhexyl)phthalate; tert-butylbenzene; 4,6-dinitro-2-methylphenol; isopropylbenzene; and methylene chloride.

Aroclor-1260 was detected in one sample at a concentration of 0.0081 mg/kg. The concentration was below the EQL, decreased with depth at location 00-604223, and decreased laterally. The residential SSL was 300 times the concentration. The lateral and vertical extent of Aroclor-1260 are defined.

Benzene was detected in one sample at a concentration of 0.0002 mg/kg. The concentration was below the EQL, increased with depth at location 00-603901, and increased laterally. The residential SSL was 89,000 times the concentration. Further sampling for extent of benzene is not warranted.

Bis(2-ethylhexyl)phthalate was detected in one sample at a concentration of 0.075 mg/kg. The concentration was below the EQL, increased with depth at location 00-603901, and increased laterally. The residential SSL was approximately 5100 times the concentration. Further sampling for extent of bis(2-ethylhexyl)phthalate is not warranted.

Butylbenzene[tert-] was detected in one sample at a concentration of 0.00015 mg/kg. The concentration was below the EQL, increased with depth at location 00-603901, and increased laterally. The residential SSL was 52,000,000 times the concentration. Further sampling for extent of tert-butylbenzene is not warranted.

Dinitro-2-methylphenol[4,6-] was detected in one sample at a concentration of 0.41 mg/kg. The concentration was below the EQL, increased with depth at location 00-604223, and decreased laterally. The residential and industrial SSLs were approximately 12 times and 179 times the concentration. The lateral extent of 4,6-dinitro-2-methylphenol is defined, and further sampling for vertical extent is not warranted.

Isopropylbenzene was detected in one sample at a concentration of 0.00012 mg/kg. The concentration was below the EQL, decreased with depth at location 00-603901, and increased laterally. The residential SSL was approximately 19,667,000 times the concentration. The vertical extent of isopropylbenzene is defined, and further sampling for lateral extent is not warranted.

Methylene chloride was detected in three samples with a maximum concentration of 0.0064 mg/kg. Concentrations were below the EQL, decreased with depth at location 00-604223, and did not change substantially (0.0002 mg/kg) with depth at location 00-603899 and laterally (0.0007 mg/kg) at location 03-603871, which is associated with SWMU 01-001(s1) (Figure 6.6-3). The residential SSL was approximately 64,000 times the maximum concentration. Further sampling for extent of methylene chloride is not warranted.

Radionuclides

Radionuclide COPCs at SWMU 01-002(a1)-00 include plutonium-238, plutonium-239/240, and uranium-235/236.

Plutonium-238 was detected in one tuff sample at an activity of 0.117 pCi/g. The activities increased with depth at location 00-603899 and decreased laterally at location 03-603871, which is associated with SWMU 01-001(s1) (Figure 6.6-4). The residential SAL was approximately 718 times the activity at location 00-603899. Further sampling for extent of plutonium-238 is not warranted.

Plutonium-239/240 was detected in two tuff samples with a maximum activity of 0.476 pCi/g. The activities decreased with depth at location 00-604223, increased with depth at location 00-603899, and decreased laterally at locations 00-603901 and 03-603871, which is associated with SWMU 01-001(s1) (Figure 6.6-4). The residential SAL was approximately 648 times the activity at location 00-603899. Further sampling for extent of plutonium-239/240 is not warranted.

Uranium-235/236 was detected above the Qbt 2,3,4 BV in one sample at an activity of 0.167 pCi/g. The activities decreased with depth at location 00-603899 and decreased laterally at location 03-603871, which is associated with SWMU 01-001(s1) (Figure 6.6-4). The lateral and vertical extent of uranium-235/236 are defined.

6.7.5 Summary of Human Health Risk Screening

Industrial Scenario

The surface of SWMU 01-002(a1)-00 is either covered by asphalt as part of a parking lot for the adjacent buildings or was sampled at depths greater than 0.0 to 1.0 ft bgs. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest sample collected.

No carcinogenic COPCs were identified in the shallowest sample collected. The industrial HI is 0.01, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.03 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

No carcinogenic COPCs were identified for the construction worker scenario. The construction worker HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.06 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

The total excess cancer risk for the residential scenario is 1×10^{-6}, which is below the NMED target risk level of $1 \times 10–5$ (NMED 2015, 600915). The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Based on the risk-screening assessment results, no potential unacceptable risks and doses exist for the industrial, construction worker, and residential scenarios at SWMU 01-002(a1)-00.

6.7.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, and potential effects to populations (individuals for T&E species), no potential ecological risks exist at SWMU 01-002(a1)-00.

6.8 AOC 01-003(b1), Surface Disposal Area

6.8.1 Site Description and Operational History

AOC 01-003(b1) is part of a former surface disposal site [AOC 01-003(b)] for construction debris reported to be below the north rim of Los Alamos Canyon approximately 450 ft east of Bailey Bridge Canyon (LANL 1990, 007511). AOC 01-003(b1) is the portion of the surface disposal area located within the former LA Inn property (Figure 6.8-1). Several trips were made to locate the site, but the disposal area was not evident, although several pieces of metal piping were found, a few objects were found scattered over more than an acre on the hillside, and the portable beta/gamma instruments used to screen each object registered only background radiation.

Currently, the area is on undeveloped land.

6.8.2 Relationship to Other SWMUs and AOCs

AOC 01-003(b1) was originally part of AOC 01-003(b) and is northeast of newly designated AOC 01-003(b2).

6.8.3 Summary of Previous Investigations

No off-site fixed laboratory data are available for this AOC.

6.8.4 Site Contamination

6.8.4.1 Soil, Rock, and Sediment Sampling

As part of the investigation, the following characterization activities were conducted at AOC 01-003(b1):

- A total of eight samples were collected from locations 01-61501 and 01-61502. Samples were collected at depths of 0.0 to 1.0 ft bgs, 1.0 to 2.0 ft bgs and 2.0 to 3.0 ft bgs, and 3.0 to 4.0 ft bgs and analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, pH, and gamma-emitting radionuclides.
- Three additional samples were collected at location 01-61502 from 4.0 to 5.0 ft, 5.0 to 6.0 ft, and 6.0 to 7.0 ft and analyzed for isotopic plutonium.

The sampling locations at AOC 01-003(b1) are shown in Figure 6.8-1. Table 6.8-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.8.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.8.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at AOC 01-003(b1) consist of results from 11 samples (8 soil, 3 tuff) collected from 2 locations.

Inorganic Chemicals

Eight soil samples were analyzed for TAL metals, nitrate, cyanide, and perchlorate. Table 6.8-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.8-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Antimony was not detected above the soil BV (0.83 mg/kg) but had DLs (1.03 mg/kg to 1.14 mg/kg) above the BV in seven samples. The DLs were slightly above (0.03 mg/kg to 0.14 mg/kg) the maximum soil background concentration (1 mg/kg). Antimony was detected below BV in the other sample. Antimony is not a COPC.

Cadmium was not detected above the soil BV (0.4 mg/kg) but had DLs (0.517 mg/kg to 0.548 mg/kg) above the BV in seven samples. The DLs were only 0.117 mg/kg to 0.148 mg/kg above the BV, were below the highest background DL (2 mg/kg), and were below the three highest soil background concentrations (0.6 mg/kg, 1.4 mg/kg, and 2.6 mg/kg). Cadmium was detected below the BV in the other sample. Cadmium is not a COPC.

Calcium was detected above the soil BV (6120 mg/kg) in one sample at a concentration of 8790 mg/kg. The Gehan and quantile tests indicated site concentrations of calcium in soil are not statistically different from background (Figure F-7 and Table F-2). Calcium is not a COPC.

Copper was detected above the soil BV (14.7 mg/kg) in one sample at a concentration of 18.2 mg/kg. The Gehan and slippage tests indicated site concentrations of copper in soil are statistically different from background (Figure F-8 and Table F-2). Copper is retained as a COPC.

Lead was detected above the soil BV (22.3 mg/kg) in three samples with a maximum concentration of 147 mg/kg. The Gehan and quantile tests indicated site concentrations of lead in soil are statistically different from background (Figure F-9 and Table F-2). Lead is retained as a COPC.

Mercury was detected above the soil BV (0.1 mg/kg) in one sample at a concentration of 0.378 mg/kg. Mercury is retained as a COPC.

Nitrate was detected in four samples with a maximum concentration of 1.54 mg/kg. Nitrate is naturally occurring, and the concentrations likely reflect naturally occurring levels. Nitrate is not a COPC.

Perchlorate was detected in three samples with a maximum concentration of 0.00168 mg/kg. Perchlorate is retained as a COPC.

Zinc was detected above the soil BV (48.8 mg/kg) in three samples with a maximum concentration of 108 mg/kg. The Gehan and quantile tests indicated site concentrations of zinc in soil are statistically different from background (Figure F-10 and Table F-2). Zinc is retained as a COPC.

Organic Chemicals

Eight soil samples were analyzed for VOCs, SVOCs, and PCBs. Table 6.8-3 presents the detected organic chemicals. Figure 6.8-3 shows the spatial distribution of detected organic chemicals.

Organic chemicals detected at AOC 01-003(b1) include acetone; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene. The detected organic chemicals are retained as COPCs.

Radionuclides

Eight soil samples were analyzed for americium-241, isotopic plutonium, isotopic uranium, strontium-90, tritium, and gamma-emitting radionuclides, and three tuff samples were analyzed for isotopic plutonium. 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.

Americium-241 was detected above the soil FV (0.013 pCi/g) in one sample and detected in soil below 1.0 ft bgs in four samples with a maximum activity of 0.384 pCi/g. Americium-241 is retained as a COPC.

Cesium-137 was detected in one soil sample below 1.0 ft bgs at an activity of 0.121 pCi/g. Cesium-137 is retained as a COPC.

Plutonium-239/240 was detected above the soil FV (0.054 pCi/g) in two samples, detected in soil below 1.0 ft bgs in six samples, and detected in three tuff samples with a maximum activity of 21.5 pCi/g. Plutonium-239/240 is retained as a COPC.

6.8.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at AOC 01-003(b1) are discussed below.

Inorganic Chemicals

The inorganic COPCs at AOC 01-003(b1) include copper, lead, mercury, perchlorate, and zinc.

Copper was detected above the soil BV in one sample at a concentration of 18.2 mg/kg. Concentrations decreased with depth and increased laterally. The residential SSL was approximately 172 times the maximum concentration. The vertical extent of copper is defined, and further sampling for lateral extent is not warranted.

Lead was detected above the soil BV in three samples with a maximum concentration of 147 mg/kg. Concentrations decreased with depth at both locations and were below the maximum soil background concentration (28 mg/kg) at location 01-61502. Concentrations decreased laterally. The lateral and vertical extent of lead are defined.

Mercury was detected above the soil BV in one sample at a concentration of 0.378 mg/kg. Concentrations decreased with depth at location 01-61502. Concentrations increased laterally. The residential SSL was approximately 62 times the maximum concentration. The vertical extent of mercury is defined, and further sampling for lateral extent is not warranted.

Perchlorate was detected in three samples with a maximum concentration of 0.00168 mg/kg. Concentrations were below the estimated DLs and decreased with depth at location 01-61501. Concentrations decreased laterally. The lateral and vertical extent of perchlorate are defined.

Zinc was detected above the soil BV in three samples with a maximum concentration of 108 mg/kg. Concentrations decreased with depth at location 01-61501 and did not change substantially (1 mg/kg) with depth at location 01-61502. The concentrations above BV at location 01-61502 were below the

maximum soil background concentration (75.5 mg/kg). The residential SSL was approximately 217 times the maximum concentration. Concentrations decreased laterally. The lateral extent of zinc is defined and further sampling for vertical extent is not warranted.

Organic Chemicals

Organic COPCs at AOC 01-003(b1) include acetone; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene.

Acetone was detected in one sample at a concentration of 0.00206 mg/kg. The concentration was below the EQL and decreased with depth at location 01-61501. Concentrations decreased laterally. The lateral and vertical extent of acetone are defined.

Aroclor-1254 was detected in one sample at a concentration of 0.0296 mg/kg. The concentration was below the EQL and increased with depth at location 01-61502. Concentrations increased laterally. The residential and industrial SSLs were approximately 39 times and 389 times the concentration. Further sampling for extent of Aroclor-1254 is not warranted.

Aroclor-1260 was detected in eight samples with a maximum concentration of 0.0236 mg/kg. Concentrations did not change substantially (0.015 mg/kg and 0.016 mg/kg) with depth and laterally (0.004 mg/kg) at both locations. The residential and industrial SSLs were approximately 103 times and 487 times the maximum concentration. Further sampling for extent of Aroclor-1260 is not warranted.

Benzo(a)anthracene was detected in six samples with a maximum concentration of 0.0395 mg/kg. Concentrations decreased with depth at location 01-61501 and did not change substantially (0.0034 mg/kg) with depth at location 01-61502. Concentrations did not change substantially (0.0165 mg/kg) laterally. The residential and industrial SSLs were approximately 67 times and 1404 times the maximum concentration at location 01-61502. Further sampling for extent of benzo(a)anthracene is not warranted.

Benzo(a)pyrene was detected in six samples with a maximum concentration of 0.0399 mg/kg. Concentrations decreased with depth at location 01-61501 and did not change substantially (0.0026 mg/kg) with depth at location 01-61502. Concentrations did not change substantially (0.0194 mg/kg) laterally. The residential and industrial SSLs were approximately 7.5 times and 158 times the maximum concentration at location 01-61502. Further sampling for extent of benzo(b)pyrene is not warranted.

Benzo(b)fluoranthene was detected in seven samples with a maximum concentration of 0.049 mg/kg. Concentrations decreased with depth at location 01-61501 and did not change substantially (approximately 0.02 mg/kg) with depth at location 01-61502. Concentrations did not change substantially (0.0039 mg/kg) laterally. The residential and industrial SSLs were approximately 51 times and 1084 times the maximum concentration at location 01-61502. Further sampling for extent of benzo(b)fluoranthene is not warranted.

Benzo(g,h,i)perylene was detected in four samples with a maximum concentration of 0.0236 mg/kg. Concentrations decreased with depth at location 01-61501 and did not change substantially (approximately 0.0058 mg/kg) with depth at location 01-61502. Concentrations did not change substantially (0.0057 mg/kg) laterally. The residential SSL was approximately 97,200 times the maximum concentration at location 01-61502. Further sampling for extent of benzo(g,h,i)perylene is not warranted.

Benzo(k)fluoranthene was detected in two samples with a maximum concentration of 0.0185 mg/kg. Concentrations decreased with depth at both locations. Concentrations did not change substantially (0.0052 mg/kg) laterally. The residential SSL was approximately 827 times the maximum concentration. The vertical extent of benzo(k)fluoranthene is defined and further sampling for lateral extent is not warranted.

Chrysene was detected in five samples with a maximum concentration of 0.0417 mg/kg. Concentrations decreased with depth at location 01-61501 and did not change substantially (approximately 0.0021 mg/kg) with depth at location 01-61502. Concentrations did not change substantially (0.0231 mg/kg) laterally. The residential SSL was approximately 3669 times the maximum concentration. Further sampling for extent of chrysene is not warranted.

Fluoranthene was detected in seven samples with a maximum concentration of 0.0657 mg/kg. Concentrations decreased with depth at location 01-61501 and did not change substantially (approximately 0.012 mg/kg) with depth at location 01-61502. Concentrations did not change substantially (0.0177 mg/kg) laterally. The residential SSL was approximately 35,312 times the maximum concentration. Further sampling for extent of fluoranthene is not warranted.

Indeno(1,2,3-cd)pyrene was detected in one sample at a concentration of 0.0218 mg/kg. The concentration was below the EQL and decreased with depth at location 01-61501. Concentrations decreased laterally. The residential and industrial SSLs were approximately 70 times and 1482 times the maximum concentration. The lateral and vertical extent of indeno(1,2,3-cd)pyrene are defined.

Phenanthrene was detected in two samples with a maximum concentration of 0.0381 mg/kg. Concentrations decreased with depth at both locations. Concentrations did not change substantially (0.0248 mg/kg) laterally. The residential SSL was approximately 45,700 times the maximum concentration. The vertical extent of phenanthrene is defined, and further sampling for lateral extent is not warranted.

Pyrene was detected in six samples with a maximum concentration of 0.0686 mg/kg. Concentrations decreased with depth at location 01-61501 and did not change substantially (0.013 mg/kg) with depth at location 01-61502. Concentrations did not change substantially (0.0375 mg/kg) laterally. The residential SSL was approximately 25,364 times the maximum concentration. Further sampling for extent of pyrene is not warranted.

Radionuclides

Radionuclide COPCs at AOC 01-003(b1) include americium-241, cesium-137, and plutonium-239/240.

Americium-241 was detected above the soil FV in one sample and detected in soil below 1.0 ft bgs in four samples with a maximum activity of 0.384 pCi/g. Activities decreased with depth at location 01-65101 and increased with depth at location 01-61502. The residential SAL was approximately 216 times the maximum activity. Activities decreased downgradient at location 01-614802 within SWMU 01-006(b) (Plate 2). The lateral extent of americium-241 is defined and further sampling for vertical extent is not warranted.

Cesium-137 was detected in one soil sample below 1.0 ft bgs at an activity of 0.121 pCi/g. Activities decreased with depth at location 01-61501 and decreased laterally. The lateral and vertical extent of cesium-137 are defined.

Plutonium-239/240 was detected above the soil FV in two samples, detected in soil below 1.0 ft bgs in six samples, and detected in three tuff samples with a maximum activity of 21.5 pCi/g. Activities decreased with depth at both locations. Activities decreased downgradient at location 01-614802 within SWMU 01-006(b) (Plate 2). The residential and industrial SALs were approximately 3.7 times and 56 times the maximum activity. The lateral and vertical extent of plutonium-239/240 are defined.

6.8.5 Summary of Human Health Risk Screening

Industrial Scenario

The total excess cancer risk for the industrial scenario is 8×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.0004, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.02 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

The total excess cancer risk for the industrial scenario is 2×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

The total excess cancer risk for the residential scenario is 3×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.3, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 4 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Based on the risk-screening assessment results, no potential unacceptable risks and doses exist for the industrial, construction worker, and residential scenarios at AOC 01-003(b1).

6.8.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), and LOAEL analyses, no potential ecological risks exist at AOC 01-003(b1).

6.9 SWMU 01-006(b), Drainline and Outfall

6.9.1 Site Description and Operational History

SWMU 01-006(b) consists of a drainline and outfall that served former building D, which was used to process plutonium (Figure 6.9-1). The drainline exited the southwest side of the building and extended southwest and then south before discharging into Los Alamos Canyon. The types and quantities of fluids handled by this drainline are not known. During the excavation of the areas in and around former buildings D and D-2, all drainlines were removed along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64).

Currently, the area is undeveloped.

6.9.2 Relationship to Other SWMUs and AOCs

The former drainline and outfall of SWMU 01-006(b) were entirely within the boundary of SWMU 01-007(a).

6.9.3 Summary of Previous Investigations

The drainline of SWMU 01-006(b) was removed during the Ahlquist radiological survey. In addition, almost 9000 m^3 of soil was removed from the buildings D and D-2 areas (Ahlquist et al. 1977, 005710, p. 40).

In 1992 and 1993, a Phase I RFI was conducted in the area of SWMU 01-007(a), within which SWMU 01-006(b) lies.

No off-site fixed-laboratory data are available for this SWMU.

6.9.4 Site Contamination

6.9.4.1 Soil, Rock, and Sediment Sampling

As part of the investigation, the following characterization activities were conducted at SWMU 01-006(b):

- For the Phase I investigation, a total of 11 samples were collected from 5 locations. Samples were collected from 0.0 to 1.0 ft bgs and 1.0 to 2.0 ft bgs at locations 00-604224 and 00-604225; 0.0 to 1.0 ft bgs and 1.25 to 2.25 ft bgs at location 00-604226; 0.0 to 1.0 ft bgs, 2.0 to 3.0 ft bgs, and 4.0 ft to 5.0 ft bgs at location 00-604237; and 15.0 to 16.0 ft bgs and 17.0 to 18.0 ft bgs at location 00-604223. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.
- For the Phase II investigation, deeper samples were collected from all previous locations and analyzed for isotopic plutonium; samples from locations 00-604225 and 00-604237 were also analyzed for americium-241. Samples were also collected at 12 new locations from either 0.0 to 1.0 ft bgs and 4.0 to 5.0 ft bgs or 0.0 to 1.0 ft bgs, 4.0 to 5.0 ft bgs, and 6.0 to 7.0 ft bgs and analyzed for isotopic plutonium; samples from locations 01-614801, 01-614802, and 00-614803 were also analyzed for americium-241.
- Plutonium-239/240 activities exceeded the residential SAL at locations 00-604224, 00-604225, and 00-604237, with a maximum activity of 1030 pCi/g in the 2.0 to 3.0 ft bgs sample at location 00-604237. Soil removal was conducted at these three locations as part of the Phase II investigation to reduce plutonium-239/240 activities to below the residential SAL. Excavations were from 0.0 to 1.0 ft bgs at location 00-604224, 0.0 to 4.0 ft bgs at location 00-604225, and 0.0 to 6.0 ft bgs at location 00-604237. Deeper samples were collected at 00-604225 and 00-604237 and analyzed for americium-241 and isotopic plutonium.
- Investigation in 2013 resulted in samples collected from 8 locations (locations 01-201 through 01-208) at depths of 0.0 to 1.0 ft bgs, 3.0 to 4.0 ft bgs, 5.0 to 6.0 ft bgs, 7.0 to 8.0 ft bgs, and 9.0 to 10.0 ft bgs. Samples were analyzed for isotopic plutonium.

- Investigation in 2016 resulted in excavation of contaminated media at five locations on the canyon slope outside of the former LA inn property boundary. Plutonium-239/240 activities were elevated at locations 01-12, 01-13, 01-14, 01-204, and 01-208. The larger excavation encompassing locations 01-12, 01-13, 01-14, 00-604224, and 01-208 had dimensions of 13 ft wide × 13 ft long × 10 ft deep; the smaller excavation, at and around location 01-204, had dimensions of 2.5 ft × 4.5 ft × 5 ft. The larger excavation was bounded by locations 01-201, 01-203, 01-205, and 01-207. Because of the depth of the larger excavation, all previously collected samples at locations 01-12, 01-13, and 00-604224 were excavated (plutonium-239/240 activities decreased with depth and were below the residential SAL at depths less than 10 ft bgs at these sampling locations), while previously collected samples from 0.0 to 1.0 ft bgs and 4.0 to 5.0 ft bgs at location 01-14 and from 5.0 to 6.0 ft bgs, 7.0 to 8.0 ft bgs, and 9.0 to 10.0 ft bgs at location 01-208 were excavated. Confirmation samples were collected from depths of 10.0 to 11.0 ft bgs, 12.0 to 13.0 ft bgs, and 14.0 to 15.0 ft bgs at locations 01-14 and 01-208. The smaller excavation resulted in previously collected samples from 0.0 to 1.0 ft bgs and 3.0 to 4.0 ft bgs at location 01-204 being removed; no additional samples were collected at location 01-204 because deeper samples were available from 5.0 to 6.0 ft bgs, 7.0 to 8.0 ft bgs, and 9.0 to 10.0 ft bgs. Samples were also collected at location 01-254 from 0.0 to 1.0 ft bgs, 3.0 to 4.0 ft bgs, 5.0 to 6.0 ft bgs, 7.0 to 8.0 ft bgs, and 9.0 to 10.0 ft bgs. The area at and around location 01-204 (2.5 ft × 4.5 ft × 5 ft) was remediated as much as was feasible but was limited by topography, terrain, and vegetation. Samples were analyzed for isotopic plutonium.
- As part of the 2016 investigation, additional samples were collected at one new location (LA-61504) from 10.5 to 11.5 ft bgs, 12.5 to 13.5 ft bgs, and 14.5 to 15.5 ft bgs. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.

The sampling locations at SWMU 01-006(b) are shown in Figure 6.9-1. Table 6.9-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.9.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.9.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-006(b) consist of results from 83 samples (18 soil, 65 tuff) collected from 24 locations.

Inorganic Chemicals

Seven samples (one soil, six tuff) were analyzed for TAL metals, cyanide, nitrate, and perchlorate. Because fewer than eight soil and tuff samples were collected, statistical tests could not be performed on results for these media. Table 6.9-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.9-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Antimony was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had DLs (0.54 mg/kg to 1.04 mg/kg) above the BV in four samples. Antimony is retained as a COPC.

Barium was detected above the Qbt 2,3,4 BV (46 mg/kg) in one sample at a concentration of 102 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (51.6 mg/kg). Barium is retained as a COPC.

Beryllium was detected above the Qbt 2,3,4 BV (1.21 mg/kg) in two samples with a maximum concentration of 1.61 mg/kg. One concentration was only 0.04 mg/kg above the BV and similar to or below the two highest Qbt 2,3,4 background concentrations (1.2 mg/kg and 1.8 mg/kg). The other concentration was below the maximum Qbt 2,3,4 background concentration (1.8 mg/kg). Beryllium was detected below the soil and Qbt 2,3,4 BVs in the other five samples. Beryllium is not a COPC.

Chromium was detected above the Qbt 2,3,4 BV (7.14 mg/kg) in one sample at a concentration of 29.9 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (13 mg/kg). Chromium is retained as a COPC.

Copper was detected above the Qbt 2,3,4 BV (4.66 mg/kg) in one sample at a concentration of 4.7 mg/kg. The concentration was only 0.04 mg/kg above the BV and was below the two highest Qbt 2,3,4 background concentrations (5.7 mg/kg and 6.2 mg/kg). Copper was detected below the soil and Qbt 2,3,4 BVs in the other five samples. Copper is not a COPC.

Cyanide was detected above the Qbt 2,3,4 BV (0.5 mg/kg) in one tuff sample at a concentration of 0.62 mg/kg and had a DL (0.54 mg/kg) above the BV in one sample. Cyanide is retained as a COPC.

Lead was detected above the Qbt 2,3,4 BV (11.2 mg/kg) in one tuff sample at a concentration of 21.2 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (15.5 mg/kg). Lead is retained as a COPC.

Nickel was detected above the Qbt 2,3,4 BVs (6.58 mg/kg) in three tuff samples with a maximum concentration of 14 mg/kg. The concentrations were above the maximum Qbt 2,3,4 background concentrations (7 mg/kg). Nickel is retained as a COPC.

Nitrate was detected in seven samples with a maximum concentration of 4.9 mg/kg. Nitrate is naturally occurring, and the concentrations likely reflect naturally occurring levels. Nitrate is not a COPC.

Perchlorate was detected in one sample at a concentration of 0.00101 mg/kg. Perchlorate is retained as a COPC.

Selenium was detected above the Qbt 2,3,4 BV (0.3 mg/kg) in three samples with a maximum concentration of 1.44 mg/kg and had DLs (0.51 mg/kg, 0.53 mg/kg, and 0.54 mg/kg) above the BV in three samples. Selenium is retained as a COPC.

Organic Chemicals

Seven samples (1 soil, 6 tuff) were analyzed for VOCs, SVOCs, and PCBs. Table 6.9-3 presents the detected organic chemicals. Figure 6.9-3 shows the spatial distribution of detected organic chemicals.

Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are a class of SVOCs frequently detected as a result of environmental sampling but generally were not released from the SWMUs or AOCs being investigated. PAHs unrelated to site activities are thus often detected in samples analyzed for the presence of site-related SVOCs.

PAHs are known to be widely distributed in the environment from a number of sources, both natural, such as forest fires, and anthropogenic, such as combustion of fossil fuels, oil drips off motor vehicles, vehicle tires, coal tar pitch, and weathering or eroding of asphalt pavement (Kose et al. 2008, 219977; Teaf 2008, 219976). PAHs from these sources generally occur as complex mixtures, not as single compounds. Individual PAH compounds can be manufactured for research purposes and some PAHs (e.g., anthracene, fluorene, naphthalene, and pyrene) are used in dye production, in the manufacture of synthetic fibers, and in plastics and pesticides.

The principal sources of PAHs in soil along parking lots, roads and highways are vehicular exhaust and emissions, the wearing of tires, and asphalt. PAH-containing materials, such as asphalt and rubber particles, do not easily dissolve in water, thus preventing migration, except as suspended particles in storm water. PAH concentrations in excess of soil cleanup levels may result from common anthropogenic sources such as runoff from asphalt-paved areas (e.g., roads and parking areas).

Site Activities

SWMU 01-006(b) was identified as a SWMU because it was a drainline and outfall that served former building D, which was used to process plutonium. The drainline exited the southwest side of the building and extended southwest and then south before discharging into Los Alamos Canyon. The types and quantities of fluids handled by this drainline are not known. During the excavation of the areas in and around former buildings D and D-2, all drainlines were removed along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). Currently, the site has been covered with fill material.

Former building D was used to process plutonium. The effluent from the outfall would be solely or primarily radioactively contaminated wastewater. Operations within former building D did not use or produce PAHs. Much of the natural mesa-top soil in former TA-01 has been replaced by fill material during various remediation, construction, and landscaping activities (LANL 2006, 091915; LANL 2006, 091916). During the Ahlquist radiological survey, contaminated soil was excavated in the areas of buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70) along with the drainline associated with the SWMU. The site is within the area of SWMU 01-007(a) on the bench area below the mesa top and is covered with fill material of unknown origin by a previous property owner and was deposited after the removal of the drainline and former building D (Figure H-1). The fill contains debris, including pieces of asphalt and concrete, and has been subject to runoff and erosion (Figures H-2 and H-3). Runoff from the mesa top area, which is paved with asphalt, and is a commercially developed area (Figures H-4 and H-5), and the fill covered bench area crosses the SWMU before entering Los Alamos Canyon. The bench area has been disturbed as a result of recent remediation activities (Figure H-6). Best management practices have been installed and the slope has been hydroseeded following recent field activities. The runoff is not a regulated component of the SWMU because there is no management of solid waste and is not the result of operational activities. In the samples collected from the outfall area, PAHs were either not detected or only one PAH [benzo(g,h,i)perylene] was detected below the EQL. PAHs were detected in surface samples collected from the slope below the outfall but not in deeper samples. The nature of the PAHs detected in samples used to characterize this site (i.e., in surface samples on the canyon slope) 40 yr after the removal of the drainline and former building D and the presence of pieces of asphalt within the fill material indicate the PAHs are not site-related. Therefore, benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; phenanthrene; and pyrene are not COPCs.

Organic COPCs

Other organic chemicals detected at SWMU 01-006(b) include Aroclor-1254; Aroclor-1260; bis(2-ethylhexyl)phthalate; 4,6-dinitro-2-methylphenol; and methylene chloride. The detected organic chemicals listed are retained as COPCs.

Radionuclides

Seven samples (1 soil, 6 tuff) were analyzed for isotopic uranium, strontium-90, tritium, and gamma-emitting radionuclides, 20 samples (4 soil, 16 tuff) were analyzed for americium-241, and 83 samples (18 soil, 65 tuff) were analyzed for isotopic plutonium. Table 6.9-4 presents the radionuclides detected or detected above background. Plate 2 shows the spatial distribution of radionuclides detected or detected above background.

Americium-241 was detected above the soil BV (0.013 pCi/g) in three surface samples with a maximum activity of 0.116 pCi/g. Americium-241 is retained as a COPC.

Plutonium-238 was detected above the soil BV (0.023 pCi/g) in four surface samples and detected in eight tuff samples with a maximum activity of 0.381 pCi/g. Plutonium-238 is retained as a COPC.

Plutonium-239/240 was detected above the soil BV (0.054 pCi/g) in 17 surface samples, detected in 1 soil sample below 1.0 ft bgs, and detected in 55 tuff samples with a maximum activity of 138 pCi/g. Plutonium-239 is retained as a COPC.

6.9.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at SWMU 01-006(b) are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-006(b) include antimony, barium, chromium, cyanide, lead, nickel, perchlorate, and selenium.

Antimony was not detected above the Qbt 2,3,4 BV but had DLs (0.54 mg/kg to 1.04 mg/kg) above the BV in four samples. The residential SSL was approximately 30 times the maximum DL. Further sampling for extent of antimony is not warranted.

Barium was detected above the Qbt 2,3,4 BV in one sample at a concentration of 102 mg/kg. Concentrations decreased with depth at location LA-61504 and decreased downgradient. The lateral and vertical extent of barium are defined.

Chromium was detected above the Qbt 2,3,4 BV in one sample at a concentration of 29.9 mg/kg. Concentrations increased with depth at location 00-604223 and decreased downgradient. The residential and industrial total chromium SSLs were approximately 3 times and 17 times the maximum concentration. Because there was no known use of hexavalent chromium at this site, and site conditions would not have produced or promoted the formation of hexavalent chromium, the vast majority, if not all, of the total chromium detected consists of trivalent chromium. Given the preponderance of trivalent chromium versus hexavalent chromium, it is appropriate to use the trivalent chromium SSL in evaluating the total chromium results. The residential SSL for trivalent chromium was approximately 3910 times the maximum concentration. In addition, chromium does not contribute to the residential cancer risk and the total excess cancer risk for the site because the only concentration above a BV was in a sample from 17.0 to

18.0 ft bgs, which is below the exposure depth. The lateral extent of chromium is defined, and further sampling for vertical extent is not warranted.

Cyanide was detected above the Qbt 2,3,4 BV in one tuff sample at a concentration of 0.62 mg/kg and had a DL (0.54 mg/kg) above the BV in one sample. Concentrations increased with depth at location 00-604226 and increased downgradient. The residential and industrial SSLs were approximately 18 times and 102 times the concentration and the residential SSL was approximately 21 times maximum DL. Further sampling for extent of cyanide is not warranted.

Lead was detected above the Qbt 2,3,4 BV in one tuff sample at a concentration of 21.2 mg/kg. Concentrations did not change substantially (2.7 mg/kg) with depth at location 00-604226 (concentration in the shallower sample was 18.5 mg/kg and below the soil BV [Appendix E, Inorganic Pivot Table]) and increased downgradient. The residential and industrial SSLs were approximately 19 times and 38 times the maximum concentration (approximately 379 mg/kg and 779 mg/kg below the SSLs). Further sampling for extent of lead is not warranted.

Nickel was detected above the Qbt 2,3,4 BV in three tuff samples with a maximum concentration of 14 mg/kg. Concentrations decreased with depth at location LA-061504, increased with depth at locations 00-604223 and 00-604226, and decreased downgradient. The residential SSL was approximately 111 times the maximum concentration. The lateral extent of nickel is defined and further sampling for vertical extent is not warranted.

Perchlorate was detected in one sample at a concentration of 0.00101 mg/kg. Concentrations decreased with depth at location LA-61504 and decreased downgradient. The lateral and vertical extent of perchlorate are defined.

Selenium was detected above the Qbt 2,3,4 BV in three samples with a maximum concentration of 1.44 mg/kg and had DLs (0.51 mg/kg, 0.53 mg/kg, and 0.54 mg/kg) above the BV in three samples. Concentrations did not change substantially (0.3 mg/kg) with depth at location LA-61504 and decreased downgradient. The residential SSL was approximately 272 times the maximum concentration and approximately 724 times the maximum DL. The lateral extent of selenium is defined and further sampling for vertical extent is not warranted.

Organic Chemicals

Organic COPCs at SWMU 01-006(b) include Aroclor-1254; Aroclor-1260; bis(2-ethylhexyl)phthalate; 4,6-dinitro-2-methylphenol; and methylene chloride.

Aroclor-1254 was detected in one sample at a concentration of 0.037 mg/kg. Concentrations decreased with depth at location 00-604226, were below the EQL, and increased downgradient. The residential and industrial SSLs were approximately 31 times and 310 times the maximum concentration. The vertical extent of Aroclor-1254 is defined, and further sampling for lateral extent is not warranted.

Aroclor-1260 was detected in three samples with a maximum concentration of 0.033 mg/kg. Concentrations decreased with depth at locations 00-604223 and 00-604226, were below the EQLs, and did not change substantially (0.0249 mg/kg) downgradient. The residential and industrial SSLs were approximately 74 times and 348 times the maximum concentration. The vertical extent of Aroclor-1260 is defined, and further sampling for lateral extent is not warranted.

Bis(2-ethylhexyl)phthalate was detected in three samples with a maximum concentration of 0.401 mg/kg. Concentrations did not change substantially (0.08 mg/kg) with depth at location 01-61504 and decreased downgradient. The residential SSL was approximately 948 times the maximum concentration. The lateral extent of bis(2-ethylhexyl)phthalate is defined, and further sampling for vertical extent is not warranted.

Dinitro-2-methylphenol[4,6-] was detected in one sample at a concentration of 0.41 mg/kg. The concentration increased with depth at location 00-604223, was below the EQL, and decreased downgradient. The residential and industrial SSLs were approximately 12 times and 179 times the concentration. The lateral extent of 4,6-dinitro-2-methylphenol is defined, and further sampling for vertical extent is not warranted.

Methylene chloride was detected in one sample at a concentration of 0.0064 mg/kg. The concentration decreased with depth at location 00-604223, was below the EQL, and decreased downgradient. The lateral and vertical extent of methylene chloride are defined.

Radionuclides

Radionuclide COPCs at SWMU 01-006(b) include americium-241, plutonium-238, and plutonium-239/240.

Americium-241 was detected above the soil BV in three surface samples with a maximum activity of 0.116 pCi/g. Activities decreased with depth at location 00-604226 and did not change substantially (0.061 pCi/g) downgradient. The residential SAL was approximately 716 times the maximum activity. The vertical extent of americium-241 is defined, and further sampling for lateral extent is not warranted.

Plutonium-238 was detected above the soil BV in four surface samples and detected in eight tuff samples with a maximum activity of 0.381 pCi/g. Activities decreased with depth at locations 01-202, 01-203, 01-205, 01-208, and 01-254 and did not change substantially (0.047 pCi/g and 0.024 pCi/g) with depth at locations 01-14 and 01-201. The residential SAL was approximately 948 times the maximum activity at these two locations. Activities decreased downgradient. The lateral extent of plutonium-238 is defined, and further sampling for vertical extent is not warranted.

Plutonium-239/240 was detected above the soil BV in 17 surface samples, detected in 1 soil sample below 1.0 ft bgs, and detected in 55 tuff samples with a maximum activity of 138 pCi/g. Activities decreased with depth at 21 locations, including location 01-208 where the maximum activity was detected, and did not change substantially (0.55 pCi/g and 0.56 pCi/g) with depth at locations 01-18 and 01-19, respectively. (Note: Locations 00-604225, 00-604237, 01-14, 01-204, and 01-208 have been excavated.) The area at and around location 01-204 (2.5 ft × 4.5 ft × 5 ft) was remediated but was limited by topography, terrain, and vegetation. Activities decreased downgradient of location 01-204 in SWMU 01-007(a) (Plate 4). The residential SAL was approximately 85 times the maximum activity at these 2 locations. Activities decreased downgradient. The lateral extent of plutonium-239/240 is defined, and further sampling for vertical extent is not warranted.

6.9.5 Summary of Human Health Risk Screening

Industrial Scenario

The total excess cancer risk for the industrial scenario is 6×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). No noncarcinogenic COPCs were identified in the 0.0- to 1.0-ft depth interval. The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

The total excess cancer risk for the construction worker scenario is 4×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

The total excess cancer risk for the residential scenario is 1×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 4 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

6.9.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), and LOAEL analyses, no potential ecological risks exist at SWMU 01-006(b).

6.10 SWMU 01-006(c), Drainlines and Outfalls

6.10.1 Site Description and Operational History

SWMU 01-006(c) consists of possibly four drainlines and two outfalls that served former building D-2 (Figure 6.10-1). Former building D-2 served as the facility for laundering radioactively contaminated clothing and recyclable equipment for the entire TA from 1943 to 1945. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of former buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). The drainlines exited the southwest side of the former building and discharged directly onto Hillside 137. The two drainlines and outfall at the southeast end of the former building were indicated on engineering drawings but were not located when trenching was conducted in the building D-2 area (Ahlquist et al. 1977, 005710, p. 49). The two drainlines and outfall at the southwest end of the building were encountered during trenching and were removed (Ahlquist et al. 1977, 005710, p. 49).

SWMU 01-006(c), including all four drainlines (those located and those not located), is shown in Figure 6.10-1. Currently, the site has been covered with fill material and is undeveloped.

6.10.2 Relationship to Other SWMUs and AOCs

The former drainlines and outfalls of SWMU 01-006(c) were within the boundary of SWMU 01-007(b).

6.10.3 Summary of Previous Investigations

In 1992 and 1993, a Phase I RFI was conducted in the area of SWMU 01-007(b), within which SWMU 01-006(c) lies.

No off-site fixed-laboratory data are available for this SWMU.

6.10.4 Site Contamination

6.10.4.1 Soil, Rock, and Sediment Sampling

As part of the investigation, the following characterization activities were conducted at SWMU 01-006(c):

- For the Phase I investigation, a total of two samples were collected from one location. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, pH, and gamma-emitting radionuclides.
- As part of the Phase II investigation, subsurface samples were collected at previously sampled location 00-603783 at depths of 5.0 to 6.0 ft bgs and 7.0 to 8.0 ft bgs to define the vertical extent of contamination. Samples were analyzed for chromium, nickel, isotopic plutonium, methylene chloride, and SVOCs.

The sampling location at SWMU 01-006(c) is shown in Figure 6.10-1. Table 6.10-1 presents the samples collected and analyses requested. The geodetic coordinates of the sampling location is presented in Table 3.1-1.

6.10.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.10.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-006(c) consist of results from four samples (one soil, three tuff) collected from one location.

Inorganic Chemicals

Two samples (one soil, one tuff) were analyzed for TAL metals, nitrate, cyanide, and perchlorate. Two tuff samples were analyzed for chromium and nickel. Because fewer than eight soil and tuff samples were collected, statistical tests could not be performed on results for these media. Table 6.10-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.10-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Barium was detected above the Qbt 2,3,4 BV (46 mg/kg) in one sample at a concentration of 82.1 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (51.6 mg/kg). Barium is retained as a COPC.

Chromium was detected above the Qbt 2,3,4 BV (7.14 mg/kg) in one sample at a concentration of 29.2 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (13 mg/kg). Chromium is retained as a COPC.

Cobalt was detected above the soil BV (8.64 mg/kg) in one sample at a concentration of 8.8 mg/kg. The concentration was 0.16 mg/kg above the BV and below the maximum soil background concentration (9.5 mg/kg). Cobalt was detected below the Qbt 2,3,4 BV (3.14 mg/kg) in the other sample and was not detected above BVs downgradient within SWMU 01-007(b) (Figure 6.14-2). Cobalt is not a COPC.

Cyanide was not detected above the soil and Qbt 2,3,4 BVs (0.5 mg/kg for both) but had DLs (0.52 mg/kg and 0.53 mg/kg) above the BVs in two samples. The DLs were only 0.02 mg/kg and 0.03 mg/kg above the BVs. Cyanide is not a COPC.

Lead was detected above the soil BV (22.3 mg/kg) in one sample at a concentration of 67.9 mg/kg. The concentration was above the maximum soil background concentration (28 mg/kg). Lead is retained as a COPC.

Manganese was detected above the soil BV (671 mg/kg) in one sample at a concentration of 764 mg/kg. The concentration was below the maximum soil background concentration (1100 mg/kg). Manganese was detected below the Qbt 2,3,4 BV (482 mg/kg) in the other sample and was not detected above BVs downgradient within SWMU 01-007(b) (Figure 6.14-2). Manganese is not a COPC.

Nickel was detected above the Qbt 2,3,4 BV (6.58 mg/kg) in one sample at a concentration of 15.8 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (7 mg/kg). Nickel is retained as a COPC.

Nitrate was detected in one sample at a concentration of 0.34 mg/kg. Nitrate is naturally occurring and the concentration likely reflects naturally occurring levels of nitrate. Nitrate is not a COPC.

Perchlorate was detected in one sample at a concentration of 0.0025 mg/kg. Perchlorate is retained as a COPC.

Selenium was not detected above the soil and Qbt 2,3,4 BVs (1.52 mg/kg and 0.3 mg/kg) but had DLs (2.6 mg/kg and 0.53 mg/kg) above the soil and Qbt 2,3,4 BVs in one sample each, respectively. Selenium is retained as a COPC.

Thallium was not detected above the soil BV (0.73 mg/kg) but had a DL (1 mg/kg) above the BV. The DL was equal to the maximum soil background concentration (1 mg/kg). Thallium was not detected in the other sample with a DL below the Qbt 2,3,4 BV (1.1 mg/kg) and was also not detected above BVs in downgradient samples within SWMU 01-007(b) (Figure 6.14-2). Thallium is not a COPC.

Zinc was detected above the soil BV (48.8 mg/kg) in one sample at a concentration of 76.7 mg/kg. The concentration was above the maximum soil background concentration (75.5 mg/kg). Zinc is retained as a COPC.

Organic Chemicals

Two samples (one soil, one tuff) were analyzed for VOCs, SVOCs, and PCBs. Two tuff samples were analyzed for methylene chloride and SVOCs. Table 6.10-3 presents the detected organic chemicals. Figure 6.10-3 shows the spatial distribution of detected organic chemicals.

PAHs

PAHs are a class of SVOCs frequently detected as a result of environmental sampling but generally were not released from the SWMUs or AOCs being investigated. PAHs unrelated to site activities are thus often detected in samples analyzed for the presence of site-related SVOCs.

PAHs are known to be widely distributed in the environment from a number of sources, both natural, such as forest fires, and anthropogenic, such as combustion of fossil fuels, oil drips off motor vehicles, vehicle tires, coal tar pitch, and weathering or eroding of asphalt pavement (Kose et al. 2008, 219977; Teaf 2008, 219976). PAHs from these sources generally occur as complex mixtures, not as single compounds. Individual PAH compounds can be manufactured for research purposes and some PAHs (e.g.,

anthracene, fluorene, naphthalene, and pyrene) are used in dye production, in the manufacture of synthetic fibers, and in plastics and pesticides.

The principal sources of PAHs in soil along parking lots, roads, and highways are vehicular exhaust and emissions, the wearing of tires, and asphalt. PAH-containing materials, such as asphalt and rubber particles, do not easily dissolve in water, thus preventing migration, except as suspended particles in storm water. PAH concentrations in excess of soil cleanup levels may result from common anthropogenic sources such as runoff from asphalt-paved areas (e.g., roads and parking areas).

Site Activities

SWMU 01-006(c) was identified as a SWMU because it consists of possibly four drainlines and outfalls that served former building D-2. Building D-2 served as the facility for laundering radioactively contaminated clothing and recyclable equipment for the entire TA from 1943 to 1945. The drainlines exited the southwest side of the building and discharged directly onto Hillside 137. The two drainlines at the southeast end of the building were indicated on engineering drawings but were not located when trenching was conducted in the building D-2 area (Ahlquist et al. 1977, 005710, p. 49). The two drainlines at the southwest end of the building were encountered during trenching and were removed (Ahlquist et al. 1977, 005710, p. 49). During the Ahlquist radiological survey, contaminated soil was excavated in the areas of buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). Currently, the site is covered with fill material.

Former building D-2 served as the facility for laundering radioactively contaminated clothing and recyclable equipment for former TA-01. The effluent from the outfalls would be solely or primarily radioactively contaminated wastewater. Operations within former building D-2 (laundering contaminated clothing, and recyclable equipment) did not use or produce PAHs. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70) along with the drainlines (as noted above the two drainlines at the southeast end of the building were not located when trenching was conducted). The mesa top above the outfall is paved with asphalt and is a commercially developed area (Figure H-4). The site is on the bench below the mesa top at the mesa edge and is covered with fill material of unknown origin that was deposited after the removal of the drainlines and former building D-2 by a previous landowner; the sample collection log describes the fill as brown and dry with concrete, crushed tuff, pebbles, and cobbles. The fill also contains pieces of asphalt (Figures H-7 and H-8). The 2008 samples were collected from the fill material and below the fill/tuff interface. Deeper samples of the tuff collected in 2012 did not have any detected PAHs.

Runoff from the mesa top and the bench crosses the SWMU before entering Los Alamos Canyon. The runoff is not a regulated component of the SWMU because there is no management of solid waste and is not the result of operational activities. Therefore, the PAHs detected in samples used to characterize this site [acenaphthene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; 2-methylnaphthalene; naphthalene; phenanthrene; and pyrene] are not related to historical Laboratory site operations and are not COPCs.

Organic COPCs

Other organic chemicals detected at SWMU 01-006(c) include dibenzofuran and methylene chloride. The detected organic chemicals listed are retained as COPCs.

Radionuclides

Two samples (one soil, one tuff) were analyzed for americium-241, isotopic uranium, strontium-90, tritium, and gamma-emitting radionuclides. Four samples (one soil, three tuff) were analyzed for isotopic plutonium. Table 6.10-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.10-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Plutonium-239/240 was detected above the soil FV (0.054 pCi/g) in one sample and detected in three tuff samples with a maximum activity of 0.679 pCi/g. Plutonium-239/240 is retained as a COPC.

6.10.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at SWMU 01-006(c) are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-006(c) include barium, chromium, lead, nickel, perchlorate, selenium, and zinc.

Barium was detected above the Qbt 2,3,4 BV in one sample at a concentration of 82.1 mg/kg. Concentrations decreased with depth (concentration in the shallower soil sample was 172 mg/kg, which is below the soil BV [Appendix E, Inorganic Pivot Table]). Concentrations decreased downgradient within SWMU 01-007(b) (Figure 6.14-2). The lateral and vertical extent of barium are defined.

Chromium was detected above the Qbt 2,3,4 BV in one sample at a concentration of 29.2 mg/kg. Concentrations decreased with depth and decreased downgradient within SWMU 01-007(b) (Figure 6.14-2). The lateral and vertical extent of chromium are defined.

Lead was detected above the soil BV in one sample at a concentration of 67.9 mg/kg. Concentrations decreased with depth and decreased downgradient within SWMU 01-007(b) (Figure 6.14-2). The lateral and vertical extent of lead are defined.

Nickel was detected above the Qbt 2,3,4 BV in one sample at a concentration of 15.8 mg/kg. Concentrations decreased with depth and decreased downgradient within SWMU 01-007(b) (Figure 6.14-2). The lateral and vertical extent of nickel are defined.

Perchlorate was detected in one sample at a concentration of 0.0025 mg/kg. Concentrations increased with depth and decreased downgradient within SWMU 01-007(b) (Figure 6.14-2). The residential SSL was approximately 22,000 times the concentration. The lateral extent of perchlorate is defined, and further sampling for vertical extent is not warranted.

Selenium was not detected above the soil and Qbt 2,3,4 BVs (1.52 mg/kg and 0.3 mg/kg) but had DLs (2.6 mg/kg and 0.53 mg/kg) above the soil and Qbt 2,3,4 BVs in one sample each, respectively. The residential SSL was approximately 150 times the maximum DL. Further sampling for extent of selenium is not warranted.

Zinc was detected above the soil BV in one sample at a concentration of 76.7 mg/kg. Concentrations decreased with depth and decreased downgradient within SWMU 01-007(b) (Figure 6.14-2). The lateral and vertical extent of zinc are defined.

Organic Chemicals

Organic COPCs at SWMU 01-006(c) include dibenzofuran and methylene chloride.

Dibenzofuran was detected in one sample at a concentration of 0.14 mg/kg. The concentration was below the EQL, decreased with depth, and decreased downgradient within SWMU 01-007(b) (Figure 6.14-3). The lateral and vertical extent of dibenzofuran are defined.

Methylene chloride was detected in one sample at a concentration of 0.00088 mg/kg. The concentration was below the EQL, decreased with depth, and did not change substantially (0.00006 mg/kg) downgradient within SWMU 01-007(b) (Figure 6.14-3). The residential SSL was approximately 460,000 times the concentration. The vertical extent of methylene chloride is defined, and further sampling for lateral extent is not warranted.

Radionuclides

Radionuclide COPCs at SWMU 01-006(c) include plutonium-239/240.

Plutonium-239/240 was detected above the soil FV in one sample and detected in three tuff samples with a maximum activity of 0.679 pCi/g. Activities decreased with depth and decreased downgradient within SWMU 01-007(b) at location 00-603796 (Plate 6). The lateral and vertical extent of plutonium-239/240 are defined.

6.10.5 Summary of Human Health Risk Screening

Industrial Scenario

No carcinogenic COPCs were identified in the 0.0- to 1.0-ft depth interval. The industrial HI is 0.09, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.01 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

No carcinogenic COPCs were identified for the construction worker scenario in the 0.0- to 10.0-ft depth interval. The construction worker HI is 0.4, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.09 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

The total excess cancer risk for the residential scenario is 3×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Based on the risk-screening assessment results, no potential unacceptable risks or doses exist for the industrial, construction worker, and residential scenarios at SWMU 01-006(c).

6.10.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), LOAEL analyses, and the relationship of detected concentrations and DLs to background concentrations, no potential ecological risks exist at SWMU 01-006(c).

6.11 SWMU 01-006(h1), Storm Water Drainage System

6.11.1 Site Description and Operational History

SWMU 01-006(h1) is part of the storm water drainage system that served the northwest side of former building R and the east side of former building Y (Figure 1.1-2). SWMU 01-006(h1) is the portion of the storm water drainage system within the former LA Inn property boundary (Figure 6.11-1). Building R housed model, glass, carpentry, and plumbing shops. Building Y housed a physics laboratory that handled tritium, uranium-238, and polonium-210. The outfall was located 25 ft south of former building Y on the north rim of Los Alamos Canyon.

The location of the storm water drainage system is on privately owned and commercially developed land. The SWMU was under commercial buildings but is now accessible following building demolition and removal.

6.11.2 Relationship to Other SWMUs and AOCs

SWMU 01-006(h1) originally was part of SWMU 01-006(h). SWMU 01-006(h) is now divided into three SWMUs and originates upgradient as SWMU 01-006(h3) and becomes SWMU 01-006(h2) downgradient; each is a part of the same storm water drainage system. SWMU 01-006(h2) overlaps the footprint of SWMU 01-001(d2), with the two sites sharing the same hillside area [SWMU 01-001(d3)].

6.11.3 Summary of Previous Investigations

The Ahlquist radiological survey found no radioactive contamination in the water drainage areas near former buildings R and Y (Ahlquist et al. 1977, 005710, p. 42). The SWMU was not sampled during the Phase I RFI in part because the majority of the former storm drain and outfall were inaccessible and also because the results of the investigation conducted on Hillside 138 [the outfall area of SWMU 01-001(d)] would reveal any potential contamination (LANL 1995, 049703, p. 30).

No off-site fixed-laboratory data are available for this SWMU.

6.11.4 Site Contamination

6.11.4.1 Soil, Rock, and Sediment Sampling

As part of the investigation, the following characterization activities were conducted at SWMU 01-006(h1):

- Eight samples were collected at two locations (following the demolition and removal of buildings) from 16.0 to 17.0 ft bgs, 19.0 to 20.0 ft bgs, 22.0 to 23.0 ft bgs, and 25.0 to 26.0 ft bgs (location 01-61511) and 11.0 to 12.0 ft bgs, 14.0 to 15.0 ft bgs, 17.0 to 18.0 ft bgs, and 20.0 to 21.0 ft bgs (location 01-61512). Samples were collected from the underlying tuff as the fill material does not represent environmental medium influenced by past Laboratory operations. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, pH, and gamma-emitting radionuclides.

The sampling locations at SWMU 01-006(h1) are shown in Figure 6.11-1. Table 6.11-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.11.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.11.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-006(h1) consist of results from eight tuff samples collected from two locations.

Inorganic Chemicals

Eight tuff samples were analyzed for TAL metals, nitrate, cyanide, and perchlorate. Table 6.11-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.11-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Aluminum was detected above the Qbt 2,3,4 BV (7340 mg/kg) in one sample at a concentration of 8100 mg/kg. The Gehan and quantile tests indicated site concentrations of aluminum in tuff are not statistically different from background (Figure F-11 and Table F-3). Aluminum is not a COPC.

Antimony was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had DLs (0.914 mg/kg to 1.09 mg/kg) above the BV in eight samples. Antimony is retained as a COPC.

Arsenic was detected above the Qbt 2,3,4 BV (2.79 mg/kg) in one sample at a concentration of 2.92 mg/kg. The Gehan and quantile tests indicated site concentrations of arsenic in tuff are statistically different from background (Figure F-12 and Table F-3). Arsenic is retained as a COPC.

Barium was detected above the Qbt 2,3,4 BV (46 mg/kg) in two samples with a maximum concentration of 101 mg/kg. The Gehan and quantile tests indicated site concentrations of barium in tuff are not statistically different from background (Figure F-13 and Table F-3). Barium is not a COPC.

Beryllium was detected above the Qbt 2,3,4 BV (1.21 mg/kg) in one sample at a concentration of 1.56 mg/kg. The Gehan and quantile tests indicated site concentrations of beryllium in tuff are not statistically different from background (Figure F-14 and Table F-3). Beryllium is not a COPC.

Calcium was detected above the Qbt 2,3,4 BV (2200 mg/kg) in one sample at a concentration of 2460 mg/kg. The Gehan and quantile tests indicated site concentrations of calcium in tuff are not statistically different from background (Figure F-15 and Table F-3). Calcium is not a COPC.

Cobalt was detected above the Qbt 2,3,4 BV (3.14 mg/kg) in one sample at a concentration of 3.61 mg/kg. Cobalt is retained as a COPC.

Lead was detected above the Qbt 2,3,4 BV (11.2 mg/kg) in one sample at a concentration of 15.7 mg/kg. The Gehan test indicated site concentrations of lead in tuff are statistically different from background (Table F-3). However, the quantile and slippage tests indicated site concentrations of lead in tuff are not statistically different from background (Figure F-16 and Table F-3). Lead is not a COPC.

Magnesium was detected above the Qbt 2,3,4 BV (1690 mg/kg) in one sample at a concentration of 1880 mg/kg. The Gehan test indicated site concentrations of magnesium in tuff are statistically different from background (Table F-3). However, the quantile and slippage tests indicated site concentrations of

magnesium in tuff are not statistically different from background (Figure F-17 and Table F-3). Magnesium is not a COPC.

Nickel was detected above the Qbt 2,3,4 BV (6.58 mg/kg) in one sample at a concentration of 10 mg/kg. The quantile and slippage tests indicated site concentrations of nickel in tuff are not statistically different from background (Figure F-18 and Table F-3). Nickel is not a COPC.

Nitrate was detected in four samples with a maximum concentration of 0.607 mg/kg. Nitrate is naturally occurring, and the concentration likely reflects naturally occurring levels of nitrate. Nitrate is not a COPC.

Selenium was detected above the Qbt 2,3,4 BV (0.3 mg/kg) in eight samples with a maximum concentration of 2.05 mg/kg. Selenium is retained as a COPC.

Organic Chemicals

Eight tuff samples were analyzed for VOCs, SVOCs, and PCBs. Table 6.11-3 presents the detected organic chemicals. Figure 6.11-3 shows the spatial distribution of detected organic chemicals.

Organic chemicals detected at SWMU 01-006(h1) include bis(2-ethylhexyl)phthalate. The detected organic chemical is retained as a COPC.

Radionuclides

Eight tuff samples were analyzed for americium-241, isotopic plutonium, isotopic uranium, strontium-90, tritium, and gamma-emitting radionuclides. Table 6.11-4 presents the radionuclides detected or detected above BVs/FVs. Figure 6.11-4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Uranium-235/236 was detected above the Qbt 2,3,4 BV (0.09 pCi/g) in 1 sample at an activity of 0.116 pCi/g. The activity was only 0.026 pCi/g above the BV and uranium-235/236 was not detected above BVs in the other 7 samples. The Qbt 2,3,4 BV for uranium-235 is calculated using the total uranium measured in rock and the isotopic abundance and activity of uranium-234, uranium-235, and uranium-238. As presented in Table 5.3-4 of the Laboratory background report (LANL 1998, 059730), the maximum activity of total uranium in Qbt 2,3,4 is about 23% greater than the BV (7.123 pCi/g versus 5.79 pCi/g) based on 26 background samples. A calculated maximum uranium-235 activity for Qbt 2,3,4 background is 0.11 pCi/g. This activity is similar to the maximum site activity and indicates the uranium-235/236 activities are naturally occurring. The other uranium isotopes (uranium-234 and uranium-238) are not detected above BVs, which also indicates naturally occurring activities of uranium-235/236. Uranium-235/236 is not a COPC.

6.11.4.4 Nature and Extent of Contamination

The nature and extent of inorganic and organic COPCs at SWMU 01-006(h1) are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-006(h1) include antimony, arsenic, cobalt, and selenium.

Antimony was not detected above the Qbt 2,3,4 BV but had DLs (0.914 mg/kg to 1.09 mg/kg) above the BV in eight samples. The residential SSL was approximately 29 times the maximum DL. Further sampling for extent of antimony is not warranted.

Arsenic was detected above the Qbt 2,3,4 BV in one sample at a concentration of 2.92 mg/kg. Concentrations decreased with depth at location 01-61511 and increased downgradient. The maximum concentration was below the two highest Qbt 2,3,4 background concentrations (4 mg/kg and 5 mg/kg). The vertical extent of arsenic is defined and further sampling for lateral extent is not warranted.

Cobalt was detected above the Qbt 2,3,4 BV in one sample at a concentration of 3.61 mg/kg. Concentrations decreased with depth at location 01-61511 and increased downgradient. The maximum concentration was only 0.47 mg/kg above the BV. The residential and industrial SSLs were approximately 6.4 times and 97 times the maximum concentration. The vertical extent of cobalt is defined, and further sampling for lateral extent is not warranted.

Selenium was detected above the Qbt 2,3,4 BV in eight samples with a maximum concentration of 2.05 mg/kg. Concentrations did not change substantially (0.16 mg/kg and 0.46 mg/kg) with depth at both locations and laterally (0.6 mg/kg). The residential SSL was approximately 191 times the maximum concentration. Further sampling for extent of selenium is not warranted.

Organic Chemicals

Organic COPCs at SWMU 01-006(h1) include bis(2-ethylhexyl)phthalate.

Bis(2-ethylhexyl)phthalate was detected in one sample at a concentration of 0.127 mg/kg. The concentration was below the EQL, decreased with depth at location 01-61511, and increased downgradient. The residential SSL was approximately 2992 times the maximum concentration. The vertical extent of bis(2-ethylhexyl)phthalate is defined, and further sampling for lateral extent is not warranted.

Radionuclides

No radionuclide COPCs were identified at SWMU 01-006(h1).

6.11.5 Summary of Human Health Risk Screening

All samples collected at SWMU 01-006(h1) were from below the 0.0- to 10.0-ft depth interval. Therefore, no complete exposure pathways to a receptor exist for the industrial, construction worker, and residential scenarios.

6.11.6 Summary of Ecological Risk Screening

All samples collected at SWMU 01-006(h1) were from below the 0.0- to 5.0-ft depth interval. Therefore, no complete exposure pathways to ecological receptors exist.

6.12 SWMU 01-006(n), Storm Water Drainage System

6.12.1 Site Description and Operational History

SWMU 01-006(n) is the storm water drainage system that served former building D that was used to process plutonium (Figure 6.12-1). It originated near the east corner of the building and extended along the southeast side of the building to an outfall into Los Alamos Canyon. No information on the excavation of this specific drainline can be located, although during the excavation of the buildings D and D-2 areas, all drainlines were removed, along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64).

Currently, the site is under a paved parking lot.

6.12.2 Relationship to Other SWMUs and AOCs

The outfall of SWMU 01-006(n) is within the boundary of SWMU 01-007(a).

6.12.3 Summary of Previous Investigations

In 1992 and 1993, a Phase I RFI was conducted in the area of SWMU 01-007(a), downgradient of SWMU 01-006(n). No contaminants of concern were identified (LANL 1996, 054465, p. 110).

No off-site fixed-laboratory data are available for this SWMU.

6.12.4 Site Contamination

6.12.4.1 Soil, Rock, and Sediment Sampling

As part of the site investigation, the following characterization activities were conducted at SWMU 01-006(n):

- For the Phase I investigation a total of 10 samples were collected from four locations. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, pH, and gamma-emitting radionuclides.
- As part of the Phase II investigation surface and subsurface samples were collected at three new sampling locations; location 01-614804 was between previously sampled locations 00-604227 and 00-604228 and was sampled at 10.0 to 11.0 ft bgs and 12.0 to 13.0 ft bgs to define the vertical extent of contamination at the two previous sampling locations and locations 01-614805 and 01-614806 were sampled downgradient of locations 00-604227 and 00-604229 to define the lateral extent of contamination. Phase II samples were analyzed for isotopic plutonium.

The sampling locations at SWMU 01-006(n) are shown in Figure 6.12-1. Table 6.12-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.12.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.12.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-006(n) consist of results from 18 samples (8 soil, 10 tuff) collected from 7 locations.

Inorganic Chemicals

Ten samples (six soil, four tuff) were analyzed for TAL metals, nitrate, cyanide, and perchlorate. Because fewer than eight soil and tuff samples were collected, statistical tests could not be performed on results for these media. Table 6.12-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.12-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Antimony was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had DLs (0.51 mg/kg) above the BV in three samples. The DLs were only 0.01 mg/kg above the BV, and antimony was not detected in any samples (DLs below BVs in the other seven samples). Antimony is not a COPC.

Calcium was detected above the soil BV (6120 mg/kg) in one sample at a concentration of 6220 mg/kg. The concentration was only 100 mg/kg above the BV and was below the eight highest soil background concentrations (6300 mg/kg, 6400 mg/kg, 7200 mg/kg, 7400 mg/kg, 8400 mg/kg, 8500 mg/kg, 9700 mg/kg, and 14,000 mg/kg). Calcium was not detected above BVs in the other nine samples. Calcium is not a COPC.

Chromium was detected above the Qbt 2,3,4 BV (7.14 mg/kg) in one sample at a concentration of 18.9 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (13 mg/kg). Chromium is retained as a COPC.

Cyanide was not detected above the soil and Qbt 2,3,4 BVs (0.5 mg/kg for both) but had DLs (0.51 mg/kg to 0.53 mg/kg) above the BVs in five samples. The DLs were only 0.01 mg/kg to 0.03 mg/kg above the BVs and cyanide was not detected or detected below BVs in the other five samples (detected below the BVs in two samples). Cyanide is not a COPC.

Lead was detected above the soil BV (22.3 mg/kg) in one sample at a concentration of 44.1 mg/kg. The concentration was above the maximum soil background concentration (28 mg/kg). Lead is retained as a COPC.

Mercury was detected above the soil BV (0.1 mg/kg) in four samples with a maximum concentration of 0.555 mg/kg. Mercury is retained as a COPC

Nickel was detected above the Qbt 2,3,4 BV (6.58 mg/kg) in one sample at a concentration of 9.3 mg/kg. The concentration was above the maximum Qbt 2,3,4 background concentration (7 mg/kg). Nickel is retained as a COPC.

Nitrate was detected in nine samples with a maximum concentration of 26 mg/kg. Nitrate is naturally occurring, and all concentrations, except the maximum concentration, likely reflect naturally occurring levels. Nitrate is retained as a COPC.

Perchlorate was detected in three samples with a maximum concentration of 0.016 mg/kg. Perchlorate is retained as a COPC.

Selenium was detected above the Qbt 2,3,4 BV (0.3 mg/kg) in one sample at a concentration of 0.42 mg/kg and had DLs (0.51 mg/kg) above the BV in two samples. Selenium is retained as a COPC.

Zinc was detected above the soil BV (48.8 mg/kg) in one sample at a concentration of 54.3 mg/kg. The concentration was only 5.5 mg/kg above the BV and below the four highest background concentrations (55 mg/kg, 57 mg/kg, 60 mg/kg, and 75.5 mg/kg). Zinc was not detected above BVs in the other nine samples. Zinc is not a COPC.

Organic Chemicals

Ten samples (six soil, four tuff) were analyzed for VOCs, SVOCs, and PCBs. Table 6.12-3 presents the detected organic chemicals. Figure 6.12-3 shows the spatial distribution of detected organic chemicals.

PAHs

PAHs are a class of SVOCs frequently detected as a result of environmental sampling but generally were not released from the SWMUs or AOCs being investigated. PAHs unrelated to site activities are thus often detected in samples analyzed for the presence of site-related SVOCs.

PAHs are known to be widely distributed in the environment from a number of sources, both natural, such as forest fires, and anthropogenic, such as combustion of fossil fuels, oil drips off motor vehicles, vehicle tires, coal tar pitch, and weathering or eroding of asphalt pavement (Kose et al. 2008, 219977; Teaf 2008, 219976). PAHs from these sources generally occur as complex mixtures, not as single compounds. Individual PAH compounds can be manufactured for research purposes and some PAHs (e.g., anthracene, fluorene, naphthalene, and pyrene) are used in dye production, in the manufacture of synthetic fibers, and in plastics and pesticides.

The principal sources of PAHs in soil along parking lots, roads, and highways are vehicular exhaust and emissions, the wearing of tires, and asphalt. PAH-containing materials, such as asphalt and rubber particles, do not easily dissolve in water, thus preventing migration, except as suspended particles in storm water. PAH concentrations in excess of soil cleanup levels may result from common anthropogenic sources such as runoff from asphalt-paved areas (e.g., roads and parking areas).

Site Activities

SWMU 01-006(n) was identified as a SWMU because it is the storm water drainage system that served former building D, which was used to process plutonium. The system originated near the east corner of the building and extended along the southeast side of the building to an outfall into Los Alamos Canyon. Excavation of the areas around former buildings D and D-2 resulted in the removal of all drainlines, along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). The Ahlquist radiological survey found no radioactive contamination in the drainage area near former building D (Ahlquist et al. 1977, 005710, p. 42).

Former building D was used to process plutonium. The effluent from the drainage system would have been from the area around the former building. Operations within former building D (plutonium processing) did not use or produce PAHs. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). The SWMU is located within the larger SWMU 01-007(a) area where the mesa top is paved with asphalt and is a commercially developed area (Figure H-4). Runoff from the mesa top area crosses the SWMU before entering Los Alamos Canyon. The site is also covered with fill material of unknown origin (the sample collection logs describe the fill as crushed tuff with pebbles and cobbles), and the area had been previously excavated (fill was deposited after the removal of former building D and areas of elevated radioactivity). The area above the outfall is paved with asphalt and pieces of asphalt are apparent on the slope around and below the outfall area (Figures H-5, H-9, and H-10).

The runoff is not a regulated component of the SWMU because there is no management of solid waste and is not the result of operational activities. Therefore, the PAHs detected in samples used to characterize this site [benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; fluoranthene; phenanthrene; and pyrene] are not related to historical Laboratory site operations and are not COPCs.

Organic COPCs

Other organic chemicals detected at SWMU 01-006(n) include Aroclor-1260; bis(2-ethylhexyl)phthalate; methylene chloride; and trichlorofluoromethane. The detected organic chemicals listed are retained as COPCs.

Radionuclides

Ten samples (6 soil, 4 tuff) were analyzed for isotopic uranium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides. Eighteen samples (8 soil, 10 tuff) were analyzed for isotopic plutonium. 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.

Americium-241 was detected in one soil sample below 1.0 ft bgs at an activity of 0.264 pCi/g. Americium-241 is retained as a COPC.

Cesium-134 was detected in one soil sample at an activity of 0.052 pCi/g. Cesium-134 is retained as a COPC.

Plutonium-239/240 was detected above the soil FV (0.054 pCi/g) in four samples, detected in two soil samples below 1.0 ft bgs, and detected in nine tuff samples with a maximum activity of 8.22 pCi/g. Plutonium-239/240 is retained as a COPC.

Tritium was detected in one soil sample at an activity of 0.62 pCi/g. Tritium is retained as a COPC.

6.12.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at SWMU 01-006(n) are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-006(n) include chromium, lead, mercury, nickel, nitrate, perchlorate, and selenium.

Chromium was detected above the Qbt 2,3,4 BV in one sample at a concentration of 18.9 mg/kg. Concentrations increased with depth at location 00-604238 and decreased downgradient. The residential and industrial total chromium SSLs were approximately 5 times and 27 times the maximum concentration. Because there was no known use of hexavalent chromium at this site, and site conditions would not have produced or promoted the formation of hexavalent chromium, the vast majority, if not all, of the total chromium detected consists of trivalent chromium. Given the preponderance of trivalent chromium versus hexavalent chromium, it is appropriate to use the trivalent chromium SSL in evaluating the total chromium results. The residential SSL for trivalent chromium was approximately 6190 times the maximum concentration. In addition, the residential cancer risk for chromium and the total excess cancer risk for the site were approximately 2×10^{-6}. The lateral extent of chromium is defined, and further sampling for vertical extent is not warranted.

Lead was detected above the soil BV in one sample at a concentration of 44.1 mg/kg. Concentrations decreased with depth at location 00-604238 and decreased downgradient. The lateral and vertical extent of lead are defined.

Mercury was detected above the soil BV in four samples with a maximum concentration of 0.555 mg/kg. Concentrations decreased with depth at locations 00-604227, 00604229, and 00-604238 and decreased downgradient. The lateral and vertical extent of mercury are defined.

Nickel was detected above the Qbt 2,3,4 BV in one sample at a concentration of 9.3 mg/kg. Concentrations did not change substantially (0.8 mg/kg) with depth at location 00-604238 and decreased downgradient. The residential SSL was approximately 168 times the concentration. The lateral extent of nickel is defined, and further sampling for vertical extent is not warranted.

Nitrate was detected in nine samples with a maximum concentration of 26 mg/kg. Nitrate is naturally occurring and all concentrations, except the maximum, are likely reflect naturally occurring levels. Concentrations decreased with depth at location 00-604238 where the maximum concentration was detected and decreased downgradient. The lateral and vertical extent of nitrate are defined.

Perchlorate was detected in three samples with a maximum concentration of 0.016 mg/kg. Concentrations decreased with depth at location 00-604238, increased with depth at location 00-604229, and decreased downgradient. The residential SSL was approximately 3425 times the maximum concentration. The lateral extent of perchlorate is defined, and further sampling for vertical extent is not warranted.

Selenium was detected above the Qbt 2,3,4 BV in one sample at a concentration of 0.42 mg/kg and had DLs (0.51 mg/kg) above the BV in two samples. The concentrations increased with depth at location 00-604238 and decreased downgradient. The concentration at location 00-604238 was only 0.12 mg/kg above the BV and was below the DLs above BV. The residential SSL was approximately 930 times the concentration and approximately 767 times the DLs. Further sampling for extent of selenium is not warranted.

Organic Chemicals

Organic COPCs at SWMU 01-006(n) include Aroclor-1260; bis(2-ethylhexyl)phthalate; methylene chloride; and trichlorofluoromethane.

Aroclor-1260 was detected in six samples with a maximum concentration of 0.52 mg/kg. Concentrations did not change substantially (0.38 mg/kg) with depth at location 00-604229, decreased with depth at location 00-604238, and increased with depth at location 00-604227. The concentration at location 00-604227 was below the EQL and the residential SSL was approximately 221 the concentration. Concentrations increased downgradient at location 00-604229; the residential and industrial SSLs were approximately 5 times and 22 times the maximum concentration at this location. Further sampling for extent of Aroclor-1260 is not warranted.

Bis(2-ethylhexyl)phthalate was detected in one sample at a concentration of 0.67 mg/kg. Concentrations decreased with depth at location 00-604227 and increased downgradient. The residential SSL was approximately 567 times the concentration. The vertical extent of bis(2-ethylhexyl)phthalate is defined, and further sampling for lateral extent is not warranted.

Methylene chloride was detected in four samples with a maximum concentration of 0.0079 mg/kg. Concentrations decreased with depth at location 00-604238, did not change substantially (0.0007 mg/kg) with depth at location 00-604229, and increased with depth at location 00-604228. The concentration at location 00-604228 was below the EQL. Concentrations did not change substantially (0.0033 mg/kg) downgradient. The residential SSL was approximately 51,770 times the maximum concentration. Further sampling for extent of methylene chloride is not warranted.

Trichlorofluoromethane was detected in one sample at a concentration of 0.0012 mg/kg. Concentrations decreased with depth at location 00-604227 and increased downgradient. The concentration was below the EQL and the residential SSL was approximately 1,025,000 times the concentration. The vertical extent of trichlorofluoromethane is defined, and further sampling for lateral extent is not warranted.

Radionuclides

Radionuclide COPCs at SWMU 01-006(n) include americium-241, cesium-134, plutonium-239/240, and tritium.

Americium-241 was detected in one soil sample below 1.0 ft bgs at an activity of 0.264 pCi/g. Activities decreased with depth at location 00-604238 and decreased downgradient. The lateral and vertical extent of americium-241 are defined.

Cesium-134 was detected in one soil sample at an activity of 0.052 pCi/g. Activities decreased with depth at location 00-604238 and decreased downgradient. The lateral and vertical extent of cesium-134 are defined.

Plutonium-239/240 was detected above the soil FV in four samples, detected in two soil samples below 1.0 ft bgs, and detected in nine tuff samples with a maximum activity of 8.22 pCi/g. Activities decreased with depth at locations 00-604229, 00-604238, and 01-614806, did not change substantially (0.25 pCi/g and 0.0971 pCi/g) with depth at locations 01-614804 and 01-614805, increased with depth at locations 00-604227 and 00-604228, and decreased downgradient. Location 01-614804 was between locations 00-604227 and 00-604228 and was sampled at 10.0 to 11.0 ft bgs and 12.0 to 13.0 ft bgs to define the vertical extent of contamination at the two previous sampling locations. Activities did not change substantially (0.378 pCi/g and 0.607 pCi/g) with depth at location 01-614804 from the maximum activities at locations 00-604227 and 00-604228. The residential SAL was approximately 57 times the maximum activity at location 01-614804. The lateral extent of plutonium-239/240 is defined, and further sampling for vertical extent is not warranted.

Tritium was detected in one soil sample at an activity of 0.62 pCi/g. Activities decreased with depth at location 00-604228 and increased downgradient. The residential SAL was approximately 2742 times the activity. The vertical extent of tritium is defined, and further sampling for lateral extent is not warranted.

6.12.5 Summary of Human Health Risk Screening

Industrial Scenario

The total excess cancer risk for the industrial scenario is 5×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.0003, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

The total excess cancer risk for the construction worker is 2×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.7 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Based on the risk-screening assessment results, no potential unacceptable risks and doses exist for the industrial, construction worker, and residential scenarios at SWMU 01-006(n).

6.12.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), LOAEL analyses, and the relationship of detected concentrations and DLs to background concentrations, no potential ecological risks exist at SWMU 01-006(n).

6.13 SWMU 01-007(a), Suspected Subsurface Soil Radiological Contamination

6.13.1 Site Description and Operational History

SWMU 01-007(a) is an area of suspected subsurface soil radiological contamination near former building D, which was used for processing plutonium (Ahlquist et al. 1977, 005710, p. 11) (Figure 6.13-1).

Currently, the mesa-top portion of the SWMU area is a parking lot, the bench area has been covered with fill and is undeveloped, and the hillside portion is undeveloped.

6.13.2 Relationship to Other SWMUs and AOCs

SWMU 01-007(a) contains all or parts of SWMUs 01-002(a1)-00, 01-006(b), and 01-006(n).

6.13.3 Summary of Previous Investigations

During the Ahlquist radiological survey between 1974 and 1976, almost 9000 m^3 of soil was removed from the buildings D and D-2 areas (Ahlquist et al. 1977, 005710, p. 40).

In 1992 and 1993, a Phase I RFI was conducted and samples were collected at the mesa-top area of the former building D footprint and the hillside downgradient of the SWMU; however, most of the samples were analyzed at on-site laboratories. Samples analyzed at off-site fixed laboratories included 16 soil, fill, and sediment samples collected from 16 locations on the mesa top and hillside area downgradient of SWMU 01-007(a) at depths of 0.0 to 12.0 ft.

- Samples from 10 locations were analyzed for metals. Analytical results indicated that antimony, cadmium, lead, selenium, and thallium were detected greater than BVs in at least 1 sample between 0.0 and 0.5 ft bgs. Antimony, cadmium, lead, selenium, and thallium were detected greater than the range of the background concentrations.
- Samples from six locations were analyzed for isotopic plutonium and isotopic uranium. Analytical results indicated that only plutonium-239 was detected in at least one sample between 2.0 and 12.0 ft bgs where FVs do not apply.

The Phase I RFI data are screening level data.

6.13.4 Site Contamination

6.13.4.1 Soil, Rock, and Sediment Sampling

As part of the site investigation, the following characterization activities were conducted at SWMU 01-007(a):

- For the Phase I investigation, a total of 26 samples were collected from 11 locations. Samples were collected from 0.0 to 1.0 ft bgs and 1.0 to 2.0 ft bgs at 7 locations; 1.25 to 2.25 ft bgs and 3.25 to 4.25 ft bgs at location 00-603900; 17.5 to 19.0 ft bgs and 20.0 to 21.0 ft bgs at location 00-603901; 5.0 to 6.0 ft bgs, 8.0 to 9.0 ft bgs, 11.0 to 12.5 ft bgs, and 13.5 ft to 15.0 ft bgs at location 00-604239; and 5.0 to 6.5 ft bgs, 8.0 to 9.0 ft bgs, 11.0 to 12.0 ft bgs, and 14.0 ft to 15.0 ft bgs at location 00-604240. Samples analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.
- As part of the Phase II investigation, subsurface samples were collected at seven previous sampling locations and one new sampling location. Samples were collected from 5.0 to 6.0 ft bgs and 7.0 to 8.0 ft bgs at location 00-603900; 18.0 to 19.0 ft bgs and 19.0 to 20.0 ft bgs at location 00-604223; 3.0 to 4.0 ft bgs and 5.0 to 6.0 ft bgs at locations 00-604233, 00-604234, 00-604235, and 00-604236; 19.0 to 20.0 ft bgs at previous location 00-604240; and 0.0 to 1.0 ft bgs, 3.0 to 4.0 ft bgs, and 5.0 to 6.0 ft bgs at new location 01-614807. Phase II samples from location 00-604223 were analyzed for isotopic plutonium; samples from locations 00-603900, 00-604233, 00-604234, 00-604235, 00-604236, and 00-604240 were analyzed for chromium and nickel; and samples from locations 00-604233, 00-604234, 00-604235, 00-604236, 00-604240, and 01-614807 were analyzed for bis(2-ethylhexyl)phthalate.
- Subsequent investigation in 2013 resulted in the collection of 24 samples at 12 additional locations from 0.0 to 1.0 ft bgs and 1.0 to 2.0 ft bgs. Samples were analyzed for isotopic plutonium.
- Plutonium-239/240 activities exceeded or were close to the residential SAL at locations 00-604231, 00-604233, 01-227, and 01-231. Surface samples at and around these four locations on the canyon slope outside of the former LA inn property boundary were excavated in 2016. Deeper samples were available from 1.0 to 2.0 ft bgs at each location.
- Samples were collected in 2016 at two new locations from 10.5 to 11.5 ft bgs; 12.5 to 13.5 ft bgs and 14.5 to 15.5 ft bgs at location LA-61504; and 11.0 to 12.0 ft bgs, 13.0 to 14.0 ft bgs, and 15.0 to 16.0 ft bgs at location LA-61505. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.

The sampling locations at SWMU 01-007(a) are shown in Figure 6.13-1. Table 6.13-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.13.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.13.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-007(a) consist of results from 70 samples (20 soil, 5 sediment, 45 tuff) collected from 27 locations.

Inorganic Chemicals

Thirty-two samples (7 soil, 4 sediment, 21 tuff) were analyzed for TAL metals, nitrate, cyanide, and perchlorate and 11 tuff samples were analyzed for only chromium and nickel. Because fewer than eight soil, sediment, Qct, and Qbt 1g samples were collected, statistical tests could not be performed on results for these media. Table 6.13-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.13-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Aluminum was detected above the Qbt 1g BV (3560 mg/kg) in two samples with a maximum concentration of 9080 mg/kg. The concentrations were above the maximum Qbt 1g background concentration (3400 mg/kg). Aluminum is retained as a COPC.

Antimony was detected above the soil BV (0.83 mg/kg) in 1 sample at a concentration of 0.97 mg/kg and had DLs (0.54 mg/kg to 1.07 mg/kg) above the Qbt 2,3,4 and Qbt 1g BVs (0.5 mg/kg for both) in 11 samples. Antimony is retained as a COPC.

Arsenic was not detected above the Qbt 1g BV (0.56 mg/kg) but had DLs (0.97 mg/kg and 1 mg/kg) above the BV in two samples. The DLs were above the maximum Qbt 1g background concentration (0.7 mg/kg). Arsenic is retained as a COPC.

Beryllium was detected above the sediment, Qbt 2,3,4, and Qbt 1g BVs (1.31 mg/kg, 1.21 mg/kg, and 1.44 mg/kg) in one sediment sample and four tuff samples with a maximum concentration of 3 mg/kg. The concentrations were above the maximum sediment and Qbt 1g background concentrations (1.3 mg/kg and 1.4 mg/kg). Beryllium is retained as a COPC.

Calcium was detected above the soil BV (6120 mg/kg) in two samples with a maximum concentration of 21,000 mg/kg. One concentration was above the maximum soil background concentration (14,000 mg/kg). Calcium is retained as a COPC.

Chromium was detected above the soil, Qbt 2,3,4, and Qbt 1g BVs (19.3 mg/kg, 7.14 mg/kg, and 2.6 mg/kg) in 2 soil samples and 10 tuff samples with a maximum concentration of 74.7 mg/kg. Concentrations were above the maximum soil and Qbt 1g background concentrations (36.5 mg/kg and 2.3 mg/kg). The Gehan and quantile tests indicated site concentrations of chromium in Qbt 3 are statistically different from background (Figure F-19 and Table F-4). Chromium is retained as a COPC.

Copper was detected above the Qbt 2,3,4 BV (4.66 mg/kg) in one sample at a concentration of 5.3 mg/kg. The Gehan test indicated site concentrations of copper in tuff are statistically different from background (Table F-4). However, the quantile and slippage tests indicated site concentrations of copper in tuff are not statistically different from background (Figure F-20 and Table F-4). Copper is not a COPC.

Cyanide was not detected above the soil, Qbt 2,3,4, and Qbt 1 g BVs (0.5 for all) but had DLs (0.51 mg/kg to 0.6 mg/kg) in 14 samples. The DLs were only 0.01 mg/kg to 0.1 mg/kg above the BVs and cyanide was not detected or detected below BVs in the other 16 samples (detected below the BV in one sample). Cyanide is not a COPC.

Lead was detected above the soil BV (22.3 mg/kg) in four soil samples with a maximum concentration of 63.6 mg/kg. Two of four concentrations were above the maximum soil background concentration (28 mg/kg). Lead is retained as a COPC.

Manganese was detected above the Qbt 2,3,4 and Qbt 1g BVs (492 mg/kg and 189 mg/kg) in three tuff samples with a maximum concentration of 537 mg/kg. The Qbt 1g concentrations were above the maximum background concentration (210 mg/kg). The Gehan and quantile tests indicated site concentrations of manganese in Qbt 3 are not statistically different from background (Figure F-21 and Table F-4). Manganese is retained as a COPC.

Mercury was detected above the soil BV (0.1 mg/kg) in five samples with a maximum concentration of 2.12 mg/kg. Mercury is retained as a COPC.

Nickel was detected above the soil, Qbt 2,3,4, and Qbt 1g/Qct BVs (15.4 mg/kg, 6.58 mg/kg, and 2 mg/kg) in one soil sample and eight tuff samples with a maximum concentration of 39.5 mg/kg. Concentrations were above the maximum soil and Qbt 1g/Qct background concentrations (29 mg/kg and 2.8 mg/kg). The quantile and slippage tests indicated site concentrations of nickel in Qbt 3 are statistically different from background (Figure F-22 and Table F-4). Nickel is retained as a COPC.

Nitrate was detected in 24 samples with a maximum concentration of 9.1 mg/kg. Nitrate is naturally occurring and the concentration likely reflects naturally occurring levels of nitrate. Nitrate is not a COPC.

Perchlorate was detected in four samples with a maximum concentration of 0.0082 mg/kg. Perchlorate is retained as a COPC.

Selenium was detected above the sediment, Qbt 2,3,4, and Qbt 1g BVs (0.3 mg/kg for all) in 1 sediment sample and 12 tuff samples with a maximum concentration of 1.44 mg/kg and had DLs (0.51 mg/kg to 0.6 mg/kg) above BVs in 7 samples. Selenium is retained as a COPC.

Thallium was not detected above the sediment BV (0.73 mg/kg) but had a DL (0.86 mg/kg) above the BV. The DL was below the maximum soil background concentration (1 mg/kg) [soil BV used as the sediment BV (LANL 1998, 059730)]. Thallium was not detected or detected below BVs in the other 31 samples (detected below the BVs in 6 samples). Thallium is not a COPC.

Zinc was detected above the soil and sediment BVs (48.8 mg/kg and 60.2 mg/kg) in one two soil samples and one sediment sample with a maximum concentration of 69.1 mg/kg. The sediment concentration was above the maximum background concentration (56.2 mg/kg). Zinc is retained as a COPC.

Organic Chemicals

Thirty-two samples (7 soil, 4 sediment, 21 tuff) were analyzed for SVOCs, VOCs, and PCBs, and 10 samples (1 sediment, 9 tuff) were analyzed for bis(2-ethylhexyl)phthalate. Table 6.13-3 presents the detected organic chemicals. Plate 3 shows the spatial distribution of detected organic chemicals.

PAHs

PAHs are a class of SVOCs frequently detected as a result of environmental sampling but generally were not released from the SWMUs or AOCs being investigated. PAHs unrelated to site activities are thus often detected in samples analyzed for the presence of site-related SVOCs.

PAHs are known to be widely distributed in the environment from a number of sources, both natural, such as forest fires, and anthropogenic, such as combustion of fossil fuels, oil drips off motor vehicles, vehicle tires, coal tar pitch, and weathering or eroding of asphalt pavement (Kose et al. 2008, 219977; Teaf 2008,

219976). PAHs from these sources generally occur as complex mixtures, not as single compounds. Individual PAH compounds can be manufactured for research purposes and some PAHs (e.g., anthracene, fluorene, naphthalene, and pyrene) are used in dye production, in the manufacture of synthetic fibers, and in plastics and pesticides.

The principal sources of PAHs in soil along parking lots, roads, and highways are vehicular exhaust and emissions, the wearing of tires, and asphalt. PAH-containing materials, such as asphalt and rubber particles, do not easily dissolve in water, thus preventing migration, except as suspended particles in storm water. PAH concentrations in excess of soil cleanup levels may result from common anthropogenic sources such as runoff from asphalt-paved areas (e.g., roads and parking areas).

Site Activities

SWMU 01-007(a) was identified as a SWMU because it is an area of suspected subsurface soil radiological contamination near former building D, which was used for processing plutonium. Excavation of the areas around former buildings D and D-2 resulted in all drainlines being removed, along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). During the Ahlquist radiological survey between 1974 and 1976, almost 9000 m^3 of soil was removed from the buildings D and D-2 areas (Ahlquist et al. 1977, 005710, p. 40).

Former building D was used to process plutonium. The effluent from the outfall would be solely or primarily radioactively contaminated wastewater. Operations within former building D did not use or produce PAHs. Much of the natural mesa-top soil in former TA-01 has been replaced by fill material during various remediation, construction, and landscaping activities (LANL 2006, 091915; LANL 2006, 091916). During the Ahlquist radiological survey, contaminated soil was excavated in the areas of buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). The site is partially on the mesa top, which is currently paved with asphalt and is a commercially developed area (Figures H-4 and H-5), and on the bench below the mesa top. The bench is covered with fill material of unknown origin that was deposited after the removal of former building D and areas of elevated radioactivity. Runoff from the mesa top area, which is paved with asphalt and is a commercially developed area (Figures H-4, H-5, and H-11), and the fill covered bench area, which also contains asphalt and other debris (Figures H-2 and H-3), crosses the SWMU before entering Los Alamos Canyon.

The runoff is not a regulated component of the SWMU because there is no management of solid waste and is not the result of operational activities. PAHs were detected in one or two samples of the fill but were not detected in tuff samples. Therefore, the PAHs detected in samples used to characterize this site [acenaphthylene; anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(k)fluoranthene; chrysene; fluoranthene; phenanthrene; and pyrene] are not related to historical Laboratory site operations and are not COPCs.

Organic COPCs

Other organic chemicals detected at SWMU 01-007(a) include acetone; Aroclor-1260; benzene; benzyl alcohol; bis(2-ethylhexyl)phthalate; tert-butylbenzene; di-n-butylphthalate; 4,6-dinitro-2-methylphenol; isopropylbenzene; 4-isopropyltoluene; methylene chloride; tetrachloroethene; and trichlorofluoromethane. The detected organic chemicals listed are retained as COPCs.

Radionuclides

Thirty-two samples (7 soil, 4 sediment, 21 tuff) were analyzed for isotopic uranium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides, and 56 samples (20 soil, 4 sediment, 32 tuff) were analyzed for isotopic plutonium. Table 6.13-4 presents the radionuclides detected or detected above BVs/FVs. Plate 4 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Americium-241 was detected above the soil and sediment BVs (0.013 pCi/g and 0.04 pCi/g) in one surface soil sample and one sediment sample, detected in two soil samples below 1.0 ft bgs, and detected in two tuff samples with a maximum activity of 0.197 pCi/g. Amercium-241 is retained as a COPC.

Plutonium-238 was detected above the soil and sediment BVs (0.023 pCi/g and 0.006 pCi/g) in one surface soil sample and one sediment sample and detected in two tuff samples with a maximum activity of 0.112 pCi/g. Plutonium-238 is retained as a COPC.

Plutonium-239/240 was detected above the soil and sediment BVs (0.054 pCi/g and 0.068 pCi/g) in 11 surface soil samples and four sediment samples, detected in 9 soil samples below 1.0 ft bgs, and detected in 19 tuff samples (17 Qbt 2,3,4 and 2 Qbt 1g) with a maximum activity of 25.6 pCi/g. Plutonium-238 is retained as a COPC.

Tritium was detected in four samples with a maximum activity of 2.08 pCi/g. Tritium is retained as a COPC.

Uranium-234 was detected above the Qbt 2,3,4 BV (1.98 pCi/g) in three samples with a maximum activity of 3.35 pCi/g. Uranium-234 is retained as a COPC.

Uranium-235/236 was detected above the Qbt 2,3,4 BV (0.09 pCi/g) in three samples with a maximum activity of 0.202 pCi/g. Uranium-235/236 is retained as a COPC.

Uranium-238 was detected above the Qbt 2,3,4 BV (1.93 pCi/g) in three samples with a maximum activity of 3.06 pCi/g. Uranium-238 is retained as a COPC.

6.13.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at SWMU 01-007(a) are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-007(a) include aluminum, antimony, arsenic, beryllium, calcium, chromium, lead, manganese, mercury, nickel, perchlorate, selenium, and zinc.

Aluminum was detected above the Qbt 1g BV in two samples with a maximum concentration of 9080 mg/kg. Concentrations increased with depth at locations 00-604235 and 00-604236 and increased downgradient. The residential SSL was approximately 8.6 times (68,920 mg/kg below the SSL) and the industrial SSL was approximately 142 times the maximum concentration. Further sampling for extent of aluminum is not warranted.

Antimony was detected above the soil BV in one sample at a concentration of 0.97 mg/kg and had DLs (0.54 mg/kg to 0.6 mg/kg) above the Qbt 2,3,4 and Qbt 1g BVs in four samples. Concentrations decreased with depth at location 00-604239 and decreased downgradient. The residential SSL was approximately 52 times the maximum DL. Further sampling for extent of antimony is not warranted.

Arsenic was not detected above the Qbt 1g BV but had DLs (0.97 mg/kg and 1 mg/kg) above the BV in two samples. The DLs above the Qbt 1g BV were similar to the DLs in the shallower sediment samples, which were below the sediment BV, at locations 00-604236 and 00-604235 (0.93 mg/kg and 1.3 mg/kg) (Appendix E, Inorganic Pivot Table). Arsenic was not detected above BVs in any samples. The residential and industrial SSLs were approximately 4.25 times and 22 times the maximum DL. Further sampling for extent of arsenic is not warranted.

Beryllium was detected above the sediment and Qbt 1g BVs in one sediment sample and two tuff samples with a maximum concentration of 3 mg/kg. Concentrations increased with depth at locations 00-604235 and 00-604236 and increased downgradient. The residential SSL was approximately 52 times the maximum concentration. Further sampling for extent of beryllium is not warranted.

Calcium was detected above the soil BV in two samples with a maximum concentration of 21,000 mg/kg. Concentrations decreased with depth at location 00-604239 and decreased downgradient. The lateral and vertical extent of calcium are defined.

Chromium was detected above the soil, Qbt 2,3,4, and Qbt 1g BVs in two soil samples and eight tuff samples with a maximum concentration of 74.7 mg/kg. Concentrations decreased with depth at locations 00-603900, 00-604233, 00-604234, 00-604235, 00-604236, 00-604239, and 00-604240 and increased with depth at locations 00-604223 and 00-604232. The concentration at depth at location 00-604232 was below the maximum Qbt 2,3,4 background concentration (13 mg/kg). Concentrations decreased downgradient. The residential and industrial SSLs were approximately 3 times and 17 times the maximum concentration at location 00-604223. Because there was no known use of hexavalent chromium at this site, and site conditions would not have produced or promoted the formation of hexavalent chromium, the vast majority, if not all, of the total chromium detected consists of trivalent chromium. Given the preponderance of trivalent chromium versus hexavalent chromium, it is appropriate to use the trivalent chromium SSL in evaluating the total chromium results. The residential SSL for trivalent chromium was approximately 3913 times the maximum concentrations at location 00-604223. In addition, the residential cancer risk for chromium was approximately 1×10^{-6} and the total excess cancer risk for the site was approximately 5×10^{-6} (the maximum site concentration and the maximum concentration at location 00-604223 were below 10 ft bgs and not included in the residential risk calculation). The lateral extent of chromium is defined, and further sampling for vertical extent is not warranted.

Lead was detected above the soil and sediment BVs (22.3 mg/kg and 19.7 mg/kg) in four soil samples and one sediment sample with a maximum concentration of 63.6 mg/kg. Concentrations decreased with depth at locations 00-604239 and 00-604240 and decreased downgradient. The lateral and vertical extent of lead are defined.

Manganese was detected above the Qbt 2,3,4 and Qbt 1g BVs in three tuff samples with a maximum concentration of 537 mg/kg. Concentrations decreased with depth at location 00-604236, increased with depth at locations 00-604233 and 00-604235, and decreased downgradient. The concentrations of manganese in Qbt 3 are not statistically different from background (Appendix F, Table F-4). The residential SSL was approximately 41 times and 48 times the concentrations in Qbt 1g (locations 00-604235 and 00-604236). The lateral extent of manganese is defined, and further sampling for vertical extent is not warranted.

Mercury was detected above the soil BV in five samples with a maximum concentration of 2.12 mg/kg. Concentrations decreased with depth at locations 00-604230, 00-604239, and 00-604240 and decreased downgradient. The lateral and vertical extent of mercury are defined.

Nickel was detected above the soil, Qbt 2,3,4, and Qbt 1g/Qct BVs in one soil sample and seven tuff samples with a maximum concentration of 39.5 mg/kg. Concentrations decreased with depth at locations 00-604230, 00-604235, 00-604236, 00-604240, and LA-61504 and increased with depth at locations 00-603900 and 00-604223. Concentrations decreased downgradient. The residential SSL was approximately 127 times and 111 times the concentrations at locations 00-603900 and 00-604223. The lateral extent of nickel is defined, and further sampling for vertical extent is not warranted.

Selenium was detected above the sediment, Qbt 2,3,4, and Qbt 1g BVs in one sediment sample and six tuff samples with a maximum concentration of 0.41 mg/kg and had DLs (0.51 mg/kg to 0.6 mg/kg) above BVs in five samples. Concentrations did not change substantially (0.4 mg/kg or less) with depth at any location and decreased downgradient. The residential SSL was approximately 954 times the maximum concentration and approximately 652 times the maximum DL. Further sampling for extent of selenium is not warranted.

Zinc was detected above the soil and sediment BVs in two soil samples and one sediment sample with a maximum concentration of 69.1 mg/kg. Concentrations decreased with depth at locations 00-604232 and 00-604239 and decreased downgradient. The lateral and vertical extent of zinc are defined.

Organic Chemicals

Organic COPCs at SWMU 01-007(a) include acetone; Aroclor-1260; benzene; benzyl alcohol; bis(2-ethylhexyl)phthalate; tert-butylbenzene; di-n-butylphthalate; isopropylbenzene; 4-isopropyltoluene; methylene chloride; tetrachloroethene; and trichlorofluoromethane.

Acetone was detected in one sample at a concentration of 0.0044 mg/kg. Concentrations decreased with depth at location 00-604232 and decreased downgradient. The lateral and vertical extent of acetone are defined.

Aroclor-1260 was detected in seven samples with a maximum concentration of 0.055 mg/kg. Concentrations decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of Aroclor-1260 are defined.

Benzene was detected in one sample at a concentration of 0.0002 mg/kg. The concentration increased with depth at location 00-603901, was below the EQL, and decreased downgradient. The residential SSL was approximately 89,000 times the concentration. The lateral extent of benzene is defined, and further sampling for vertical extent is not warranted.

Benzyl alcohol was detected in one sample at a concentration of 0.036 mg/kg. The concentration increased with depth at location 00-604223, was below the EQL, and decreased downgradient. The residential SSL was approximately 175,000 times the concentration. The lateral extent of benzyl alcohol is defined, and further sampling for vertical extent is not warranted.

Bis(2-ethylhexyl)phthalate was detected in 14 samples with a maximum concentration of 1.7 mg/kg. Concentrations decreased with depth at locations 00-604230, 00-604233, 00-604235, and 00-604236, and 00-604239; did not change substantially (0.35 mg/kg, 0.08 mg/kg, and 0.017 mg/kg) with depth at locations 00-604234, LA-61504, and LA-61505; and increased with depth at location 00-603901, where the concentration was below the EQL. Concentrations decreased downgradient. The residential SSL was approximately 5066 times the concentration at location 00-603901 and approximately 224 times the maximum concentration. The lateral extent of bis(2-ethylhexyl)phthalate is defined, and further sampling for vertical extent is not warranted.

Butylbenzene[tert-] was detected in one sample at a concentration of 0.00015 mg/kg. The concentration increased with depth at location 00-603901, was below the EQL, and decreased downgradient. The residential SSL was approximately 52,000,000 times the concentration. The lateral extent of tert-butylbenzene is defined, and further sampling for vertical extent is not warranted.

Di-n-butylphthalate was detected in one sample at a concentration of 0.065 mg/kg. Concentrations decreased with depth at location 00-604239 and decreased downgradient. The lateral and vertical extent of di-n-butylphthalate are defined.

Dinitro-2-methylphenol[4,6-] was detected in one sample at a concentration of 0.41 mg/kg. The concentration increased with depth at location 00-604223, was below the EQL and decreased downgradient. The residential and industrial SSLs were approximately 12 times and 179 times the concentration. The lateral extent of 4,6-dinitro-2-methylphenol is defined, and further sampling for vertical extent is not warranted.

Isopropylbenzene was detected in one sample at a concentration of 0.00012 mg/kg. Concentrations decreased with depth at location 00-603901 and decreased downgradient. The lateral and vertical extent of isopropylbenzene are defined.

Isopropyltoluene[4-] was detected in one sample at a concentration of 0.0041 mg/kg. Concentrations decreased with depth at location 00-604232 and decreased downgradient. The lateral and vertical extent of 4-isopropyltoluene are defined.

Methylene chloride was detected in six samples with a maximum concentration of 0.0083 mg/kg. Concentrations decreased with depth or did not change substantially (0.0025 mg/kg) with depth at locations 00-604223, 00-604239, and 00-604240 and decreased downgradient. The residential SSL was approximately 49,277 times the maximum concentration. The lateral extent of methylene chloride is defined, and further sampling for vertical extent is not warranted.

Tetrachloroethene was detected in one sample at a concentration of 0.00011 mg/kg. Concentrations decreased with depth at location 00-604235 and decreased downgradient. The lateral and vertical extent of tetrachloroethene are defined.

Trichlorofluoromethane was detected in two samples with a maximum concentration of 0.0012 mg/kg. Concentrations did not change with depth at location 00-604230 and decreased downgradient. The residential SSL was approximately 1,025,000 times the maximum concentration. The lateral extent of trichlorofluoromethane is defined, and further sampling for vertical extent is not warranted.

Radionuclides

Radionuclide COPCs at SWMU 01-007(a) include americium-241, plutonium-238, plutonium-239/240, tritium, uranium-234, uranium-235/236, and uranium-238.

Americium-241 was detected above the soil and sediment BVs in one surface soil sample and one sediment sample, detected in two soil samples below 1.0 ft bgs, and detected in two tuff samples with a maximum activity of 0.197 pCi/g. Activities decreased with depth at all locations (surface samples at locations 00-604231 and 00-604233 were excavated) and decreased downgradient. The lateral and vertical extent of americium-241 are defined.

Plutonium-238 was detected above the soil and sediment BVs in one surface soil sample and one sediment sample and detected in two tuff samples with a maximum activity of 0.112 pCi/g. Activities decreased with depth at locations 00-603900, 00-604233, 00-604234, and 01-225 (surface sample at

location 00-604233 was excavated), and decreased downgradient. The residential SAL was approximately 1333 times the activity remaining at location 00-604233. The lateral extent of plutonium-238 is defined, and further sampling for vertical extent is not warranted.

Plutonium-239/240 was detected above the soil and sediment BVs (0.054 pCi/g and 0.068 pCi/g) in 11 surface soil samples and 4 sediment samples, detected in 9 soil samples below 1.0 ft bgs, and detected in 19 tuff samples (17 Qbt 2,3,4 and 2 Qbt 1g) with a maximum activity of 25.6 pCi/g. Activities decreased with depth at 21 locations (surface samples at locations 00-604231, 00-604233, 01-227, and 01-231 were excavated); did not change substantially (0.073 pCi/g) with depth at location 01-221; increased with depth at location 01-224; and decreased downgradient. The residential SAL was approximately 147 times the activity at location 01-221 and 50 times the activity at location 01-224. The lateral extent of plutonium-239/240 is defined, and further sampling for vertical extent is not warranted.

Tritium was detected in four samples with a maximum activity of 2.08 pCi/g. Activities did not change substantially (0.36 pCi/g) with depth at location 00-604239 and decreased downgradient. The residential SAL was approximately 817 times the maximum activity. The lateral extent of tritium is defined, and further sampling for vertical extent is not warranted.

Uranium-234 was detected above the Qbt 2,3,4 BV in three samples with a maximum activity of 3.35 pCi/g. Activities did not change substantially (0.16 pCi/g) with depth at location 01-61505 and decreased downgradient. The residential SAL was approximately 87 times the maximum activity. The lateral extent of uranium-234 is defined, and further sampling for vertical extent is not warranted.

Uranium-235/236 was detected above the Qbt 2,3,4 BV in three samples with a maximum activity of 0.202 pCi/g. Activities did not change substantially (0.055 pCi/g) with depth at location 01-61505 and decreased downgradient. The residential SAL was approximately 208 times the maximum activity. The lateral extent of uranium-235/236 is defined, and further sampling for vertical extent is not warranted.

Uranium-238 was detected above the Qbt 2,3,4 BV in three samples with a maximum activity of 3.06 pCi/g. Activities did not change substantially (0.19 pCi/g) with depth at location 01-61505 and decreased downgradient. The residential SAL was approximately 49 times the maximum activity. The lateral extent of uranium-238 is defined, and further sampling for vertical extent is not warranted.

6.13.5 Summary of Human Health Risk Screening

Industrial Scenario

The total excess cancer risk for the industrial scenario is 5×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.003, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

The total excess cancer risk for the construction worker scenario is 3×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 1, which is equivalent to the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

The total excess cancer risk for the residential scenario is 5×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 3 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

6.13.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), LOAEL analyses, and the relationship of detected concentrations and DLs to background concentrations, no potential ecological risks exist at SWMU 01-007(a).

6.14 SWMU 01-007(b), Suspected Subsurface Soil Radiological Contamination

6.14.1 Site Description and Operational History

SWMU 01-007(b) is an area of suspected subsurface soil radiological contamination associated with the drainlines and outfalls from building D-2 laundry facility (Ahlquist et al. 1977, 005710, p. 11) (Figure 6.14-1). Building D-2 served as the laundry facility for radioactively contaminated clothing and recyclable equipment for the entire TA from 1943 to 1945 when the laundry facility was moved to TA-21. Drainlines from the laundry facility discharged directly onto Hillside 137 southwest of former building D-2. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of former buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70).

Currently, the mesa-top portion of the site on the bench has been covered with fill material and is undeveloped, and the hillside portion is undeveloped.

6.14.2 Relationship to Other SWMUs and AOCs

SWMU 01-007(b) contains SWMUs 01-006(c), 01-006(d), and 01-001(c).

6.14.3 Summary of Previous Investigations

During the Ahlquist radiological survey between 1974 and 1976, almost 9000 m^3 of soil was removed from the buildings D and D-2 areas (Ahlquist et al. 1977, 005710, p. 40).

In 1992 and 1993, a Phase I RFI was conducted, and samples were collected at the mesa-top area of the former building D-2 footprint and the hillside downgradient of the SWMU; however, most of the samples were analyzed at on-site laboratories. Samples analyzed at off-site fixed laboratories included 12 soil, fill, and sediment samples (0.0 to 0.5 ft) collected from 12 locations at SWMU 01-007(b).

- Samples from 12 locations were analyzed for metals. Analytical results indicated that antimony, arsenic, barium, cadmium, lead, mercury, and selenium were detected greater than BVs in at least one sample between 0.0 and 0.5 ft bgs. Barium and cadmium were detected at concentrations within the range of the background concentrations. Antimony, arsenic, lead, and selenium were detected greater than the range of the background concentrations.

The Phase I RFI data are screening level data.

6.14.4 Site Contamination

6.14.4.1 Soil, Rock, and Sediment Sampling

As part of the site investigation, the following characterization activities were conducted at SWMU 01-007(b):

- For the Phase I investigation, a total of 32 samples were collected from 16 locations. Samples were collected from approximately 0.0 to 1.0 ft bgs and approximately 1.0 to 2.0 ft bgs at 12 locations, 0.0 to 1.0 ft bgs and 2.25 to 3.25 ft bgs or 2.75 to 3.75 ft bgs at 2 locations, 5.0 to 6.5 ft bgs and 7.5 ft to 9.0 ft bgs at location 00-603782, and 10.0 ft to 13.0 ft bgs and 13.0 ft to 15.0 ft bgs at location 00-603781. Samples were analyzed for TAL metals, VOCs, SVOCs, PCBs, nitrate, cyanide, perchlorate, isotopic uranium, isotopic plutonium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides.
- As part of the Phase II investigation, subsurface samples were collected at five previous sampling locations and two new sampling locations. Samples were collected from 4.0 to 5.0 ft bgs and 6.0 to 7.0 ft bgs at locations 00-603792, 00-603797, and 00-603798, 3.0 to 4.0 ft bgs and 5.0 to 6.0 ft bgs at location 00-603796, and 10.0 to 11.0 ft bgs and 13.0 to 14.0 ft bgs at location 00-603782. Samples were collected at sampling locations 01-614808 and 01-614809 from 0.0 1.0 ft bgs, 3.0 to 4.0 ft bgs, and 5.0 to 6.0 ft bgs. Samples from the five previous locations were analyzed for chromium, nickel, selenium, and bis(2-ethylhexyl)phthalate, and samples from the new locations were analyzed for chromium, nickel, and selenium.
- Subsequent investigation in 2013 resulted in the collection of samples at locations 01-232, 01-233, 01-234, and 01-235 from 0.0 to 1.0 ft bgs and 1.0 to 2.0 ft bgs. Samples were analyzed for isotopic plutonium.
- Plutonium-239/240 activities exceeded or were close to the residential SAL at locations 00-604785, 00-604787, 00-604790, 01-233, and 01-235 on the canyon slope outside of the former LA Inn property boundary. Surface samples at these five locations were excavated as well as samples to a depth of 5.0 to 6.0 ft bgs at location 01-235 in 2016. Deeper samples were available from 1.0 to 2.0 ft bgs at locations 00-604785, 00-604787, 00-604790, and 01-233 and samples were collected from 6.0 to 7.0 ft bgs, 9.0 to 10.0 ft bgs, and 10.0 to 11.0 ft bgs at location 01-235.

The sampling locations at SWMU 01-007(b) are shown in Figure 6.14-1. Table 6.14-1 presents the samples collected and analyses requested. The geodetic coordinates of sampling locations are presented in Table 3.1-1.

6.14.4.2 Soil, Rock, and Sediment Field-Screening Results

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No radiological screening results exceeded twice the daily site background levels. Field-screening results are presented in Table 3.6-1. There were no changes to sampling or other activities as a result of field-screening results.

6.14.4.3 Soil, Rock, and Sediment Sampling Analytical Results

Decision-level data at SWMU 01-007(b) consist of results from 53 samples (5 soil, 9 sediment, 39 tuff) collected from 22 locations.

Inorganic Chemicals

Twenty-nine samples (1 soil, 9 sediment, 19 tuff) were analyzed for TAL metals, nitrate, cyanide, and perchlorate, and 16 samples (2 soil, 14 tuff) were analyzed for chromium, nickel, and selenium. Because fewer than 8 soil samples were collected, statistical tests could not be performed on results for this medium. Table 6.14-2 presents the inorganic chemicals above BVs and detected inorganic chemicals with no BVs. Figure 6.14-2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Aluminum was detected above the Qbt 2,3,4 BV (7340 mg/kg) in one sample at a concentration of 8450 mg/kg. The Gehan and quantile tests indicated site concentrations of aluminum in tuff are not statistically different from background (Figure F-23 and Table F-5). Aluminum is not a COPC.

Antimony was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had DLs (0.52 mg/kg) above the BV in two samples. The DLs were only 0.02 mg/kg above the BV and antimony was not detected or detected above BVs in the other 30 samples (detected below BVs in 8 samples). Antimony is not a COPC.

Arsenic was detected above the Qbt 2,3,4 BV (2.79 mg/kg) in one sample at a concentration of 3.6 mg/kg. The Gehan and quantile tests indicated site concentrations of arsenic in tuff are not statistically different from background (Figure F-24 and Table F-5). Arsenic is not a COPC.

Barium was detected above the Qbt 2,3,4 BV (46 mg/kg) in two samples with a maximum concentration of 2480 mg/kg. The Gehan and quantile tests indicated site concentrations of barium in tuff are not statistically different from background (Figure F-25 and Table F-5). However, the maximum site concentration was substantially above background. Barium is retained as a COPC.

Beryllium was detected above the Qbt 2,3,4 BV (1.21 mg/kg) in one sample at a concentration of 1.3 mg/kg. The Gehan and quantile tests indicated site concentrations of beryllium in tuff are not statistically different from background (Figure F-26 and Table F-5). Beryllium is not a COPC.

Calcium was detected above the Qbt 2,3,4 BV (2200 mg/kg) in one sample at a concentration of 7860 mg/kg. The Gehan and quantile tests indicated site concentrations of calcium in tuff are not statistically different from background (Figure F-27 and Table F-5). Calcium is not a COPC.

Chromium was detected above the soil and Qbt 2,3,4 BVs (19.3 mg/kg and 7.14 mg/kg) in 1 soil sample and 14 tuff samples with a maximum concentration of 41.1 mg/kg. The soil concentration was above the maximum soil background concentration (36.5 mg/kg). The Gehan and quantile tests indicated site concentrations of chromium in tuff are statistically different from background (Figure F-28 and Table F-5). Chromium is retained as a COPC.

Copper was detected above the Qbt 2,3,4 BV (4.66 mg/kg) in two samples with a maximum concentration of 9.6 mg/kg. The Gehan test indicated site concentrations of copper in tuff are statistically different from background (Table F-5). However, the quantile and slippage tests indicated site concentrations of copper in tuff are not statistically different from background (Figure F-29 and Table F-5). Copper is not a COPC.

Cyanide was not detected above the Qbt 2,3,4 BV (0.5 mg/kg) but had DLs (0.51 mg/kg, 0.52 mg/kg, and 0.53 mg/kg) above the BV in 7 samples. The DLs were only 0.01 mg/kg to 0.03 mg/kg above the BV and cyanide was not detected or not detected above BVs in the other 27 samples (detected below BVs in 4 samples). Cyanide is not a COPC.

Lead was detected above the Qbt 2,3,4 BV (11.2 mg/kg) in one sample at a concentration of 13.2 mg/kg. The Gehan and quantile tests indicated site concentrations of lead in tuff are not statistically different from background (Figure F-30 and Table F-5). The Gehan and quantile tests indicated site concentrations of lead in sediment are not statistically different from background (Figure F-31 and Table F-6). Lead is not a COPC.

Magnesium was detected above the Qbt 2,3,4 BV (1690 mg/kg) in one sample at a concentration of 2180 mg/kg. The Gehan and quantile tests indicated site concentrations of magnesium in tuff are not statistically different from background (Figure F-32 and Table F-5). Magnesium is not a COPC.

Manganese was detected above the Qbt 2,3,4 BV (482 mg/kg) in one sample at a concentration of 766 mg/kg. The Gehan and quantile tests indicated site concentrations of manganese in tuff are not statistically different from background (Figure F-33 and Table F-5). Manganese is not a COPC.

Nickel was detected above the Qbt 2,3,4 BV (6.58 mg/kg) in seven samples with a maximum concentration of 15.9 mg/kg. The quantile and slippage tests indicated site concentrations of nickel in tuff are statistically different from background (Figure F-34 and Table F-5). Nickel is retained as a COPC.

Nitrate was detected in 10 samples with a maximum concentration of 1.3 mg/kg. Nitrate is naturally occurring and the concentration likely reflects naturally occurring levels of nitrate. Nitrate is not a COPC.

Perchlorate was detected in one sample with a maximum concentration of 0.0077 mg/kg. Perchlorate is retained as a COPC.

Selenium was detected above the sediment and Qbt 2,3,4 BVs (0.3 mg/kg for both) in 3 sediment samples and 10 tuff samples with a maximum concentration of 1.6 mg/kg and had DLs (0.55 mg/kg to 3.07 mg/kg) above the BVs in 17 samples. The quantile and slippage tests indicated site concentrations of selenium in tuff are statistically different from background (Figure F-35 and Table F-5). Selenium is retained as a COPC.

Organic Chemicals

Twenty-nine samples (1 soil, 9 sediment, 19 tuff) were analyzed for SVOCs, VOCs, and PCBs, and 10 samples were analyzed for bis(2-ethylhexyl)phthalate. Table 6.14-3 presents the detected organic chemicals. Plate 5 shows the spatial distribution of detected organic chemicals.

Organic chemicals detected at SWMU 01-007(b) include Aroclor-1260; bis(2-ethylhexyl)phthalate; chloromethane; di-n-butylphthalate; isopropylbenzene; 4-isopropyltoluene; methylene chloride; toluene; trichlorofluoromethane; and 1,2,4-trimethylbenzene. The detected organic chemicals are retained as COPCs.

Radionuclides

Twenty-nine samples (1 soil, 9 sediment, 19 tuff) were analyzed for isotopic uranium, americium-241, strontium-90, tritium, and gamma-emitting radionuclides; and 37 samples (3 soil, 9 sediment, 25 tuff) were analyzed for isotopic plutonium. Table 6.14-4 presents the radionuclides detected or detected above BVs/FVs. Plate 6 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Americium-241 was detected above the sediment BV (0.04 pCi/g) in two sediment samples and detected in one tuff sample with a maximum activity of 0.24 pCi/g. Amercium-241 is retained as a COPC.

Plutonium-238 was detected in one tuff sample at an activity of 0.0367 pCi/g. Plutonium-238 is retained as a COPC.

Plutonium-239/240 was detected above the soil and sediment BVs (0.054 pCi/g and 0.068 pCi/g) in 3 soil samples and 8 sediment samples and detected in 15 tuff samples with a maximum activity of 20.1 pCi/g. Plutonium-239/240 is retained as a COPC.

6.14.4.4 Nature and Extent of Contamination

The nature and extent of inorganic, organic, and radionuclide COPCs at SWMU 01-007(b) are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 01-007(b) include barium, chromium, nickel, perchlorate, and selenium.

Barium was detected above the Qbt 2,3,4 BV in two samples with a maximum concentration of 2480 mg/kg. Concentrations decreased with depth at location 00-603782 and decreased downgradient. The lateral and vertical extent of barium are defined.

Chromium was detected above the soil and Qbt 2,3,4 BVs in 1 soil sample and 14 tuff samples with a maximum concentration of 41.1 mg/kg. Concentrations decreased with depth at locations 00-603782, 00-603792, 00-603796, and 01-614809; did not change substantially (5.3 mg/kg) with depth at location 00-603798; and increased with depth at locations 00-603786, 00-603791, 00-603793, 00-603797, and 01-614808. Concentrations were below the maximum Qbt 2,3,4 background concentration (13 mg/kg) at locations 00-603791, 00-603793, and 01-614808 and increased downgradient. The residential and industrial SSLs were approximately 5 to 6 times and 27 to 33 times the concentrations at locations 00-603786 and 00-603797 and approximately 2 times and 12 times the maximum concentration. Because there was no known use of hexavalent chromium at this site and site conditions would not have produced or promoted the formation of hexavalent chromium, the vast majority, if not all, of the total chromium detected consists of trivalent chromium. Given the preponderance of trivalent chromium versus hexavalent chromium, it is appropriate to use the trivalent chromium SSL in evaluating the total chromium results. The residential SSL for trivalent chromium was approximately 2847 times the maximum concentration. In addition, the residential cancer risk for chromium was approximately 1×10^{-6} and the total excess cancer risk for the site was approximately 2×10^{-6}. Further sampling for extent of chromium is not warranted.

Nickel was detected above the Qbt 2,3,4 BV in seven samples with a maximum concentration of 15.9 mg/kg. Concentrations decreased with depth at locations 00-603782, 00-603792, and 00-603796; did not change substantially (1.5 mg/kg) with depth at location 00-603798; and increased with depth at location 00-603786. Concentrations decreased downgradient. The residential SSL was approximately 137 times and 177 times the maximum concentrations at locations 00-603798 and 00-603786, respectively. The lateral extent of nickel is defined, and further sampling for vertical extent is not warranted.

Perchlorate was detected in one sample with a maximum concentration of 0.0077 mg/kg. Concentrations increased with depth at location 00-603792 and decreased downgradient. The residential SSL was approximately 7116 times the concentration. The lateral extent of perchlorate is defined, and further sampling for vertical extent is not warranted.

Selenium was detected above the sediment and Qbt 2,3,4 BVs in 3 sediment samples and 10 tuff samples of 1.6 mg/kg and had DLs (0.55 mg/kg to 3.07 mg/kg) above the BVs in 17 samples. Concentrations decreased with depth at locations 00-603782 and 00-603796, did not change substantially (0.01 mg/kg, 0.04 mg/kg, 0.09 mg/kg, 0.02 mg/kg, 0.09 mg/kg, and 0.34 mg/kg) with depth at locations 00-603781, 00-603789, 00-603791, 00-603792, 00-603793, and 00-603797, respectively.

The residential SSL was approximately 244 times the maximum concentration and approximately 127 times the maximum DL. Further sampling for extent of selenium is not warranted.

Organic Chemicals

Organic COPCs at SWMU 01-007(b) include Aroclor-1260; bis(2-ethylhexyl)phthalate; chloromethane; di-n-butylphthalate; isopropylbenzene; 4-isopropyltoluene; methylene chloride; toluene; trichlorofluoromethane; and 1,2,4-trimethylbenzene.

Aroclor-1260 was detected in three samples with a maximum concentration of 0.049 mg/kg. Concentrations decreased with depth at location 00-603782 and did not change substantially (0.2 mg/kg and 0.24 mg/kg) with depth at locations 00-603787 and 00-603790 (surface samples were excavated at these locations and had concentrations of 0.23 mg/kg and 0.26 mg/kg, respectively [Appendix E, Excavated Samples]). Concentrations decreased downgradient. The residential and industrial SSLs were approximately 50 times and 235 times the maximum concentration. The lateral extent of Aroclor-1260 is defined, and further sampling for vertical extent is not warranted.

Bis(2-ethylhexyl)phthalate was detected in three samples with a maximum concentration of 0.47 mg/kg. Concentrations decreased with depth at locations 00-603789 and 00-603782 and increased with depth at location 00-603791; concentrations at locations 00-603789 and 00-603791 were below the EQLs. Concentrations decreased downgradient. The residential SSL was approximately 809 times the maximum concentration. The lateral extent of bis(2-ethylhexyl)phthalate is defined, and further sampling for vertical extent is not warranted.

Chloromethane was detected in one sample at a concentration of 0.00029 mg/kg. Concentrations decreased with depth at location 00-603781 and decreased downgradient. The lateral and vertical extent of chloromethane are defined.

Di-n-butylphthalate was detected in one sample at a concentration of 0.036 mg/kg. Concentrations increased with depth at location 00-603793 and decreased downgradient. The concentration was below the EQL. The residential SSL was approximately 171,111 times the maximum concentration. The lateral extent of di-n-butylphthalate is defined, and further sampling for vertical extent is not warranted.

Isopropylbenzene was detected in one sample at a concentration of 0.00012 mg/kg. Concentrations decreased with depth at location 00-603782 and decreased downgradient. The lateral and vertical extent of isopropylbenzene are defined.

Isopropyltoluene[4-] was detected in one sample at a concentration of 0.00019 mg/kg. Concentrations increased with depth at location 00-603792 and decreased downgradient. The concentration was below the EQL. The residential SSL was approximately 12,421,000 times the concentration. The lateral extent of 4-isopropyltoluene is defined, and further sampling for vertical extent is not warranted.

Methylene chloride was detected in two samples with a maximum concentration of 0.00094 mg/kg. Concentrations decreased with depth at location 00-603796, increased with depth at location 00-603789, and decreased downgradient. Concentrations were below the EQLs. The residential SSL was approximately 435,100 times the maximum concentration. The lateral extent of methylene chloride is defined, and further sampling for vertical extent is not warranted.

Toluene was detected in two samples with a maximum concentration of 0.00039 mg/kg. Concentrations decreased with depth at locations 00-603788 and 00-603791 and decreased downgradient. The lateral and vertical extent of toluene are defined.

Trichlorofluoromethane was detected in one sample at a concentration of 0.00024 mg/kg. The concentration increased with depth at location 00-603782, was below the EQL, and decreased downgradient. The residential SSL was approximately 5,125,000 times the concentration. The lateral extent of tetrachloroethene is defined, and further sampling for vertical extent is not warranted.

Trimethylbenzene[1,2,4-] was detected in one sample at a concentration of 0.0004 mg/kg. Concentrations decreased with depth at location 00-603797 and decreased downgradient. The lateral and vertical extent of 1,2,4-trimethylbenzene are defined.

Radionuclides

Radionuclide COPCs at SWMU 01-007(b) include americium-241, plutonium-238, and plutonium-239/240.

Americium-241 was detected above the sediment BV in two sediment samples and detected in one tuff sample with a maximum activity of 0.24 pCi/g. Activities decreased with depth at locations 00-603793 and 00-603797 and decreased downgradient (the surface sample was excavated at location 00-603785 and had an activity of 2.64 pCi/g). The lateral and vertical extent of americium-241 are defined.

Plutonium-238 was detected in one tuff sample at an activity of 0.0367 pCi/g. The activity increased with depth at location 01-234 and decreased downgradient. Plutonium-238 was not detected at location 01-235 (approximately 10 ft downgradient from location 01-234) from 6.0 ft to 11.0 ft bgs, which is less than the activity in the deepest sample (1.0 ft to 2.0 ft bgs) at location 01-234. The residential SAL was approximately 2289 times the activity at location 01-234. The lateral extent of plutonium-238 is defined, and further sampling for vertical extent is not warranted.

Plutonium-239/240 was detected above the soil and sediment BVs in 3 soil samples and 8 sediment samples and detected in 15 tuff samples with a maximum activity of 20.1 pCi/g. Activities decreased with depth at all locations, except at location 01-234. The surface samples were excavated at locations 00-603785, 00-602787, and 00-603790 and the surface and deeper samples were excavated at location 01-235, all of which had higher activities than the samples left in place. The activities at location 01-235 (approximately 10 ft downgradient from location 01-234) decreased with depth from 6.0 ft to 11.0 ft bgs and were less than the activity in the deepest sample (1.0 ft to 2.0 ft bgs) at location 01-234. Activities decreased downgradient (upgradient locations 00-603790 and 01-235 were excavated) or did not change substantially (0.53 pCi/g) downgradient at location 00-603797. The residential and industrial SALs were approximately 4.6 times and 71 times the maximum activity at location 01-234 and approximately 8.7 times and 132 times the maximum activity at location 00-603797. Further sampling for extent of plutonium-239/240 is not warranted.

6.14.5 Summary of Human Health Risk Screening

Industrial Scenario

The total excess cancer risk for the industrial scenario is 4×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.00005, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

The total excess cancer risk for the construction worker is 6×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.7 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

Residential Scenario

The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.006, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

6.14.6 Summary of Ecological Risk Screening

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), LOAEL analyses, and the relationship of detected concentrations and DLs to background concentrations, no potential ecological risks exist at SWMU 01-007(b).

7.0 CONCLUSIONS

The risk-screening assessment results indicated no potential unacceptable risks or doses from COPCs exist for the industrial, construction worker, and residential scenarios at the 10 sites evaluated within the former LA Inn property. The total excess cancer risks are below the NMED target risk level of 1×10^{-5}, the HIs are below or equivalent to the NMED target HI of 1, and the doses are below the DOE target dose limit of 25 mrem/yr. In addition, risk-screening assessments were not conducted for SWMU 01-006(h1) because no samples were collected within the 0.0- to 10.0-ft depth interval relevant for exposure to receptors.

The Laboratory's "as low as reasonably achievable" (ALARA) program description (PD410, "Los Alamos National Laboratory Environmental ALARA Program," p. 7, effective date September 8, 2008) states that "quantitative ALARA evaluations are not necessary for Laboratory activities that have a potential for annual public exposure less than a 3-mrem TEDE [total effective dose equivalent] individual dose…." The calculated total radiation dose(s) for the residential scenario at the publicly accessible sites within the former LA Inn property ranged from approximately 0.2 mrem/yr to approximately 4 mrem/yr. Three sites [SWMUs 01-006(b) and 01-007(a) and AOC 01-003(b1)] had residential total doses 0.8 mrem/yr, 0.3 mrem/yr, and 1.4 mrem/yr, respectively, above 3 mrem/yr. The ALARA analysis for the three sites indicated the cost of cleanup at each site is greater than the benefit derived from dose reduction (Appendix G, Attachment G-3). The radiation exposures to the public at the other sites evaluated within the former LA Inn property are less than 3 mrem/yr and are therefore ALARA. As a result, the radiation exposures to the public at these sites are ALARA, and further soil removal is not warranted.

No potential ecological risks were found for any receptor at the 10 sites evaluated within the former LA Inn property based on minimum ESL comparisons, HI analyses, potential effects to populations (individuals for T&E species), and LOAEL analyses. A risk-screening assessment was not conducted for SWMU 01-006(h1) because no samples were collected within the 0.0- to 5.0-ft depth interval relevant for exposure to ecological receptors.

8.0 RECOMMENDATIONS

The determination of site status is based on the results of the risk-screening assessments and an evaluation of the nature and extent. Depending upon the decision scenario used, the sites are recommended as corrective actions complete either with or without controls or as requiring additional action. The residential scenario is the only scenario under which corrective action complete without controls is applicable; that is, no additional corrective actions or conditions are necessary. The other decision scenarios (industrial and construction worker) result in corrective action complete with controls; that is, some type of institutional controls must be in place to ensure land use remains consistent with site cleanup levels or that exposure controls are implemented during construction activities. The current and reasonably foreseeable future land uses for the former LA Inn property are industrial/commercial and possibly residential.

8.1 Additional Field Characterization Activities

The nature and extent of contamination has been defined and/or no further sampling is warranted for the SWMUs and AOC investigated within the former LA Inn property. Therefore, no additional characterization of the sites is recommended.

8.2 Recommendations for Corrective Actions Complete

Ten sites do not pose a potential unacceptable risk or dose under the industrial, construction worker, and residential scenarios; have no potential ecological risks for any receptor; and have the nature and extent of contamination defined and/or warrant no further sampling for extent. At these sites, the Laboratory recommends corrective action complete without controls (Table 8.1-1). They include the following:

- SWMU 01-001(d1), Waste Line for Septic Tank 138
- SWMU 01-001(s1), Portion of the Western Sanitary Waste Line
- SWMU 01-002(a1)-00, Portion of an Industrial Waste Line
- AOC 01-003(b1), Part of a Former Surface Disposal Site
- SWMU 01-006(b), Drainline and Outfall
- SWMU 01-006(c), Drainlines and Outfalls
- SWMU 01-006(h1), Portion of a Storm Water Drainage System
- SWMU 01-006(n), Storm Water Drainage System
- SWMU 01-007(a), Suspected Subsurface Soil Radiological Contamination
- SWMU 01-007(b), Suspected Subsurface Soil Radiological Contamination

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 or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the ESH Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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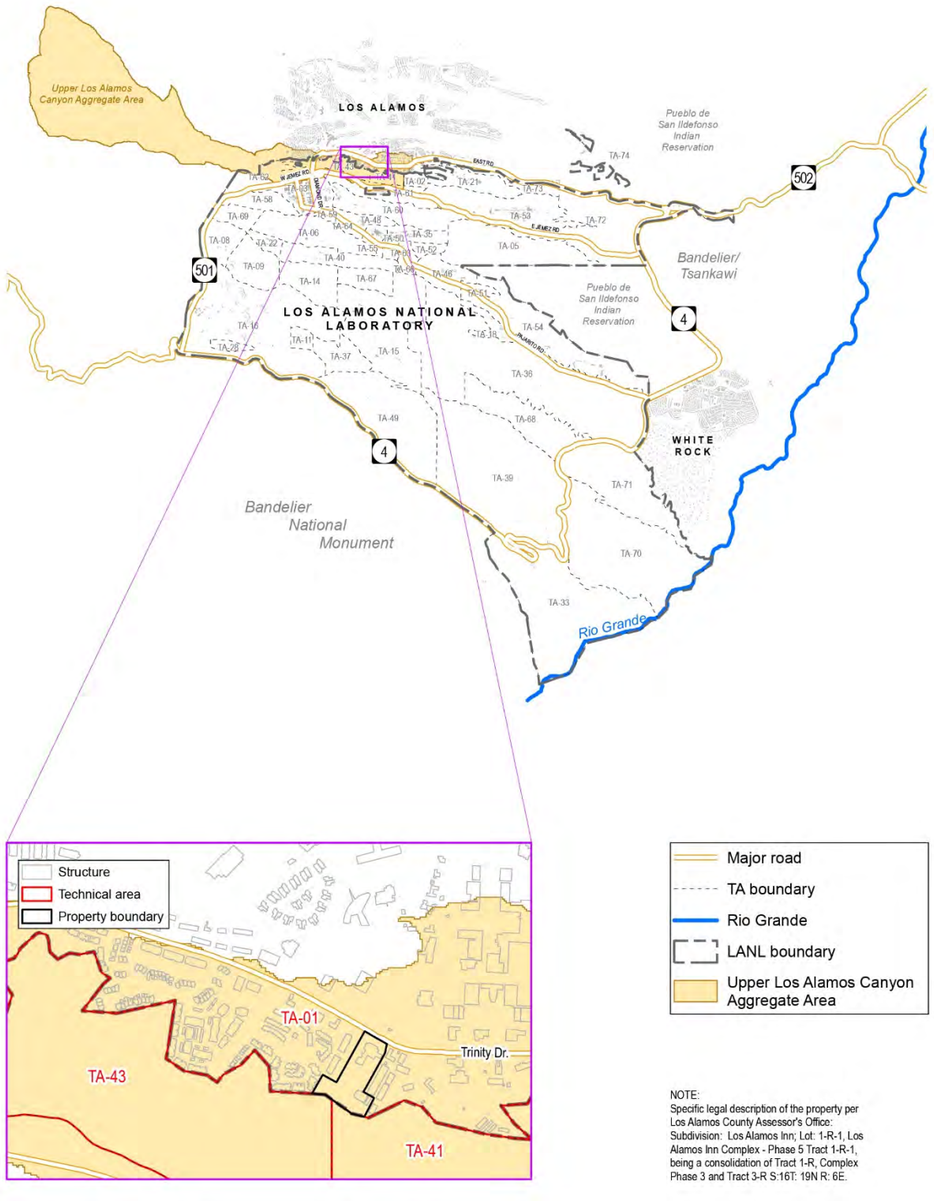

Figure 1.1-1 Location of former LA Inn property with respect to Laboratory TAs

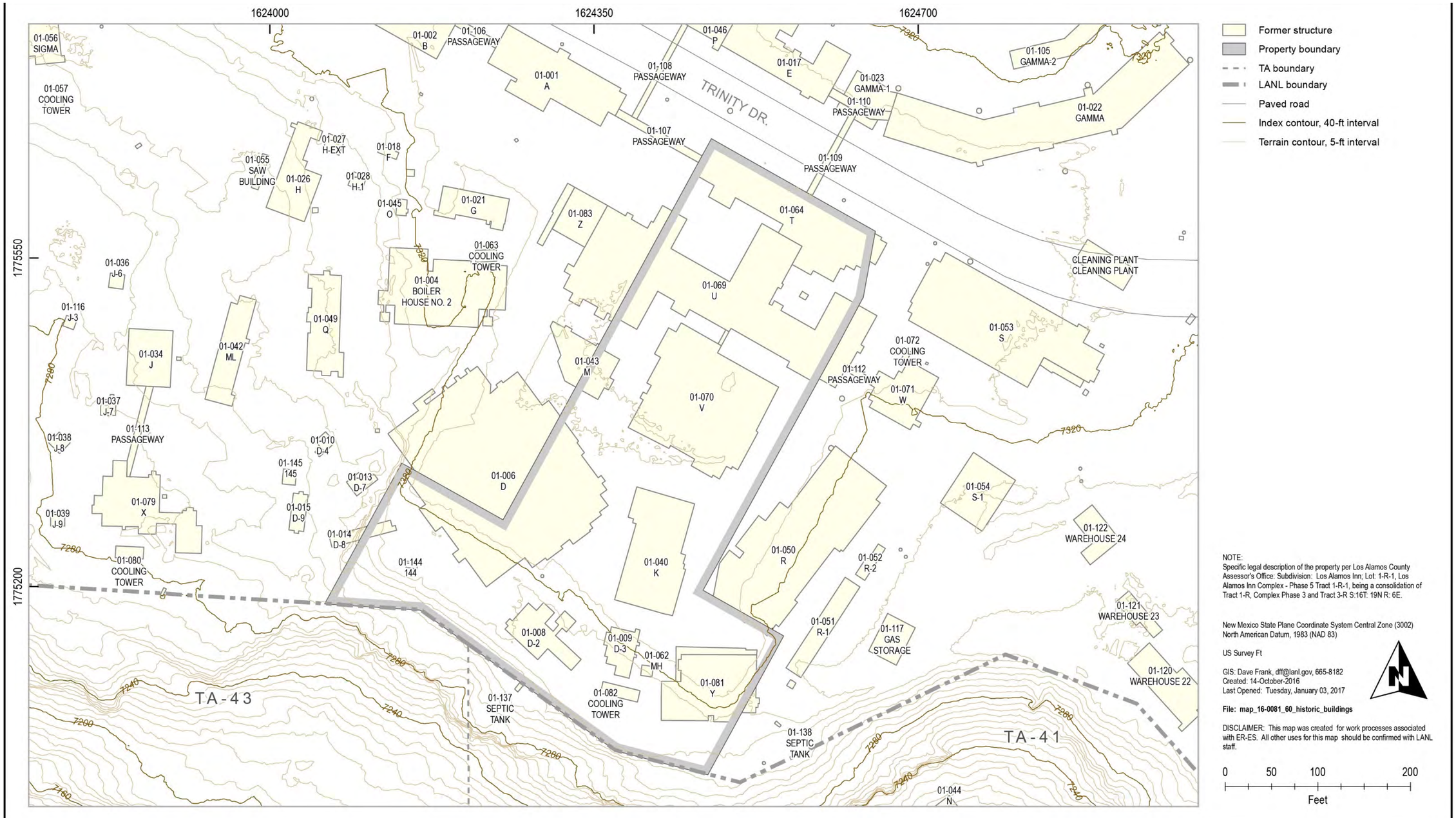

Figure 1.1-2 Locations of former buildings at former TA-01

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

Adapted from LANL 1999, 064617.

Figure 2.2-1 Generalized stratigraphy of bedrock geologic units of the Pajarito Plateau

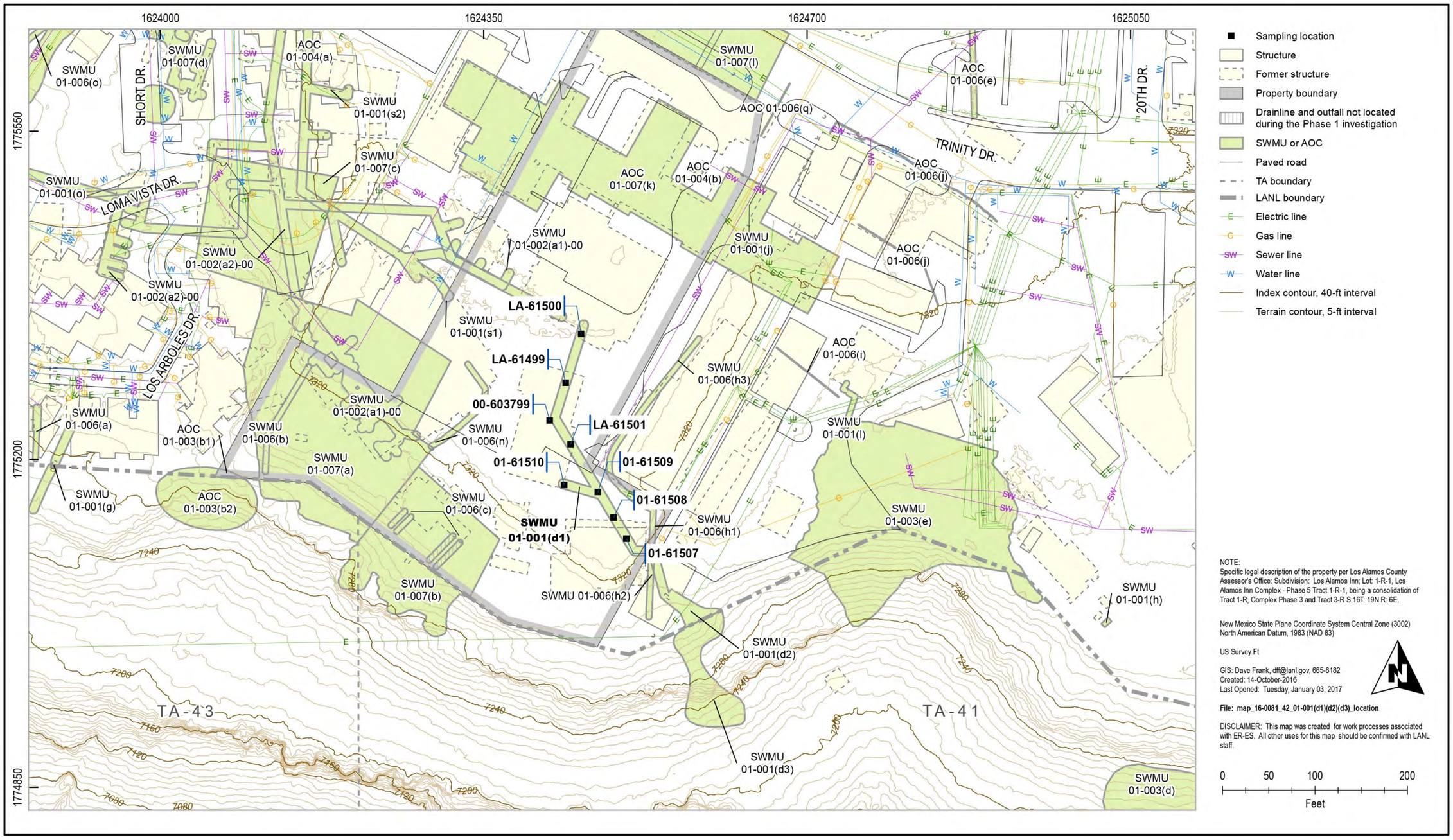

Figure 6.5-1 Sampling locations for SWMU 01-001(d1)

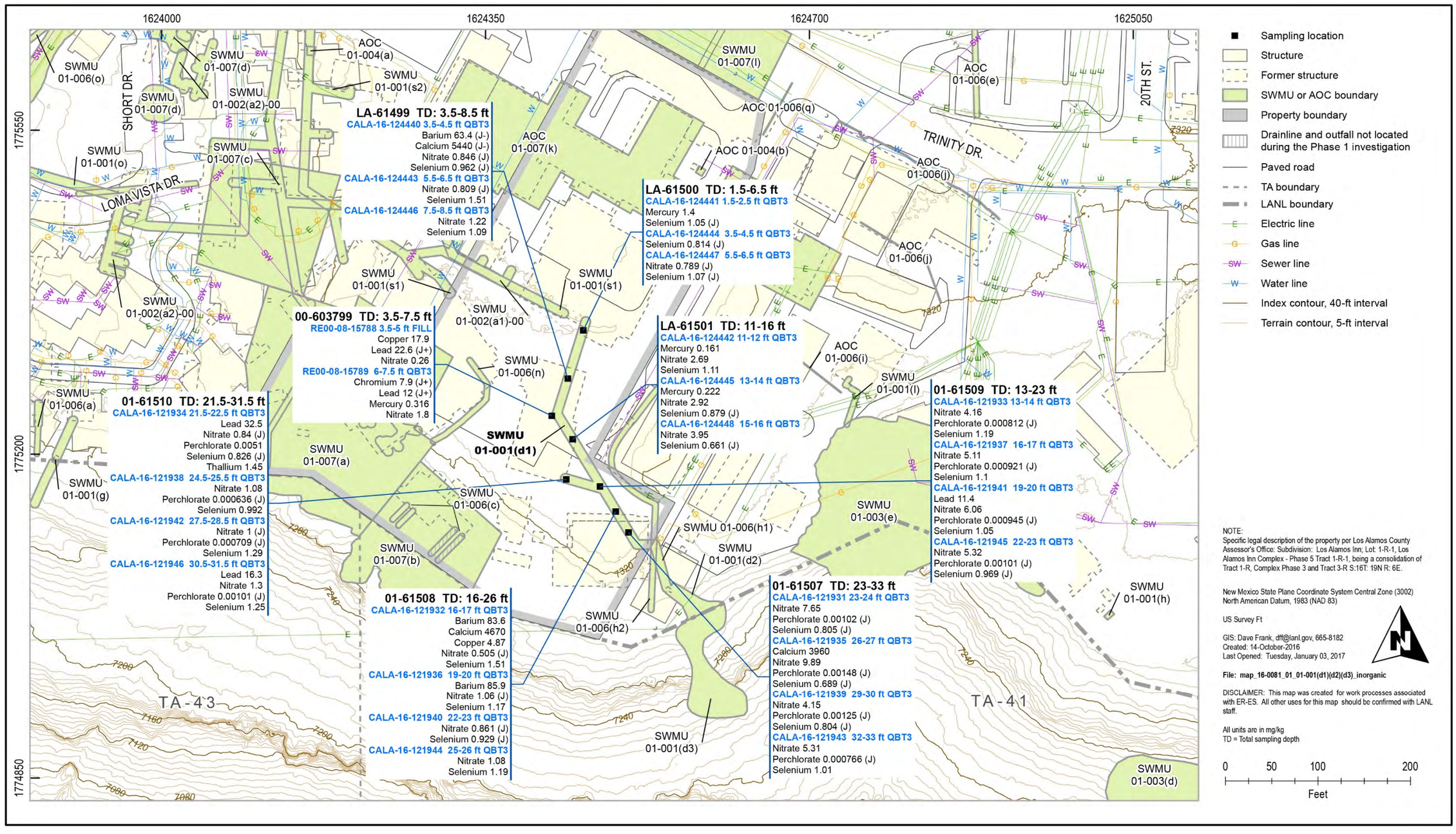

Figure 6.5-2 Inorganic chemicals detected or detected above BVs at SWMU 01-001(d1)

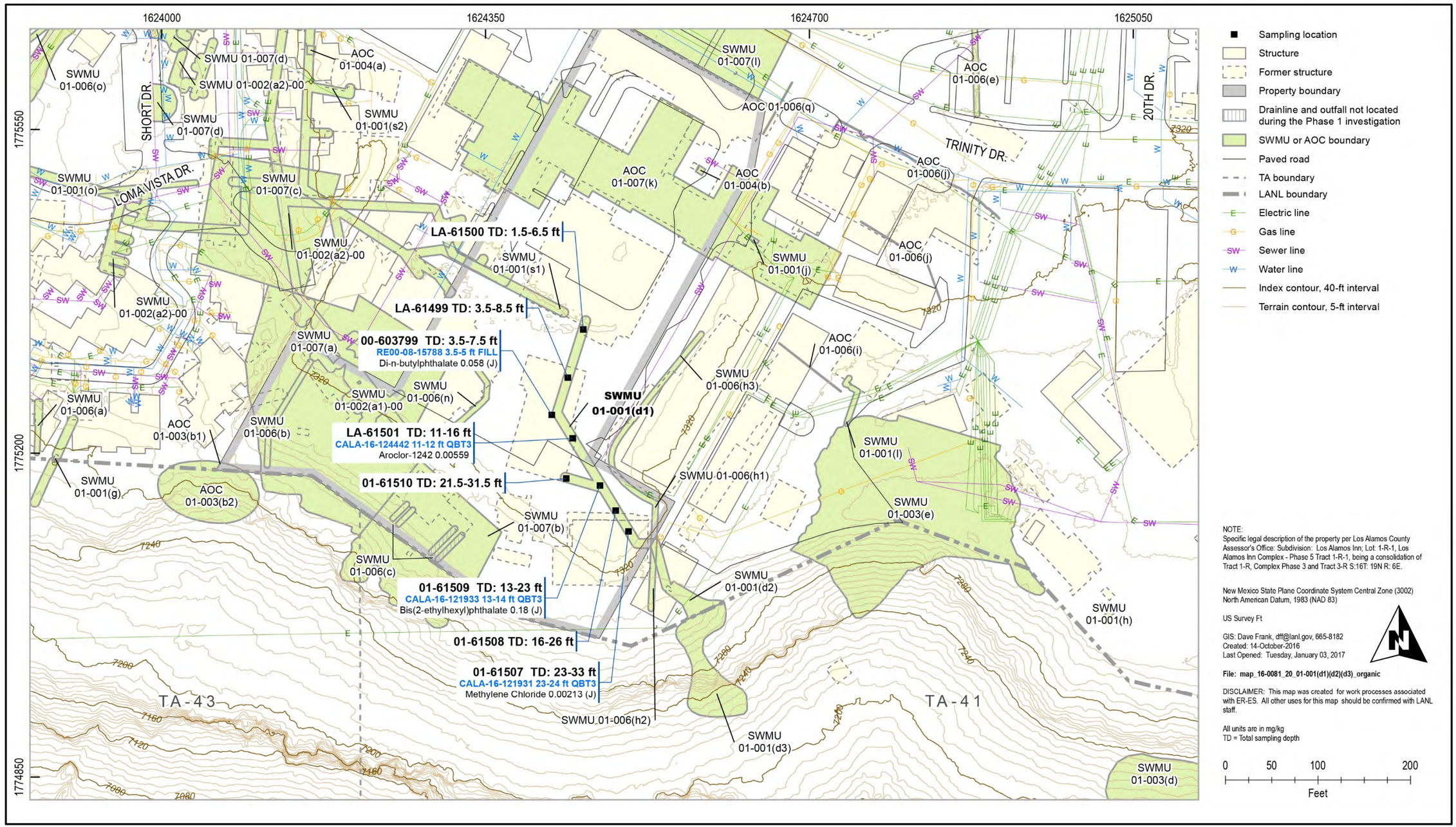

Figure 6.5-3 Organic chemicals detected at SWMU 01-001(d1)

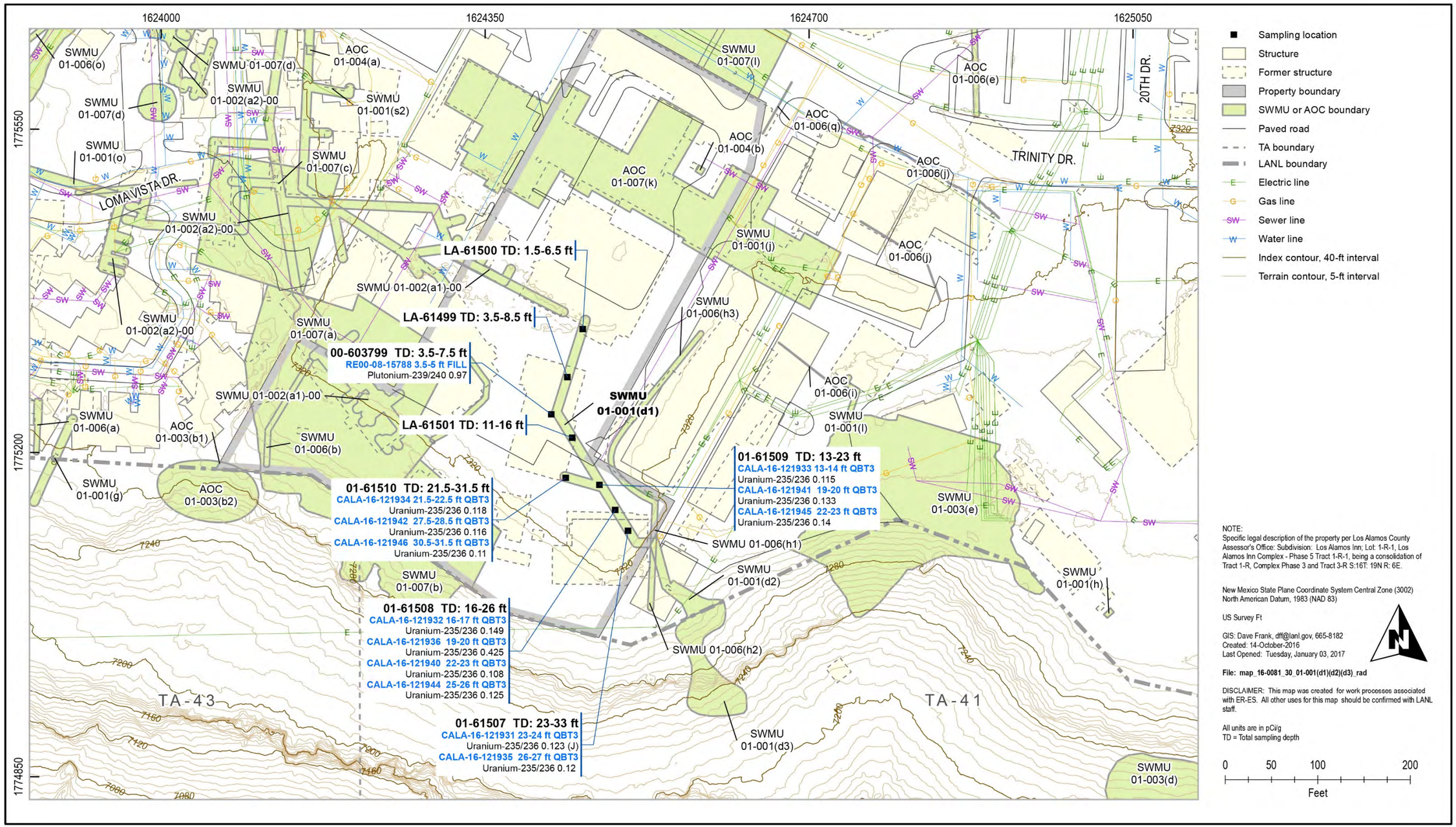

Figure 6.5-4 Radionuclides detected or detected above BVs/FVs at SWMU 01-001(d1)

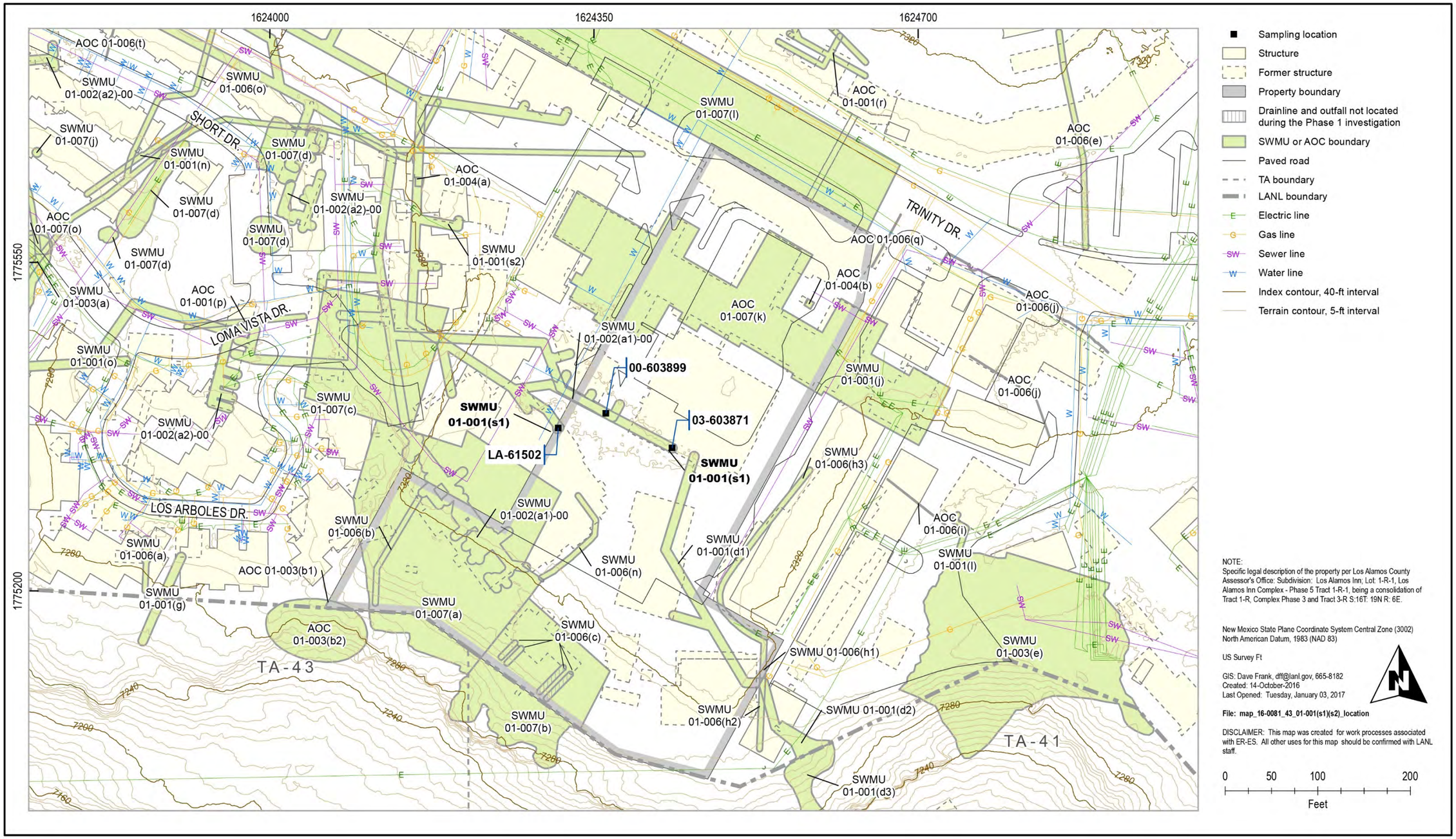

Figure 6.6-1 Sampling locations for SWMU 01-001(s1)

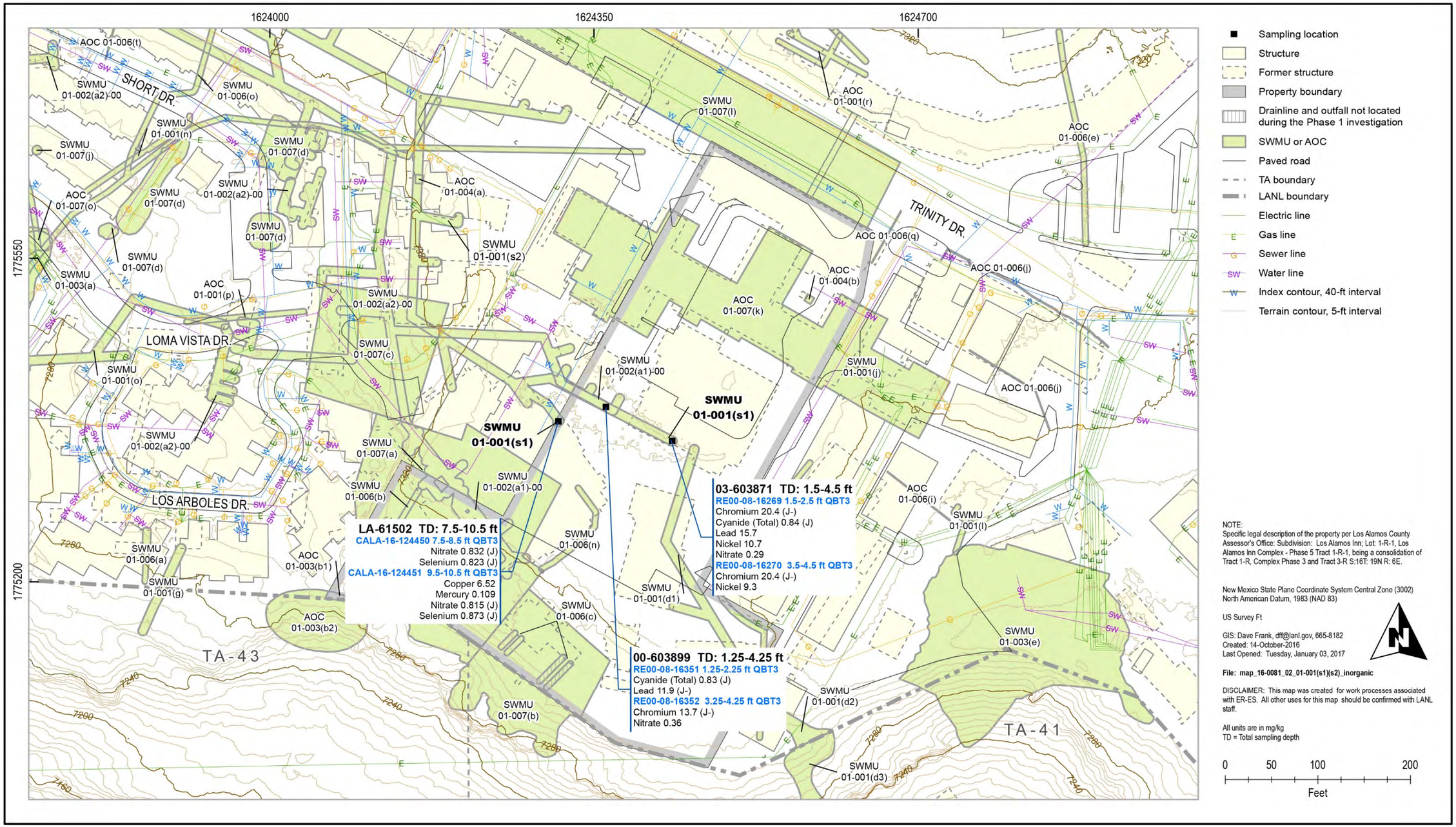

Figure 6.6-2 Inorganic chemicals detected or detected above BVs at SWMU 01-001(s1)

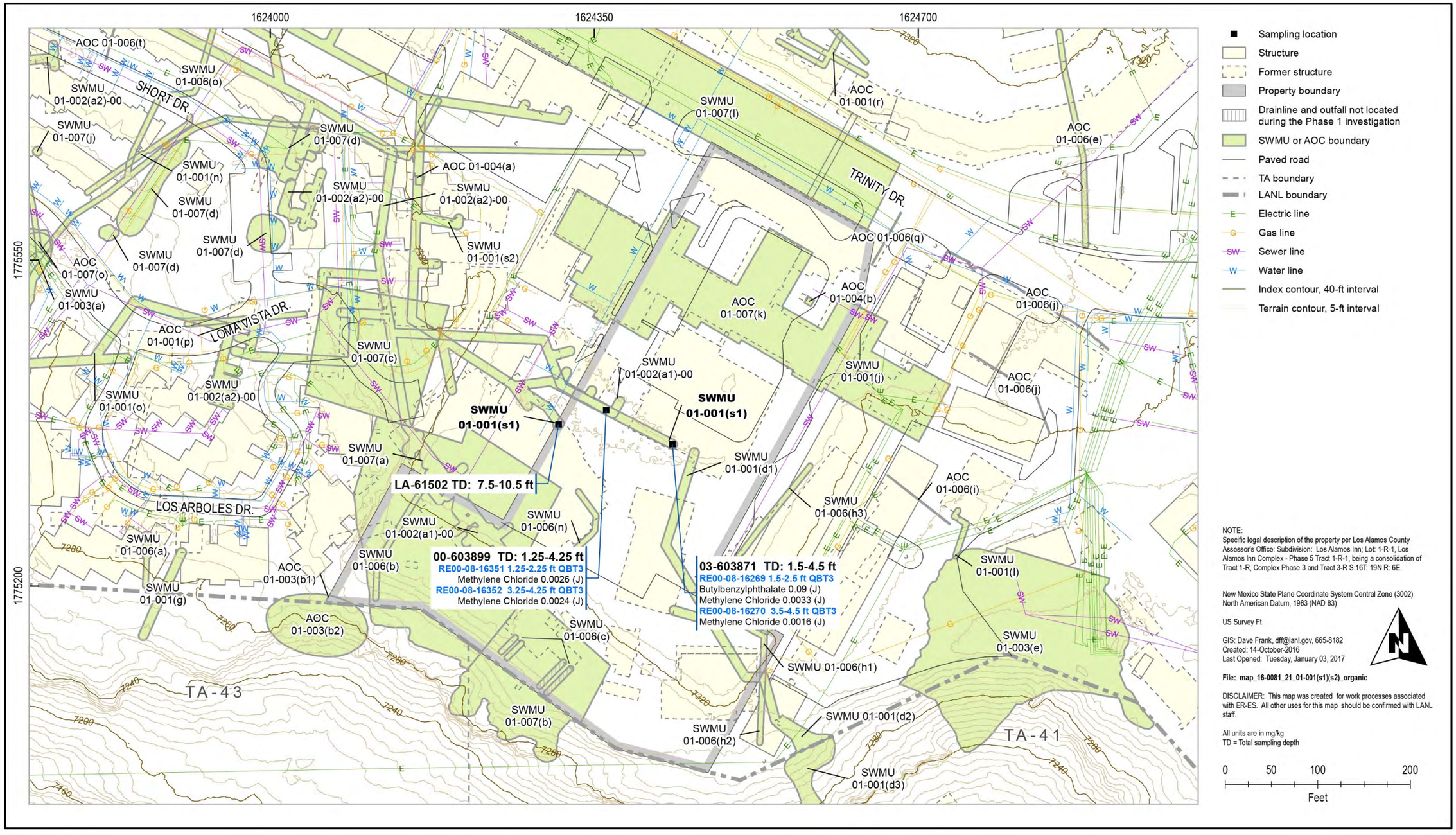

Figure 6.6-3 Organic chemicals detected at SWMU 01-001(s1)

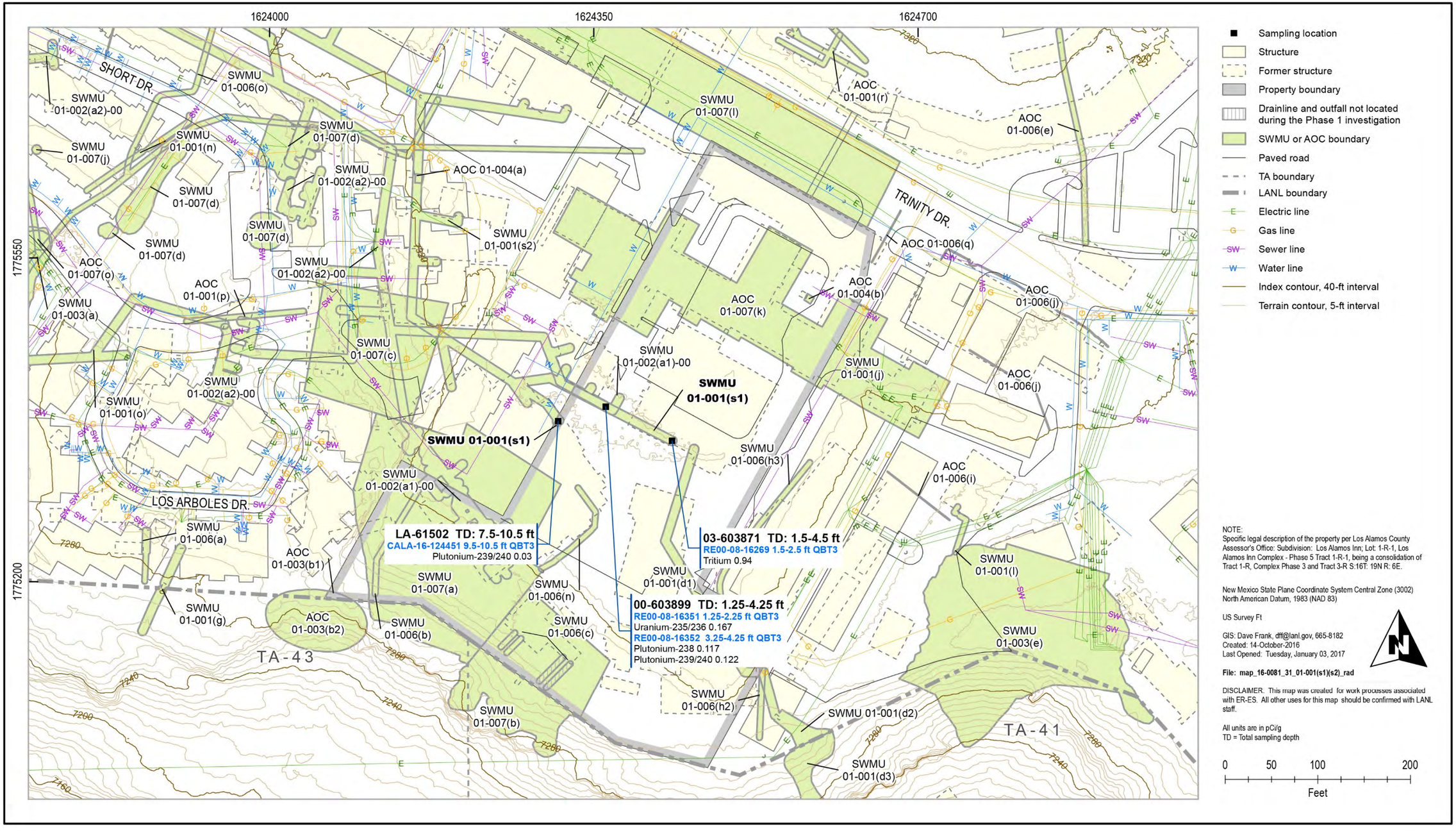

Figure 6.6-4 Radionuclides detected or detected above BVs/FVs at SWMU 01-001(s1)

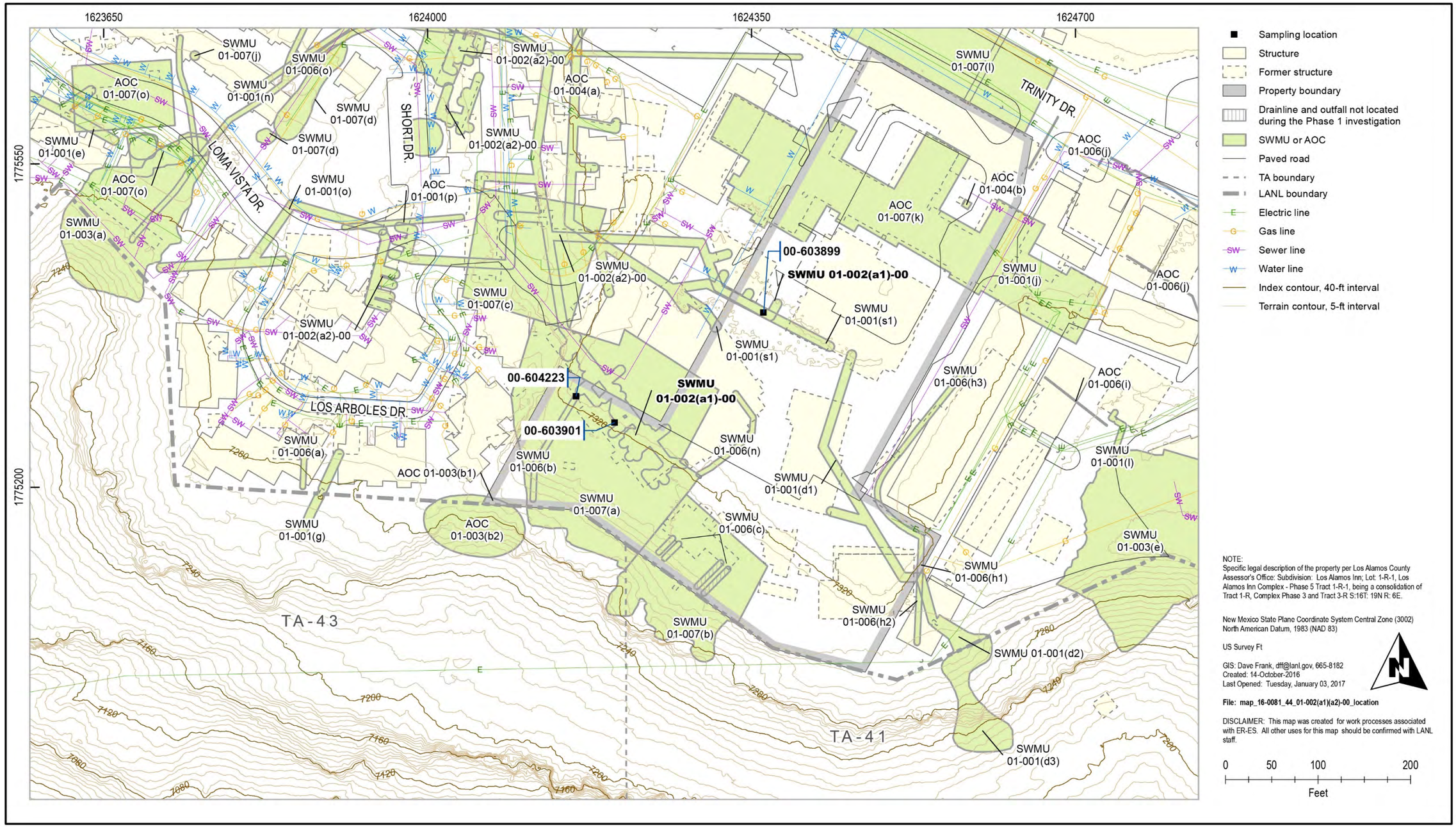

Figure 6.7-1 Sampling locations for SWMU 01-002(a1)-00

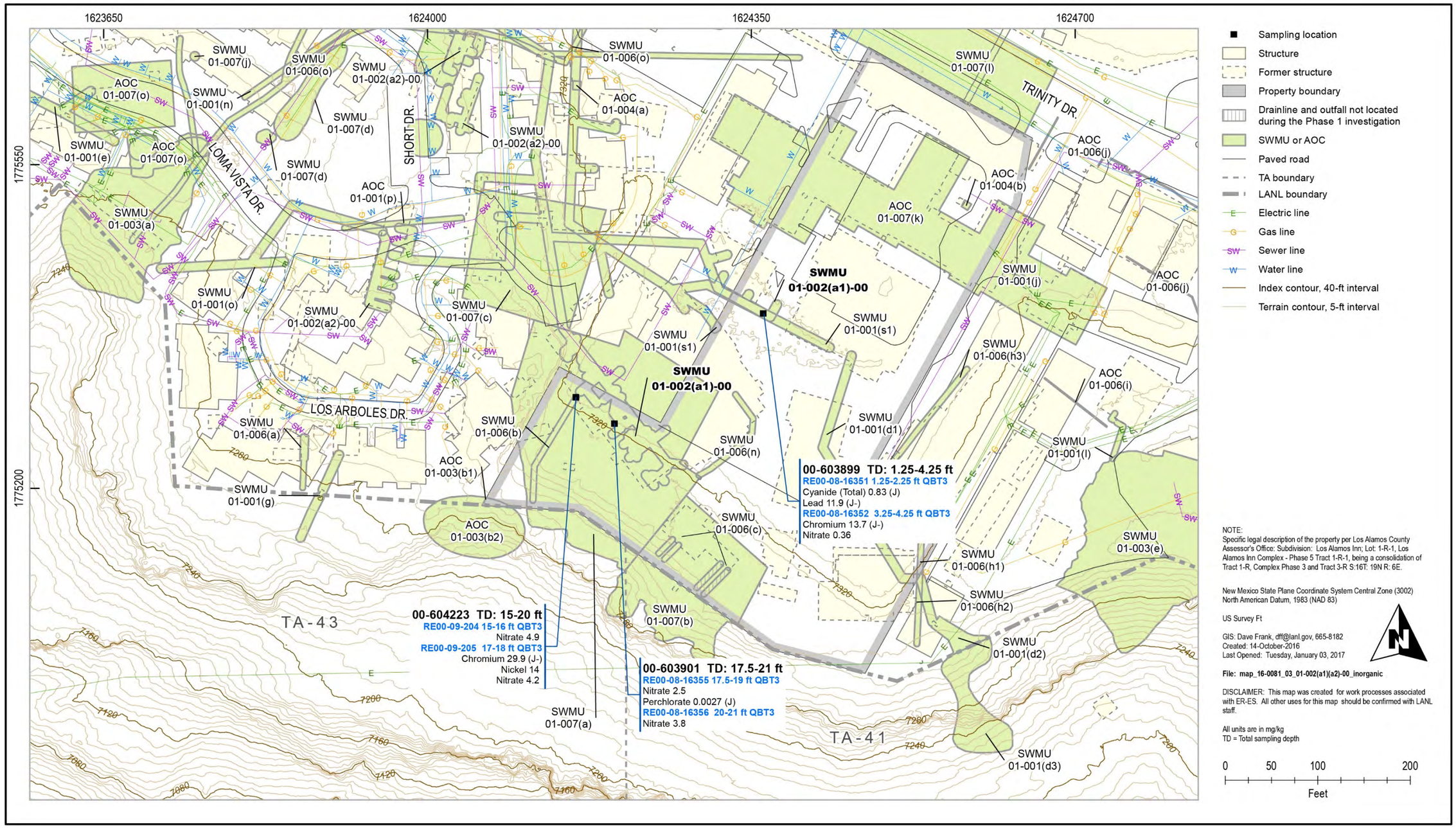

Figure 6.7-2 Inorganic chemicals detected or detected above BVs at SWMU 01-002(a1)-00

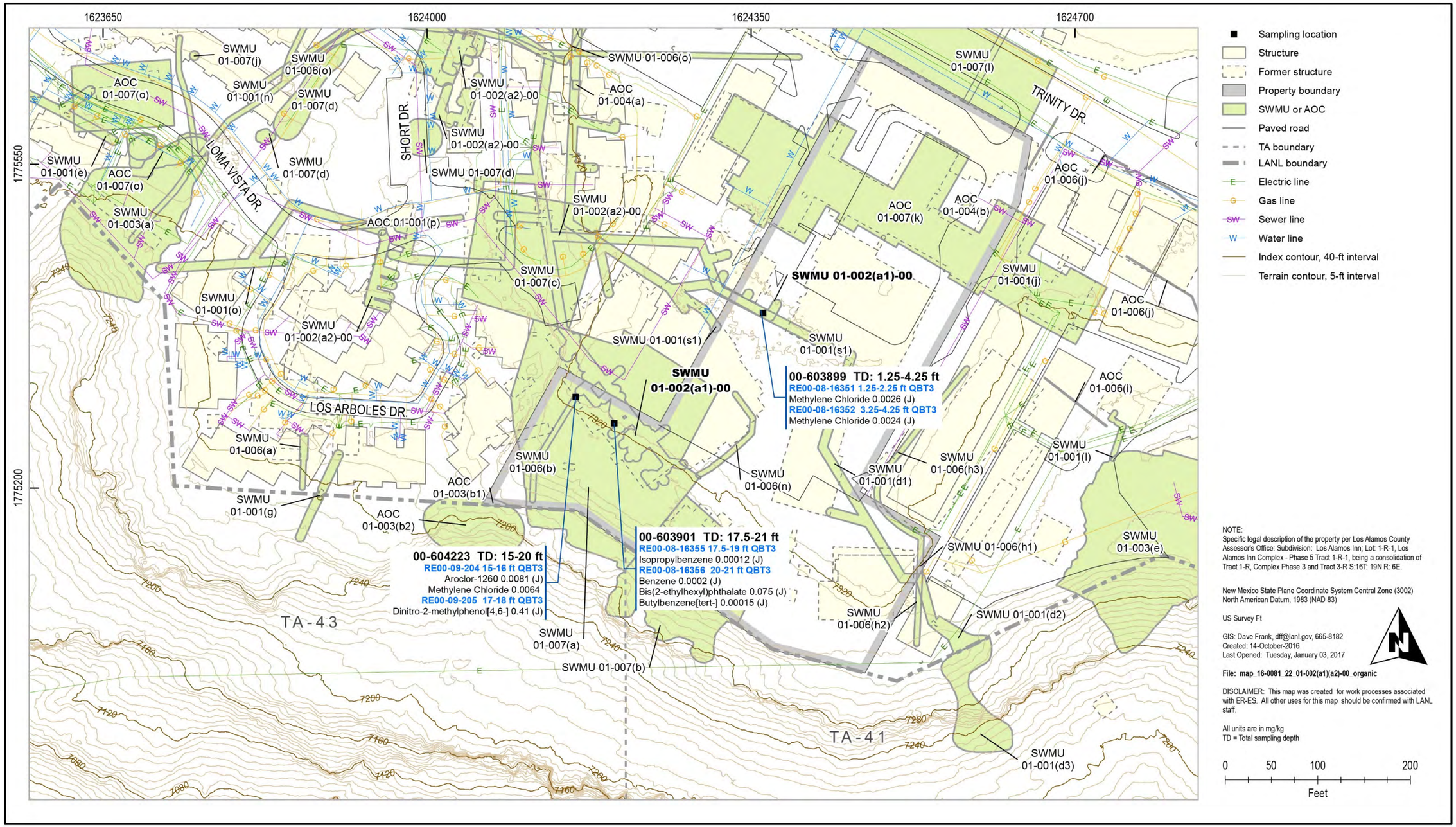

Figure 6.7-3 Organic chemicals detected at SWMU 01-002(a1)-00

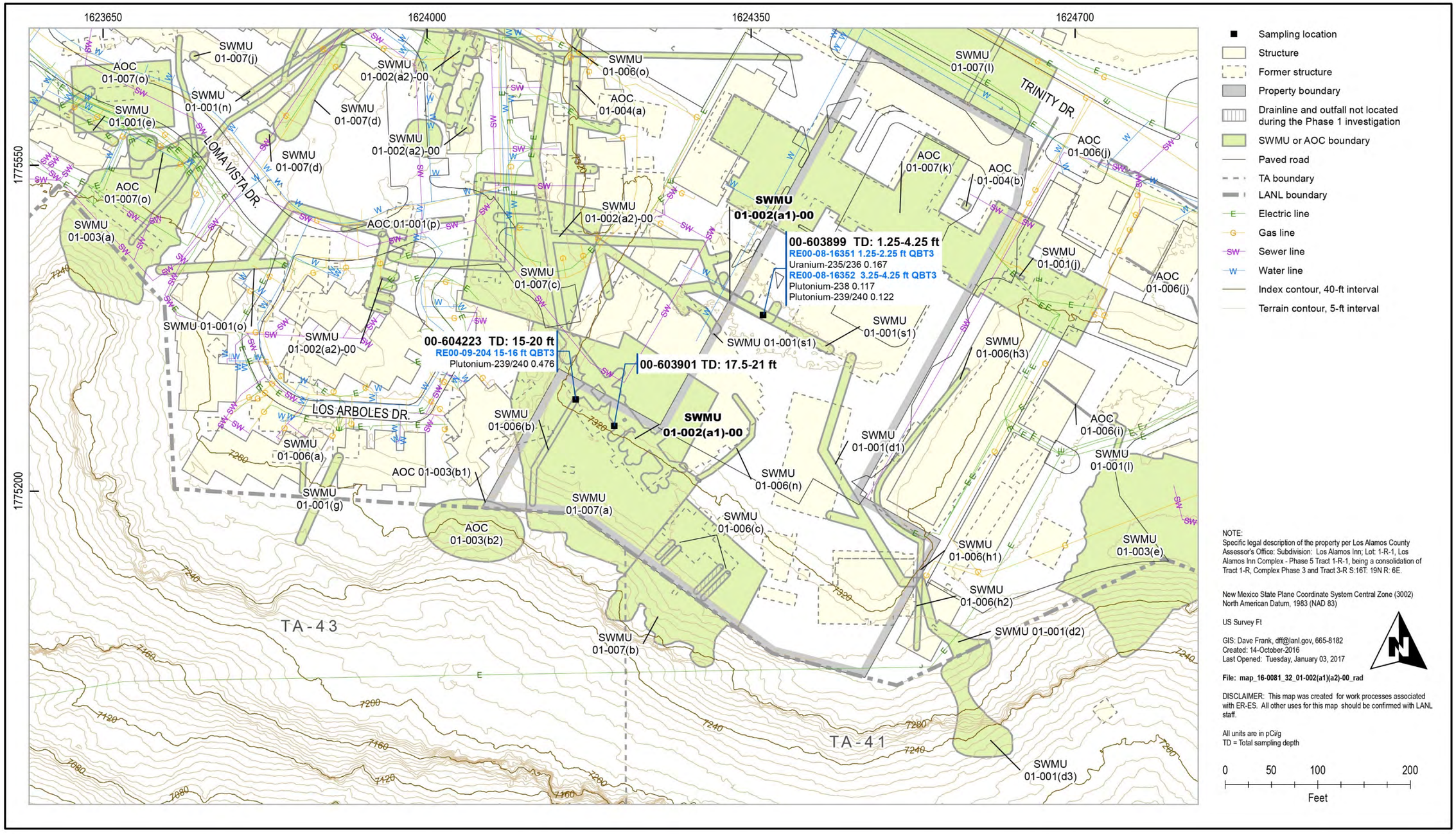

Figure 6.7-4 Radionuclides detected or detected above BVs/FVs at SWMU 01-002(a1)-00

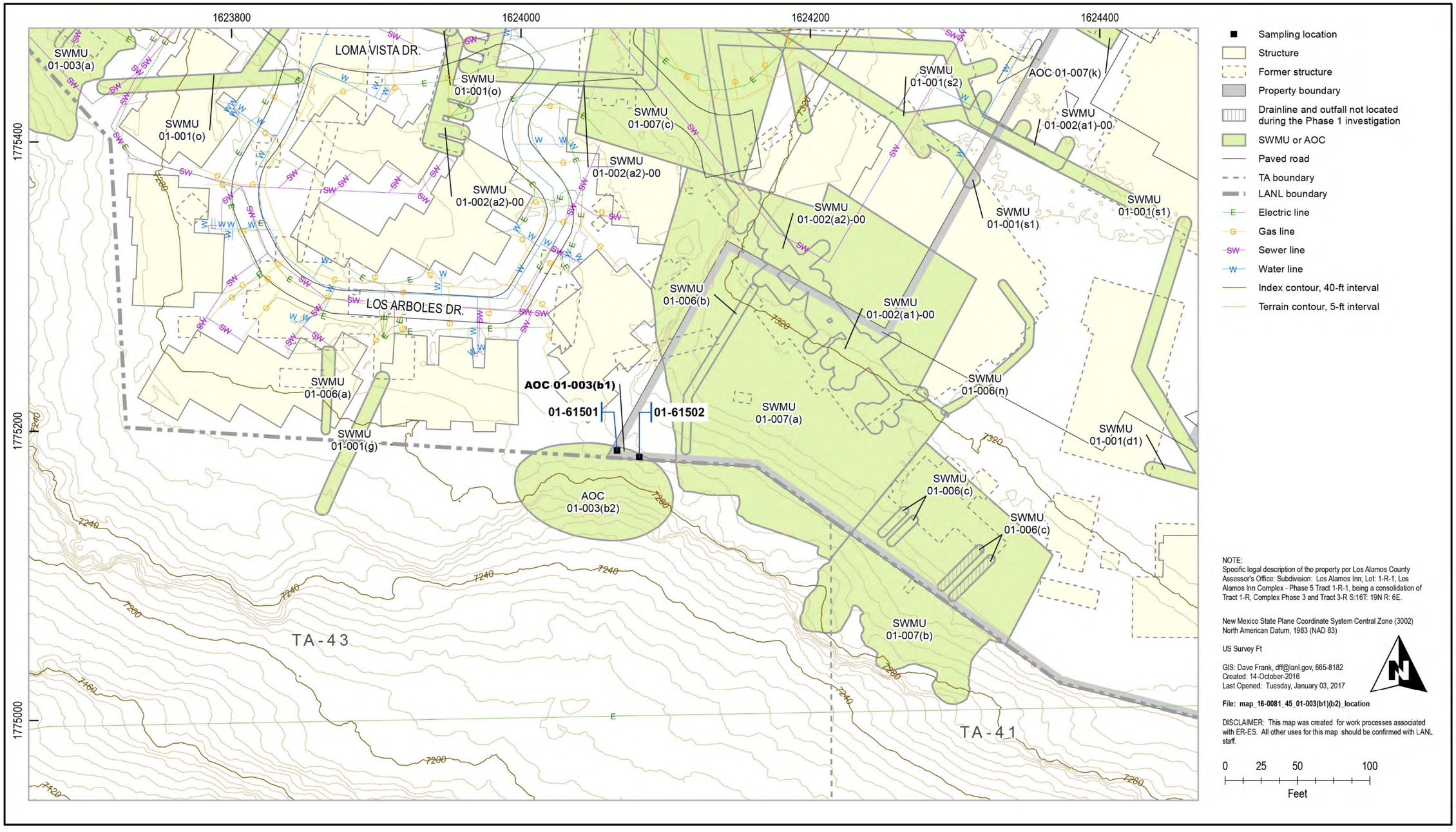

Figure 6.8-1 Sampling locations at AOC 01-003(b1)

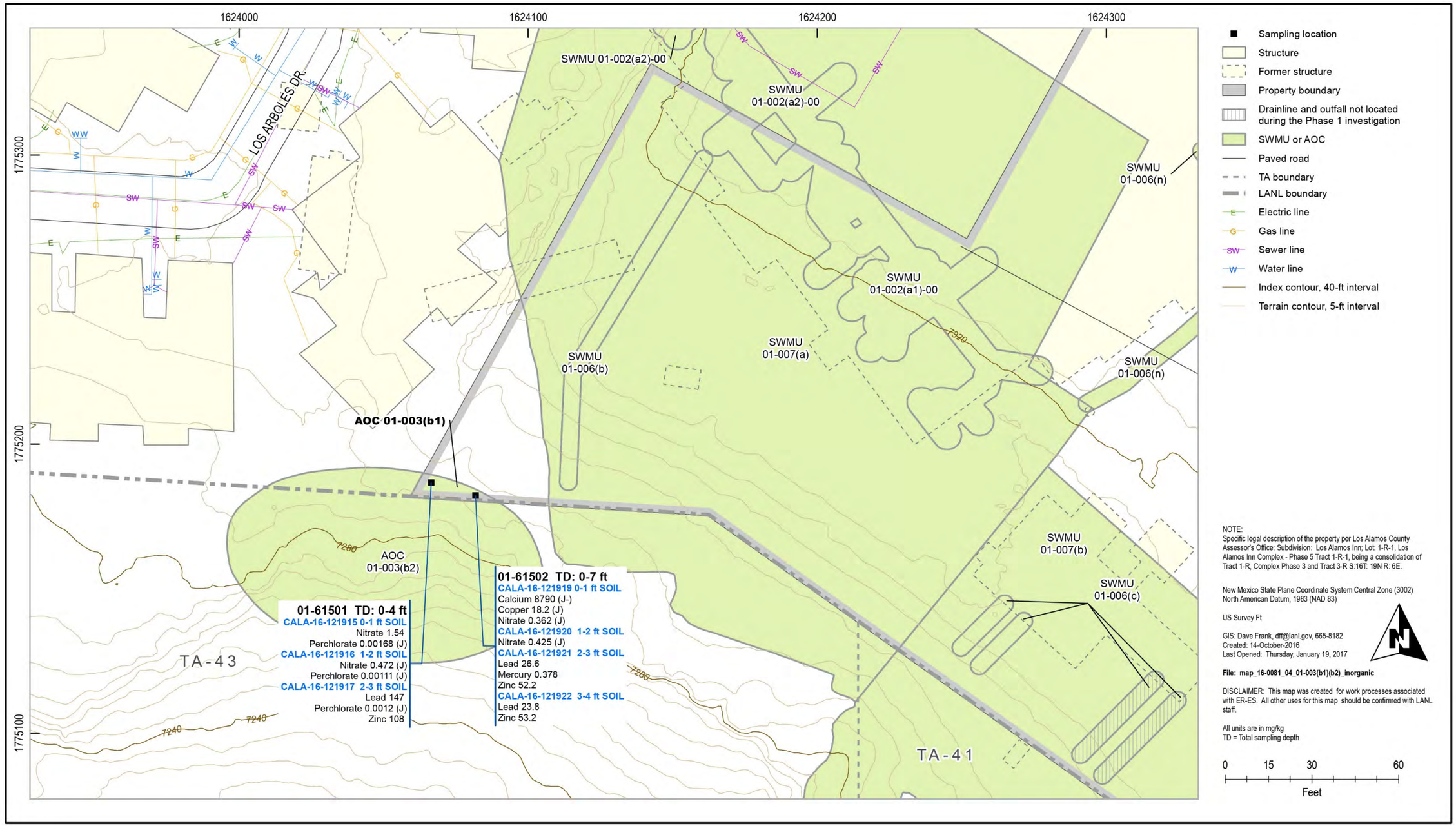

Figure 6.8-2 Inorganic chemicals detected or detected above BVs at AOC 01-003(b1)

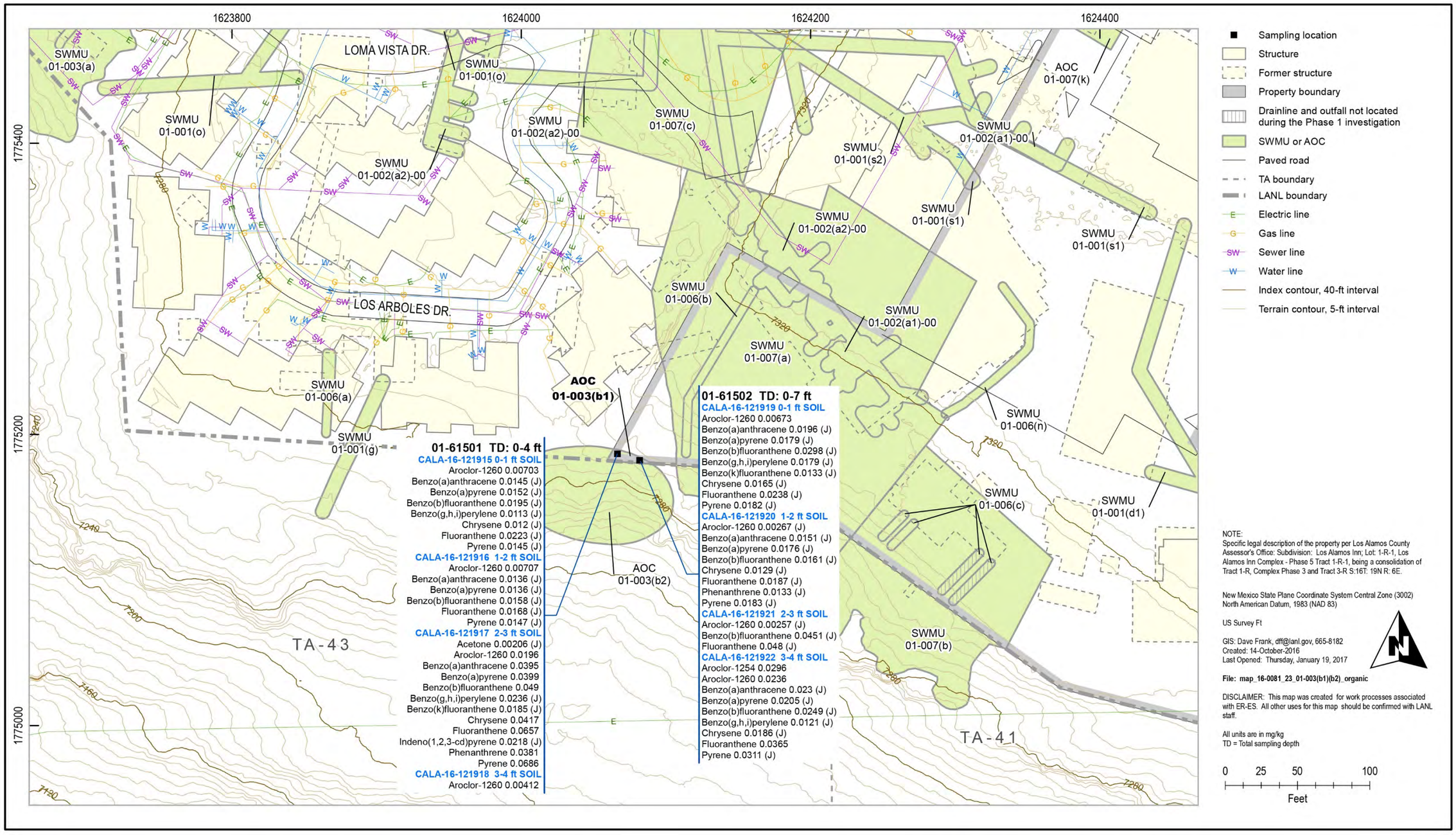

Figure 6.8-3 Organic chemicals detected at AOC 01-003(b1)

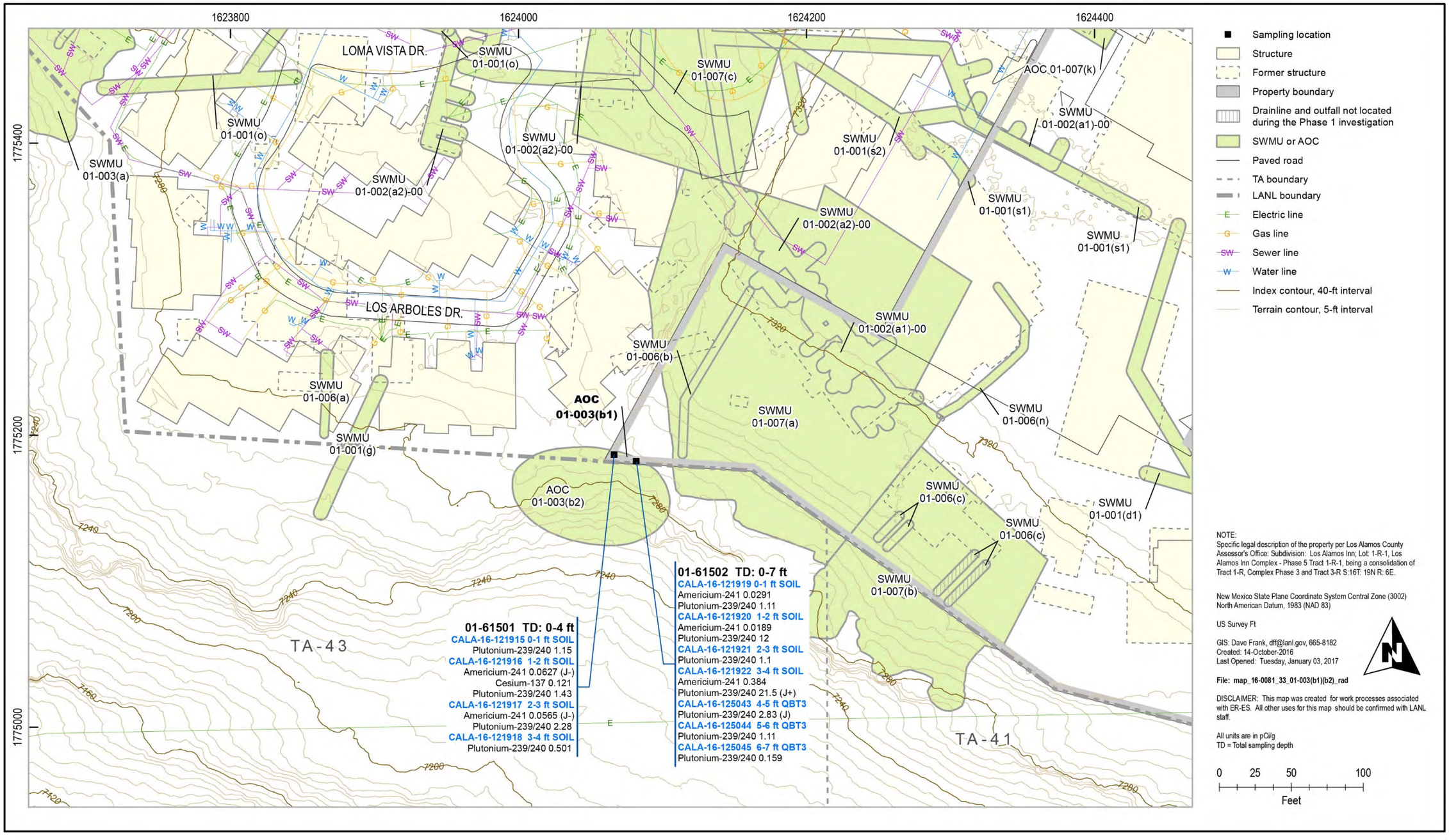

Figure 6.8-4 Radionuclides detected or detected above BVs/FVs at AOC 01-003(b1)

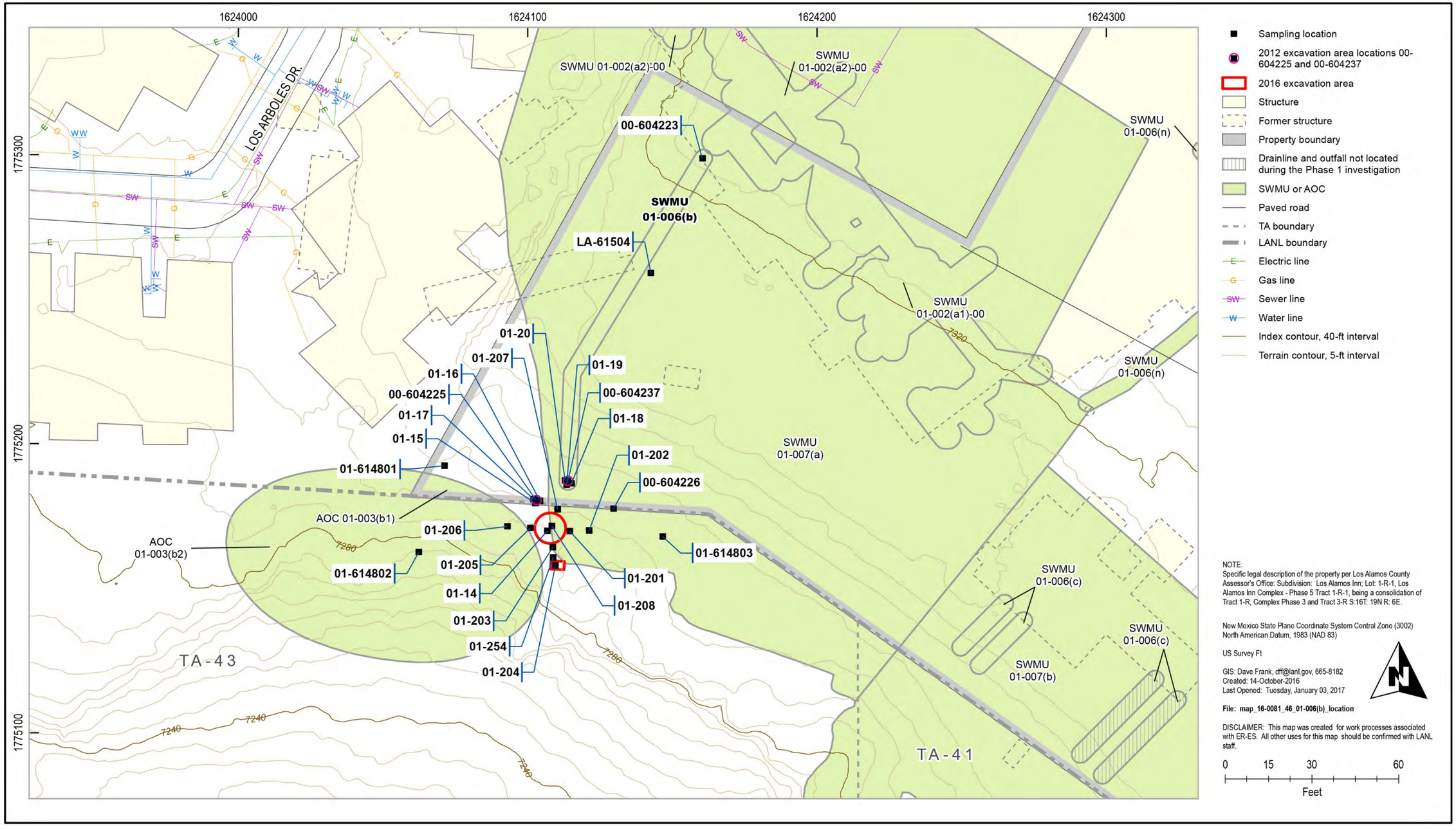

Figure 6.9-1 Sampling locations at SWMU 01-006(b)

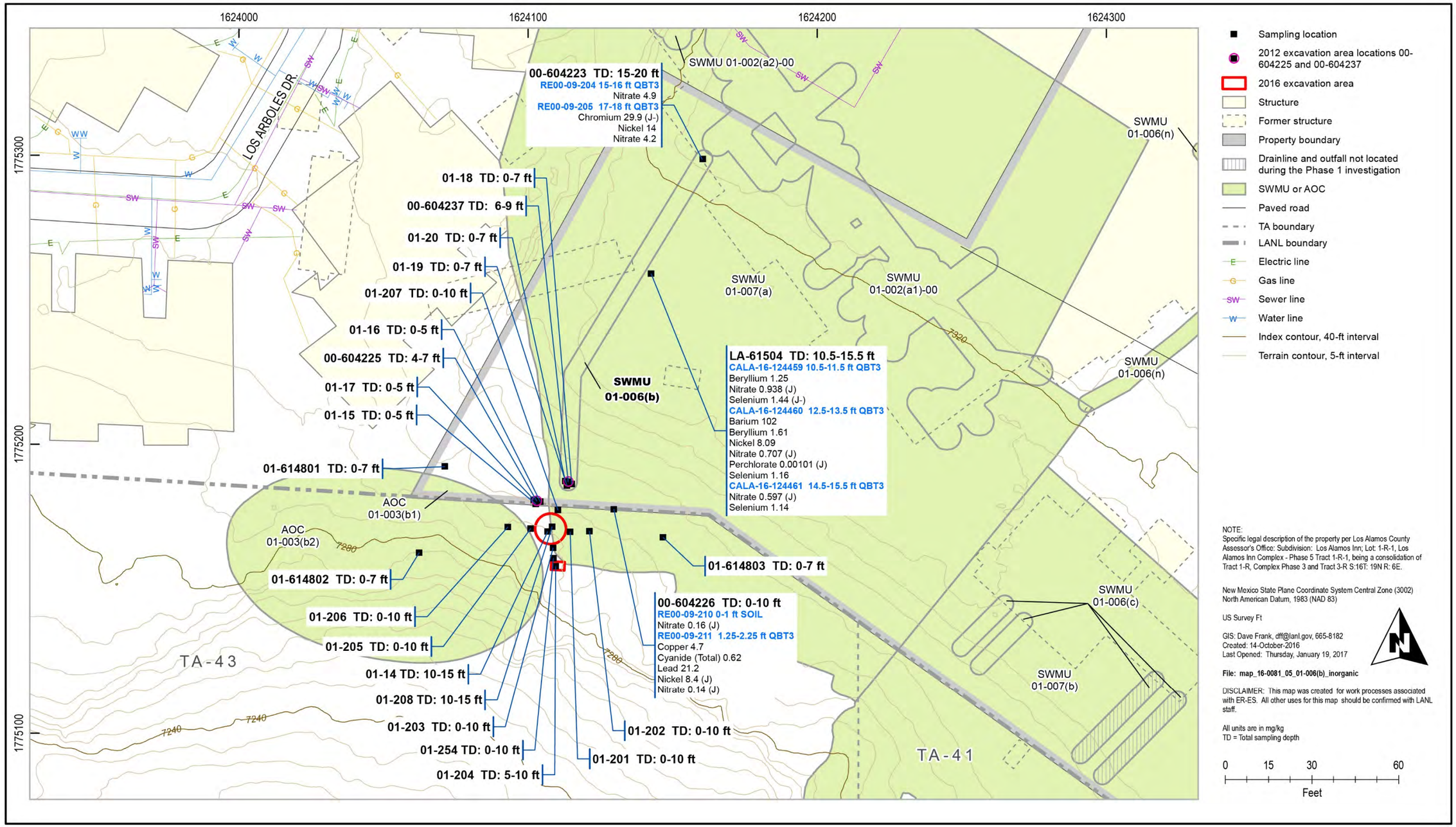

Figure 6.9-2 Inorganic chemicals detected or detected above BVs at SWMU 01-006(b)

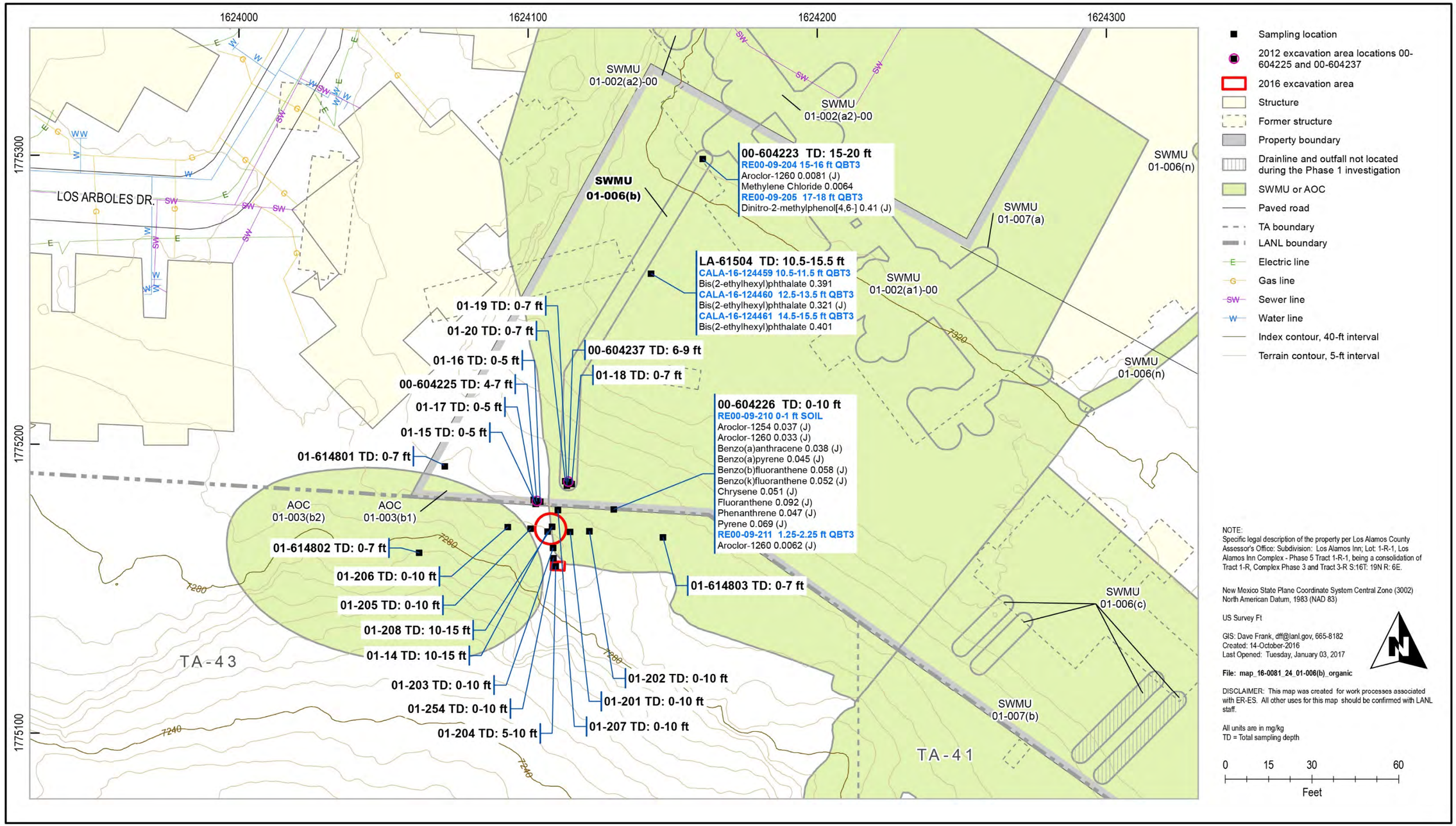

Figure 6.9-3 Organic chemicals detected at SWMU 01-006(b)

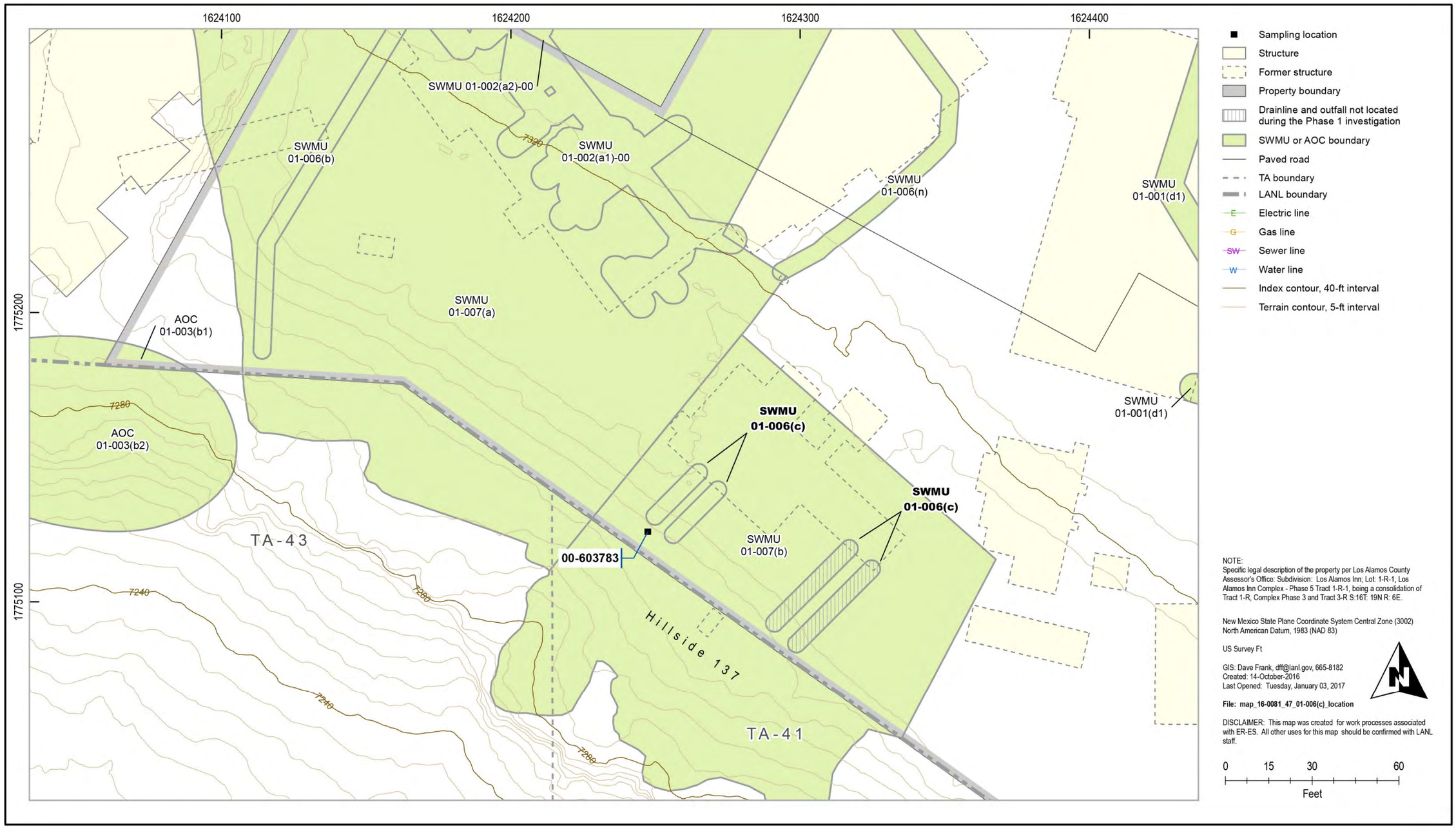

Figure 6.10-1 Sampling locations at SWMU 01-006(c)

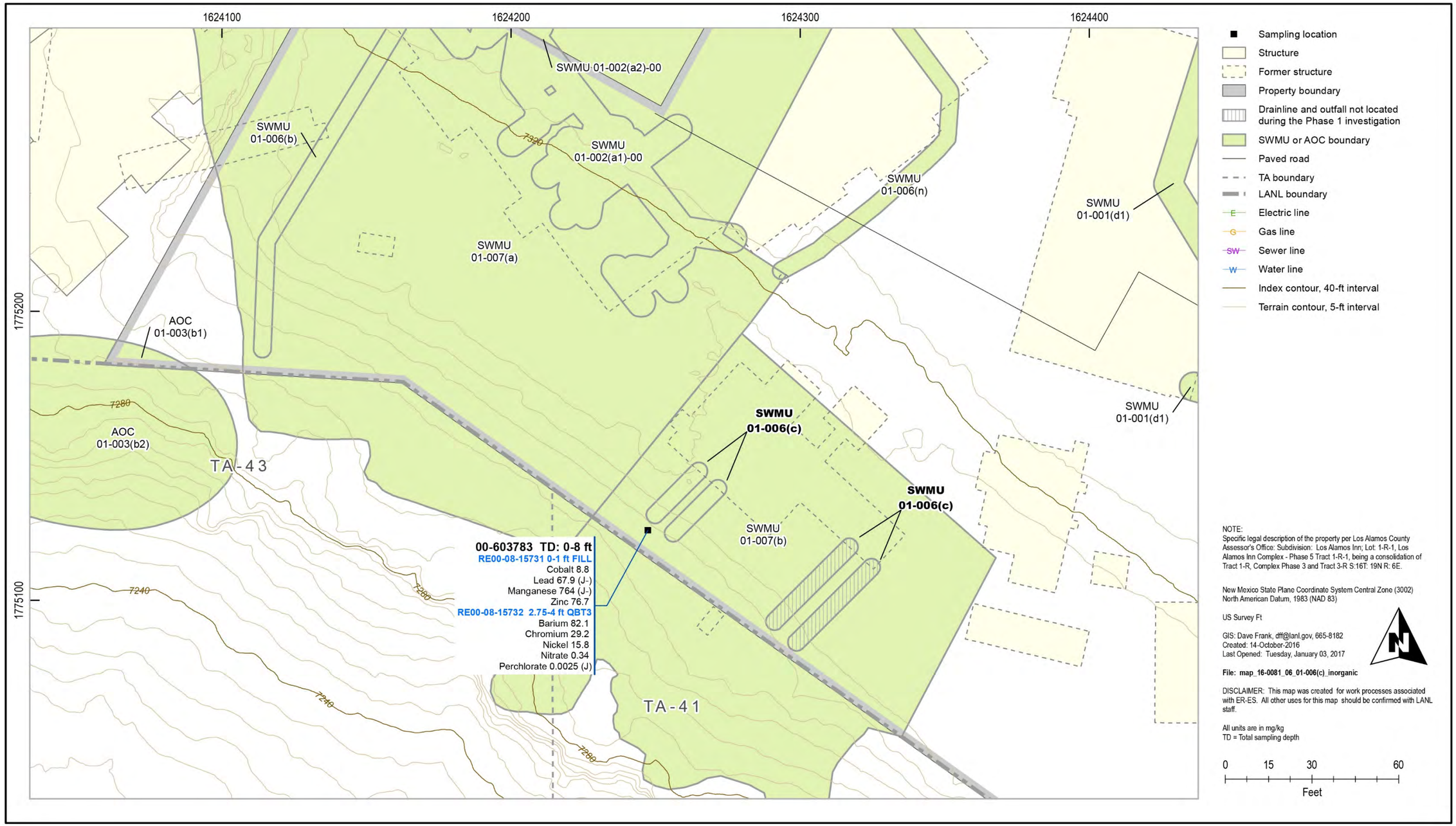

Figure 6.10-2 Inorganic chemicals detected or detected above BVs at SWMU 01-006(c)

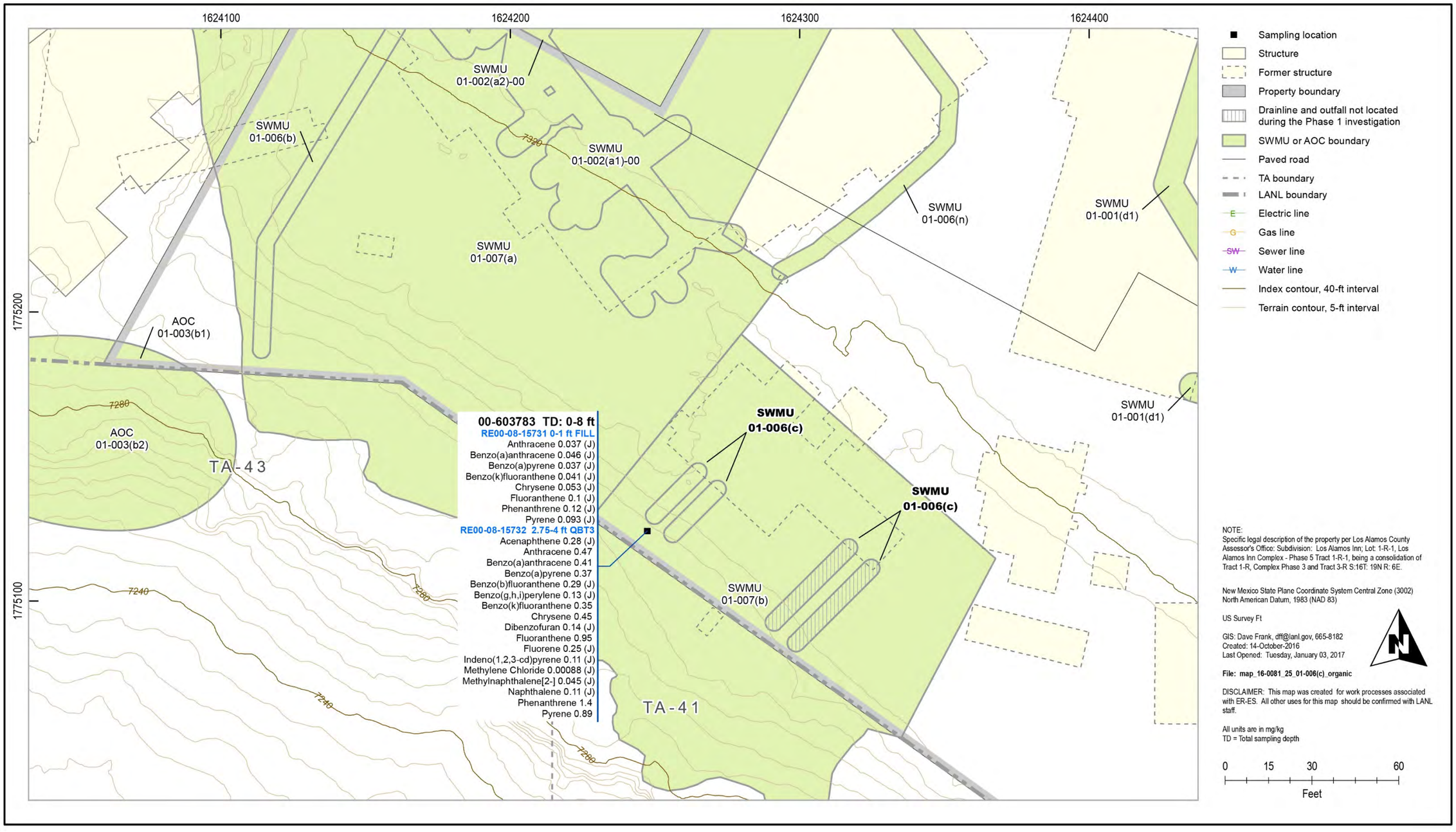

Figure 6.10-3 Organic chemicals detected at SWMU 01-006(c)

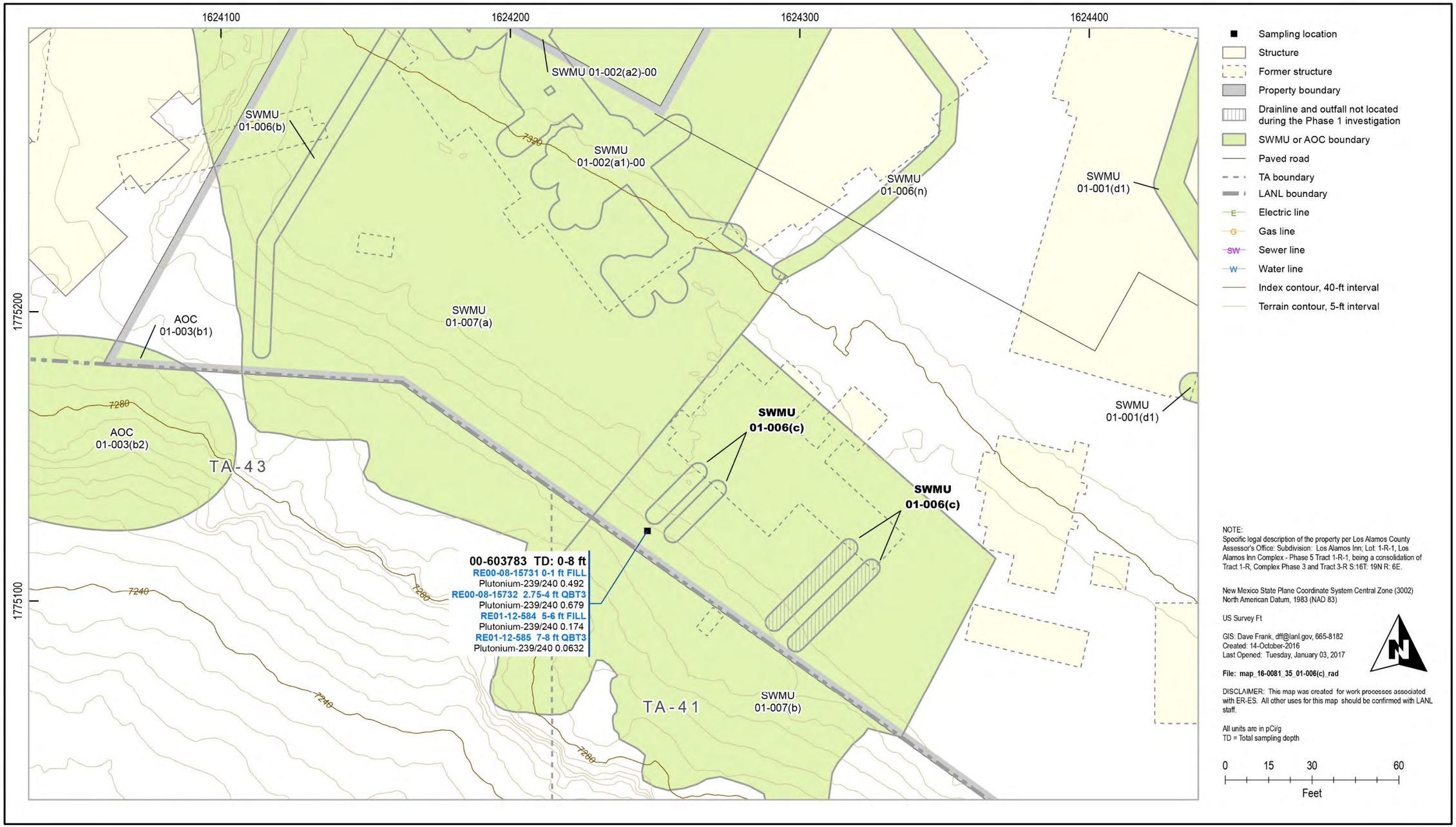

Figure 6.10-4 Radionuclides detected or detected above BVs/FVs at SWMU 01-006(c)

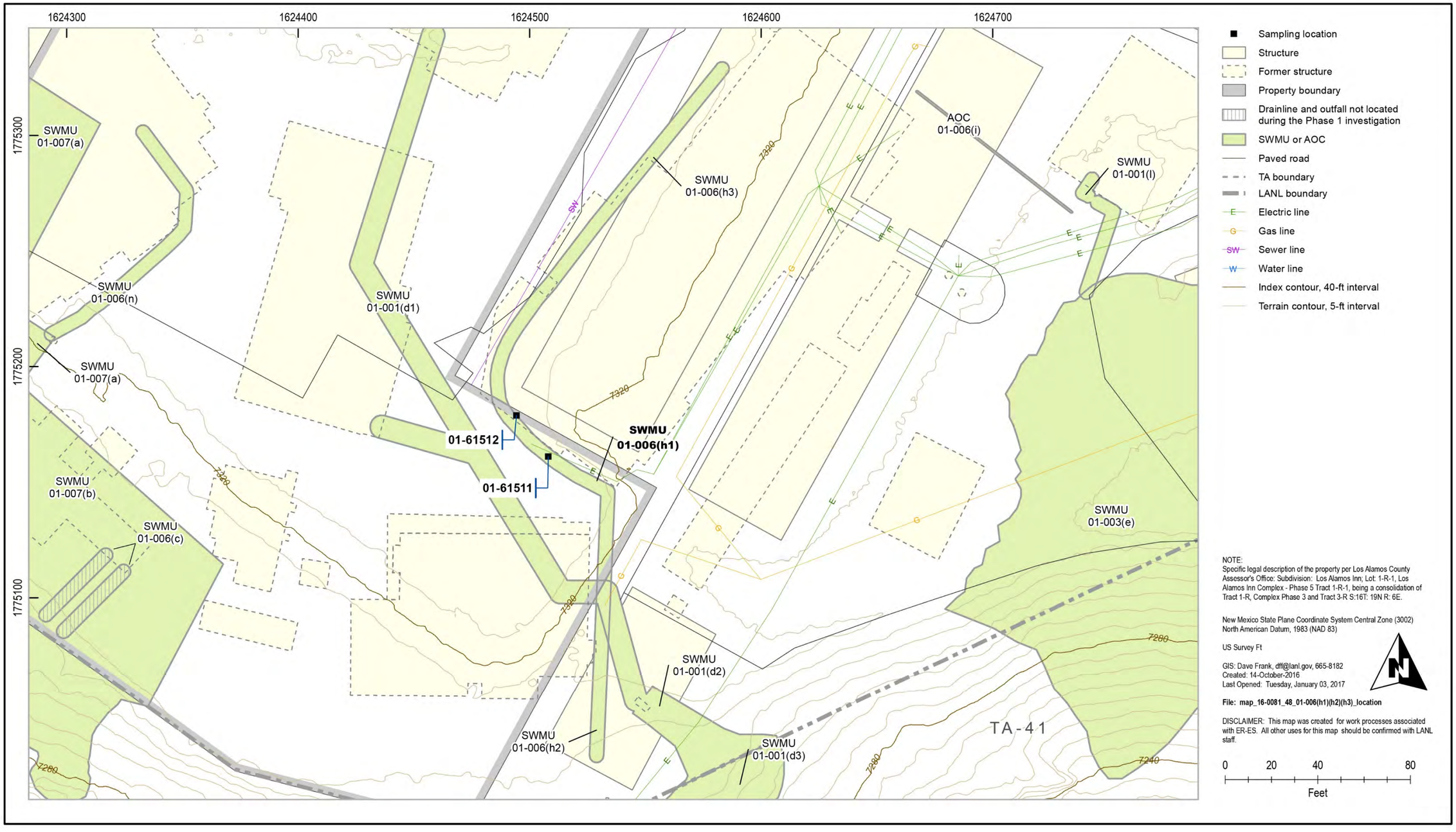

Figure 6.11-1 Sampling locations at SWMU 01-006(h1)

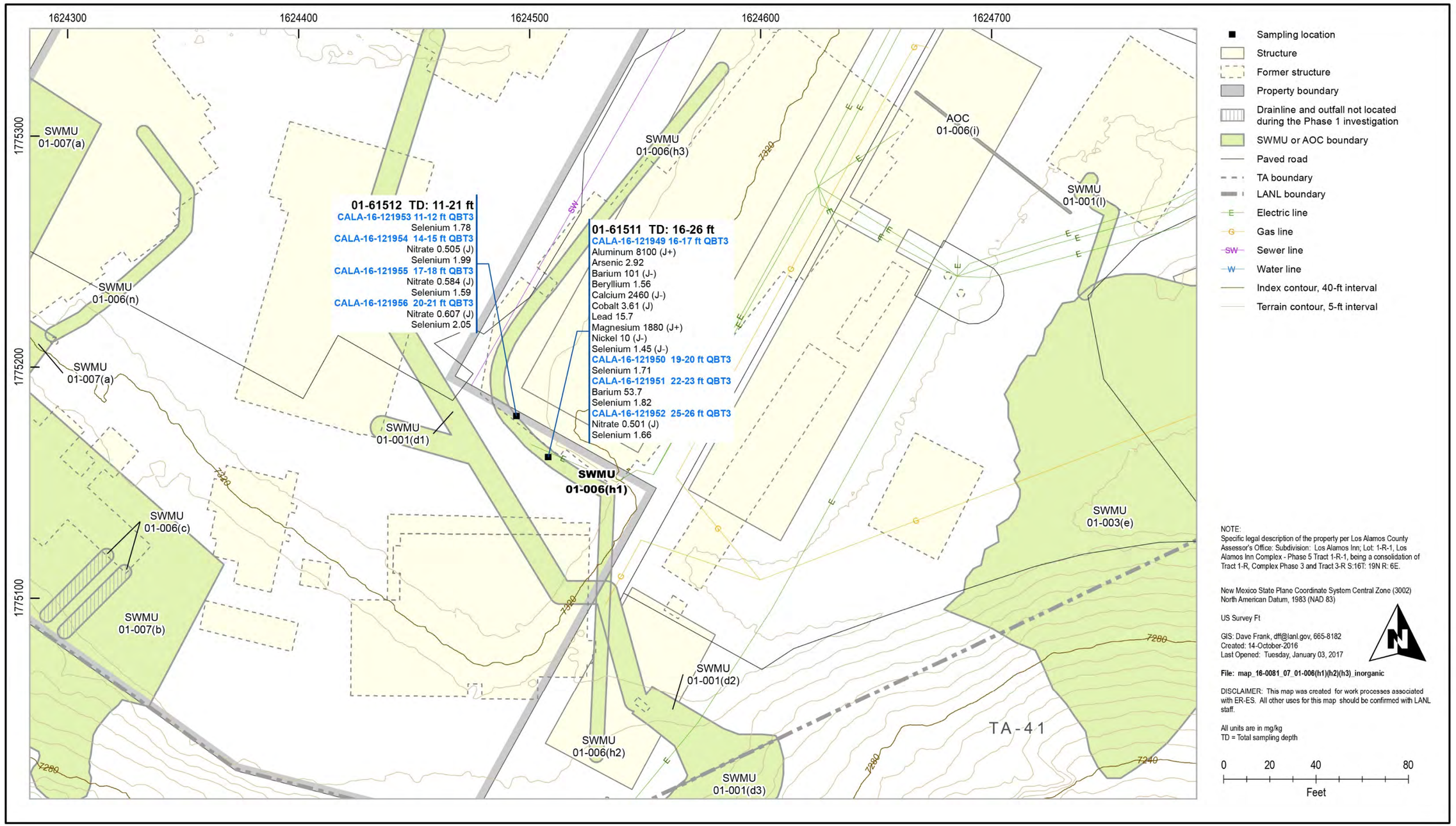

Figure 6.11-2 Inorganic chemicals detected or detected above BVs at SWMU 01-006(h1)

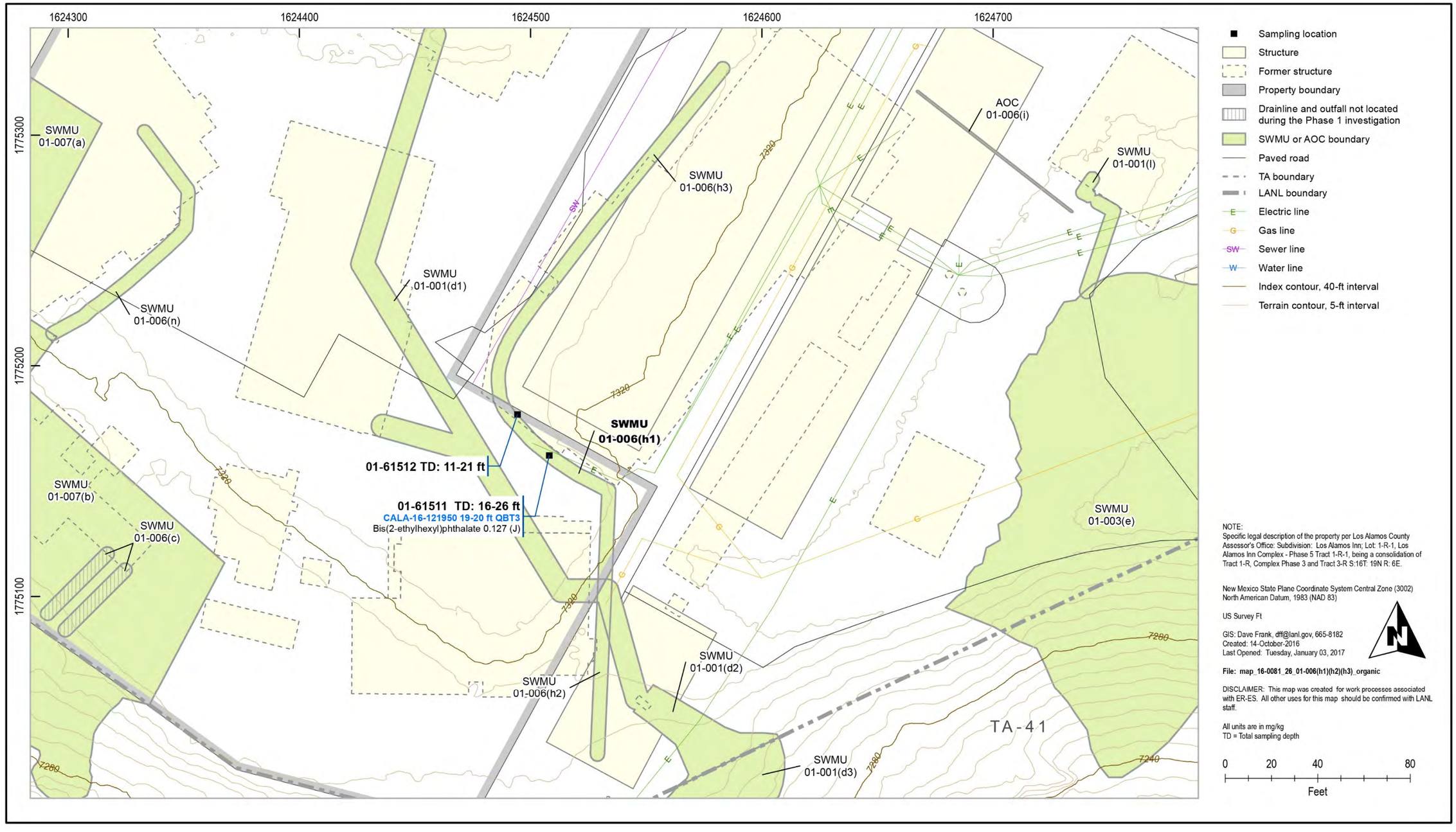

Figure 6.11-3 Organic chemicals detected at SWMU 01-006(h1)

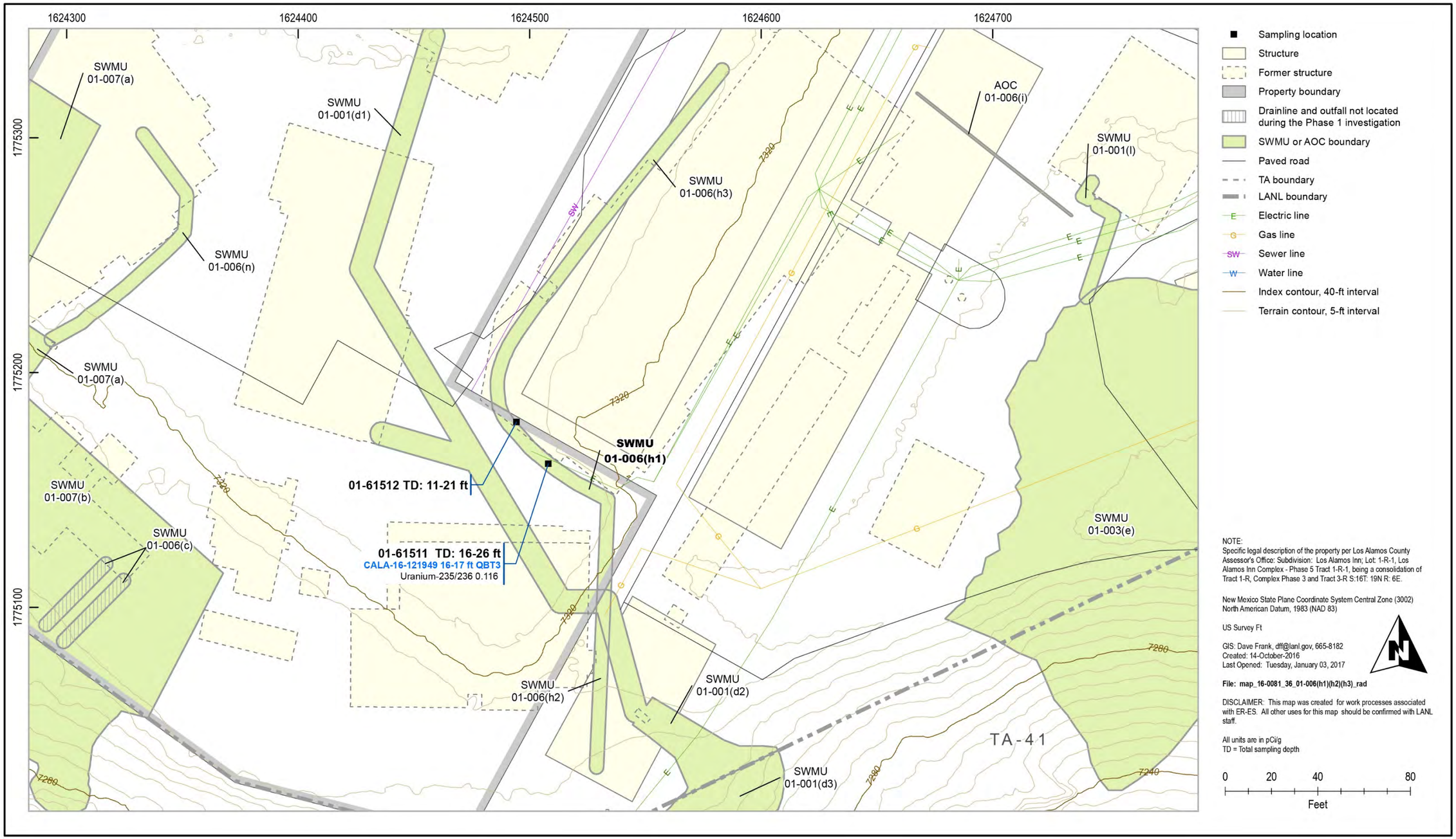

Figure 6.11-4 Radionuclides detected or detected above BVs/FVs at SWMU 01-006(h1)

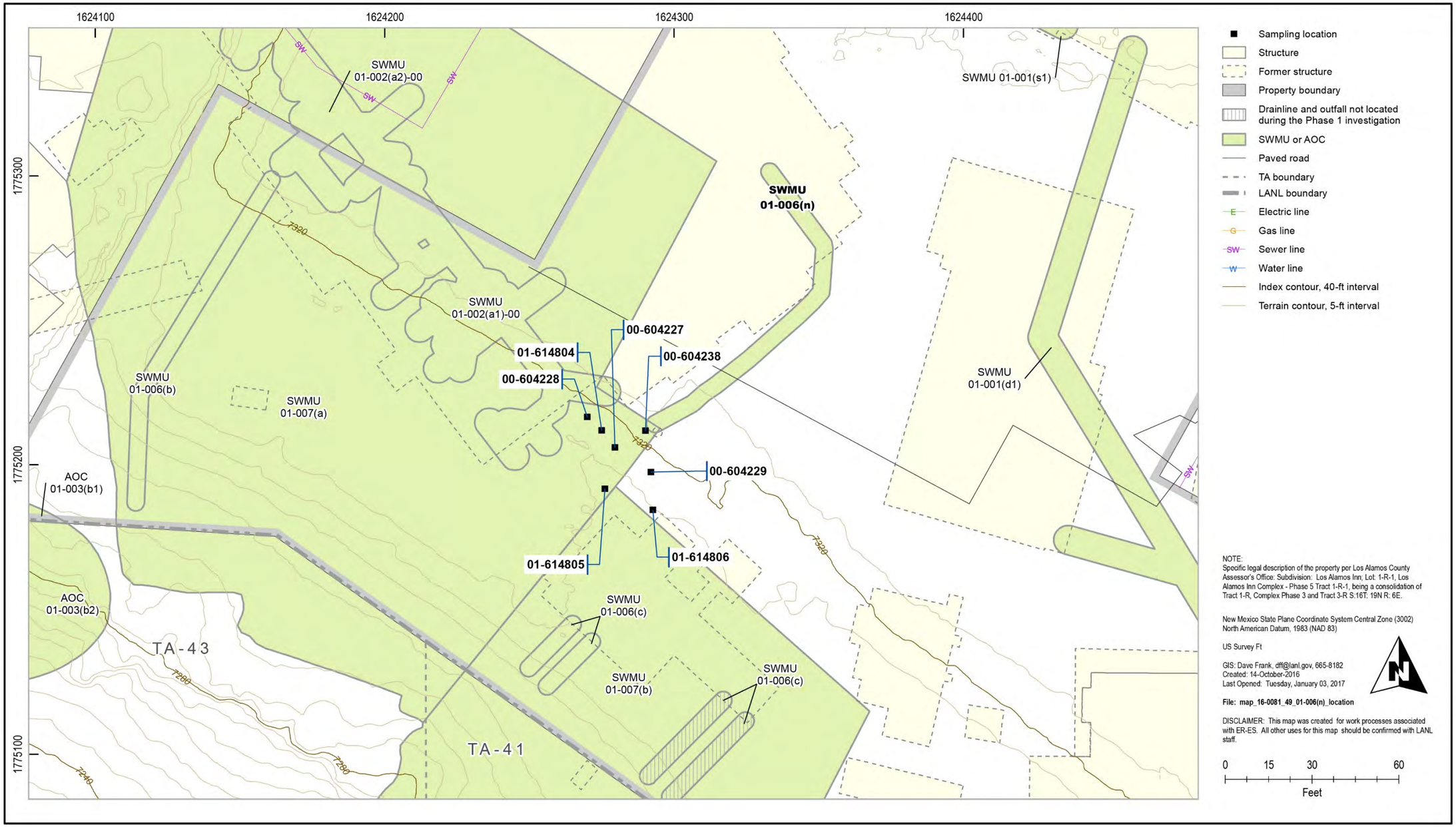

Figure 6.12-1 Sampling locations at SWMU 01-006(n)

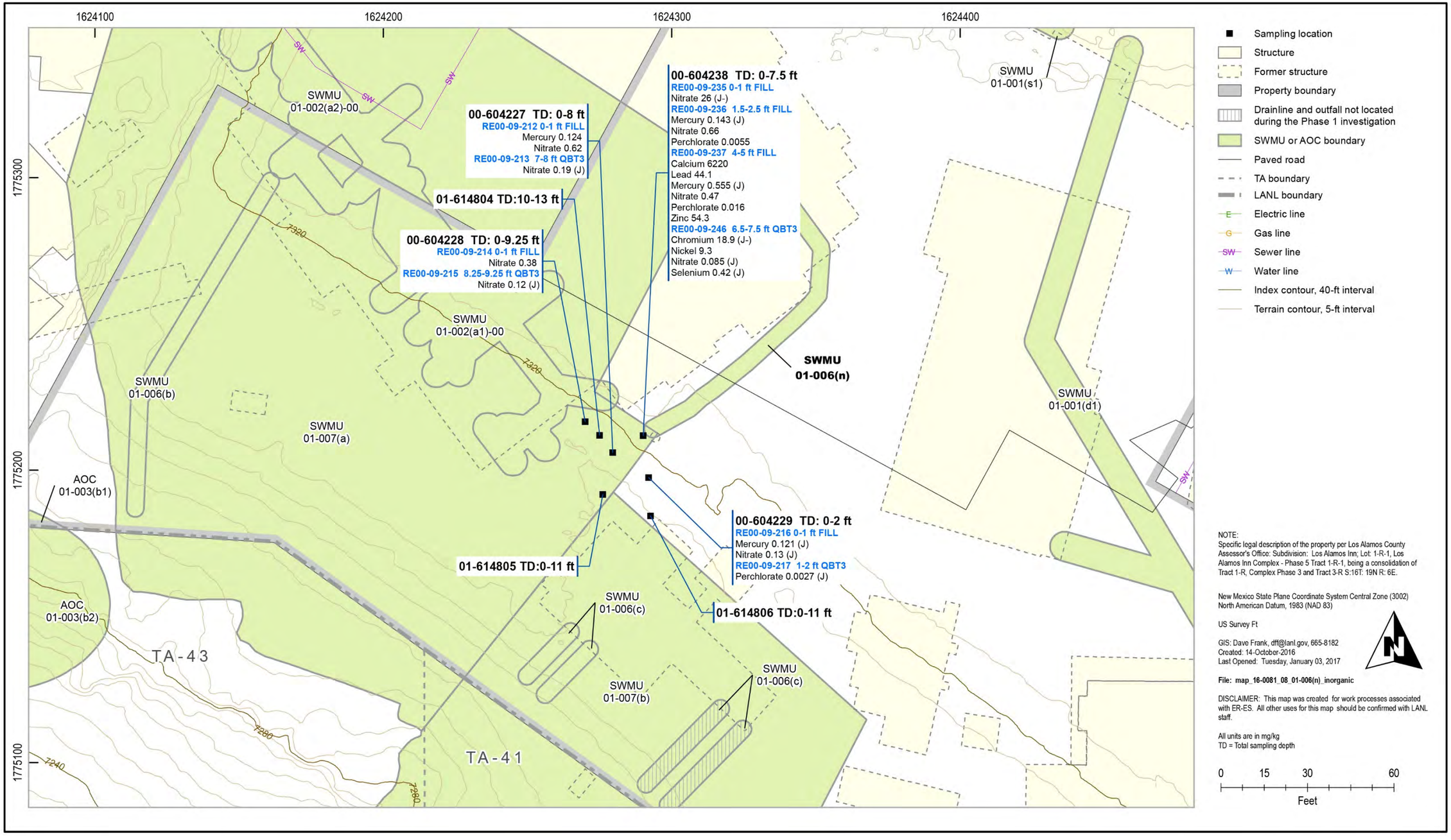

Figure 6.12-2 Inorganic chemicals detected or detected above BVs at SWMU 01-006(n)

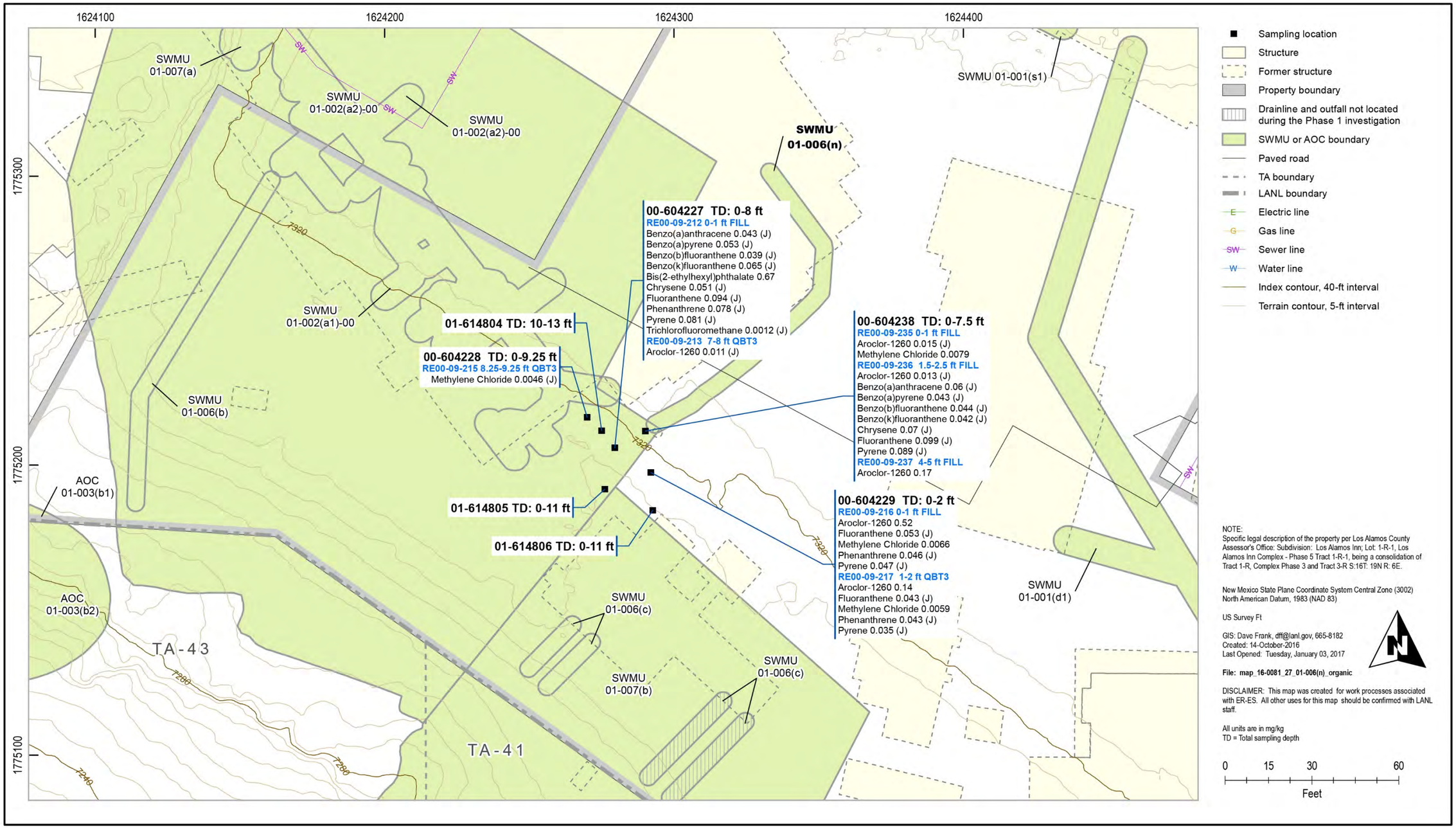

Figure 6.12-3 Organic chemicals detected at SWMU 01-006(n)

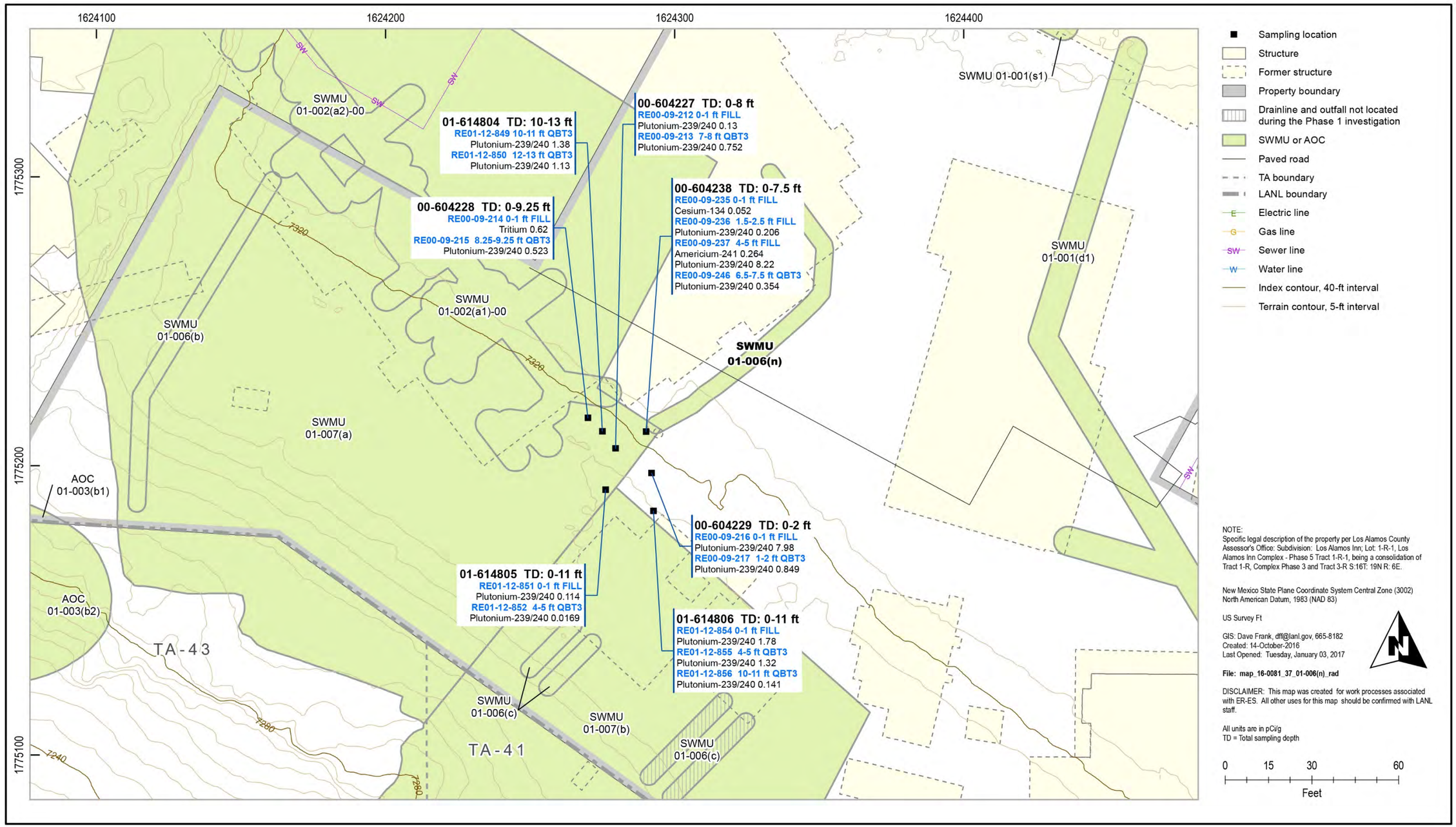

Figure 6.12-4 Radionuclides detected or detected above BVs/FVs at SWMU 01-006(n)

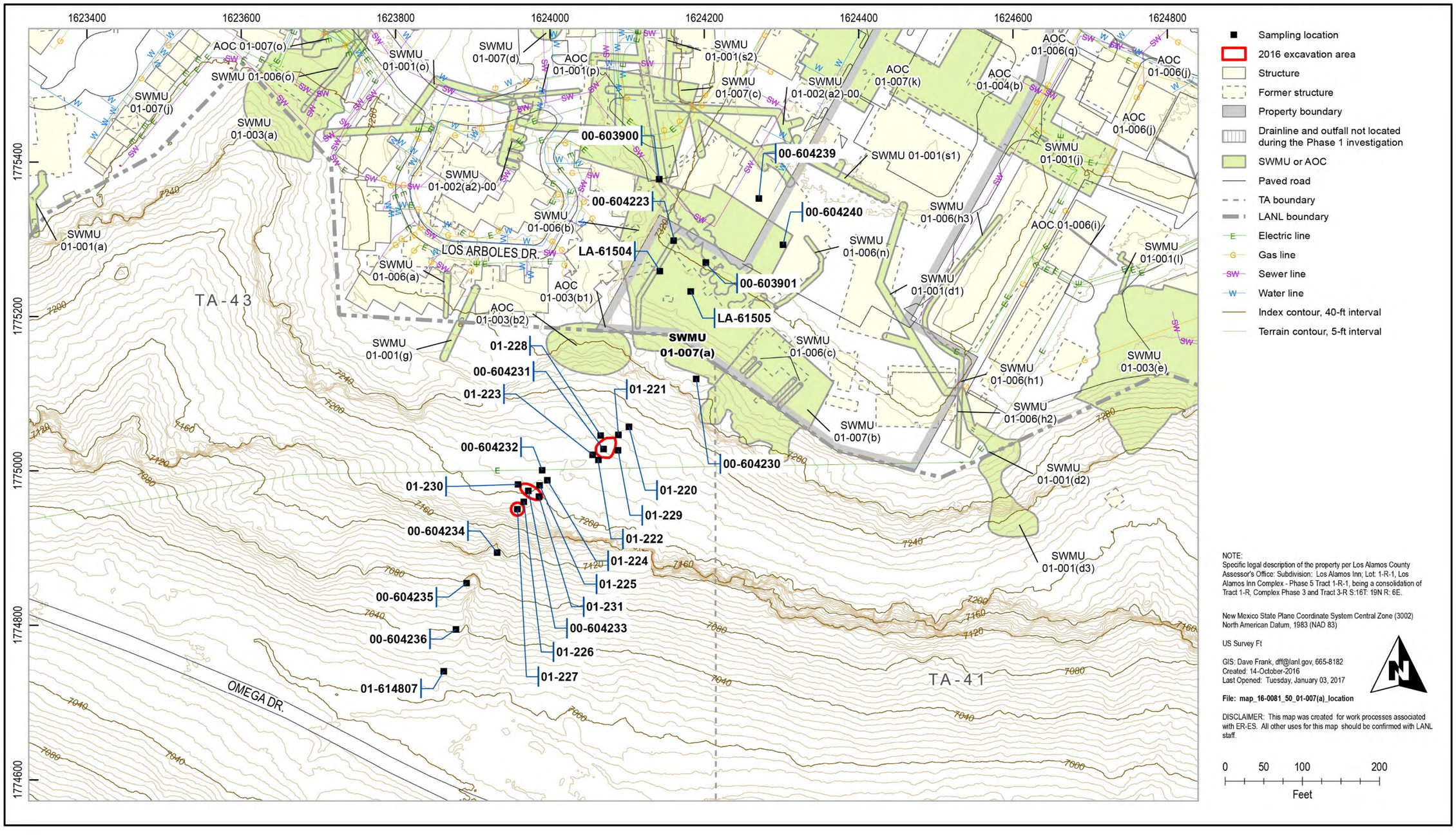

Figure 6.13-1 Sampling locations at SWMU 01-007(a)

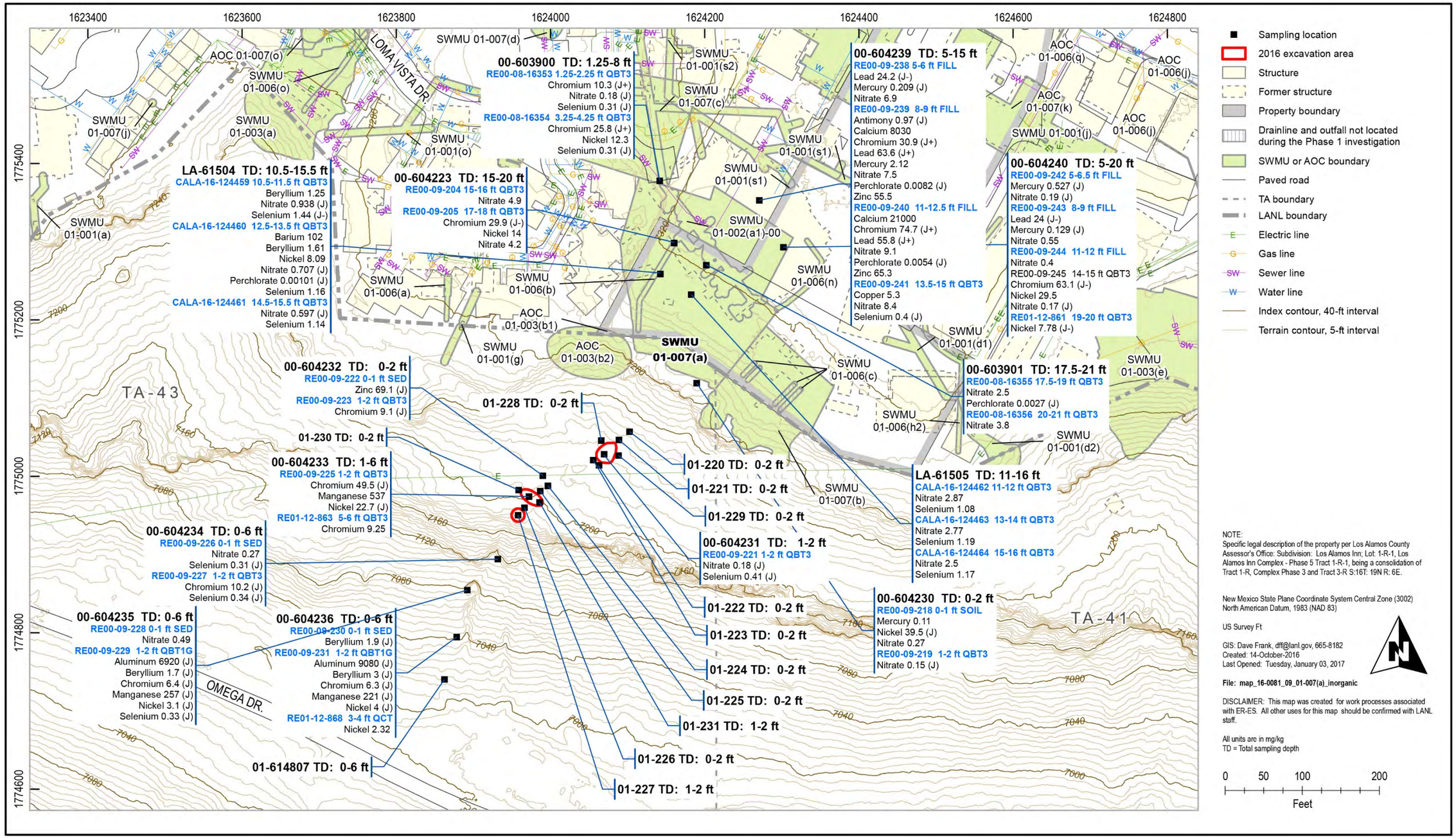

Figure 6.13-2 Inorganic chemicals detected or detected above BVs at SWMU 01-007(a)

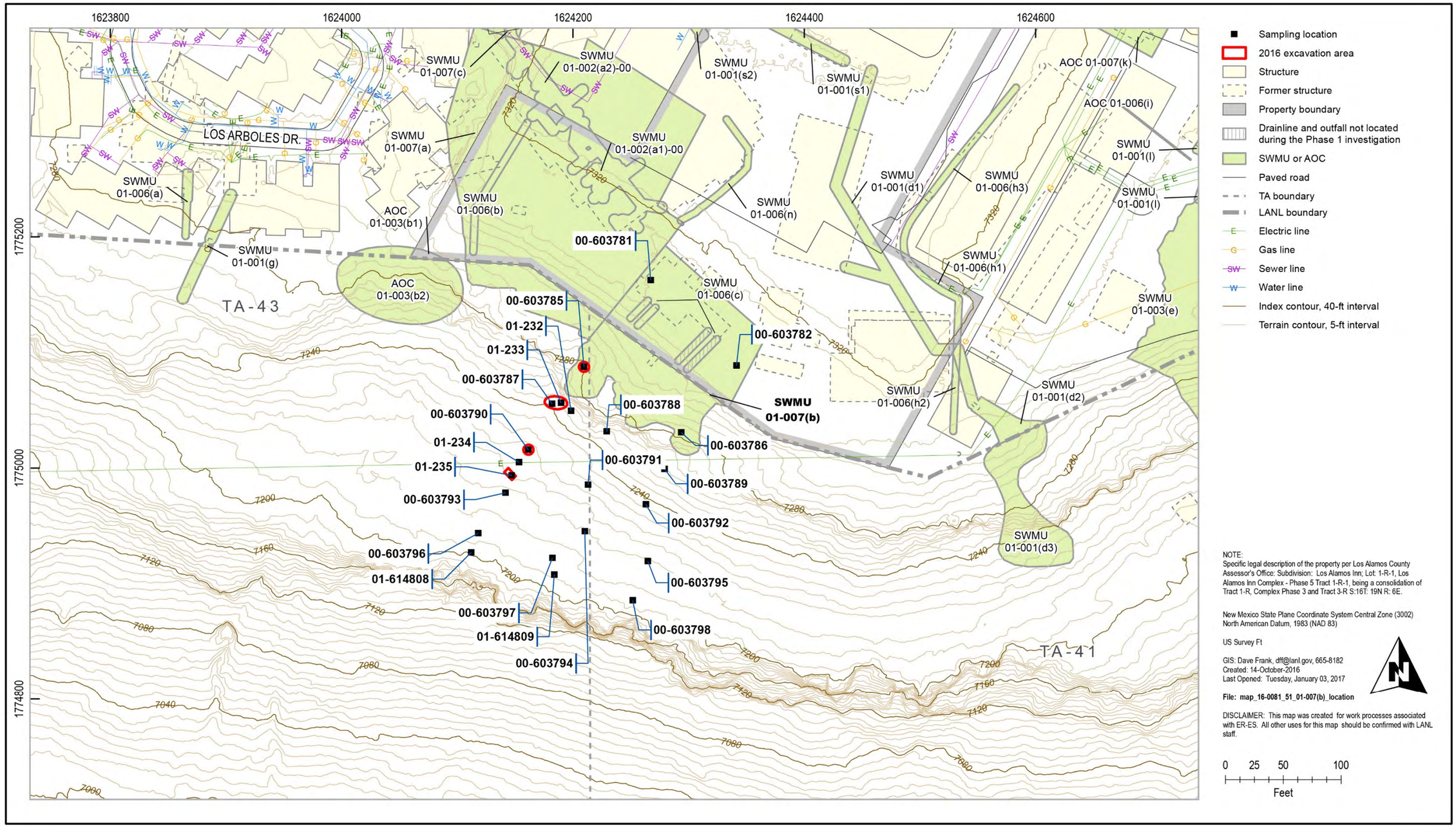

Figure 6.14-1 Sampling locations at SWMU 01-007(b)

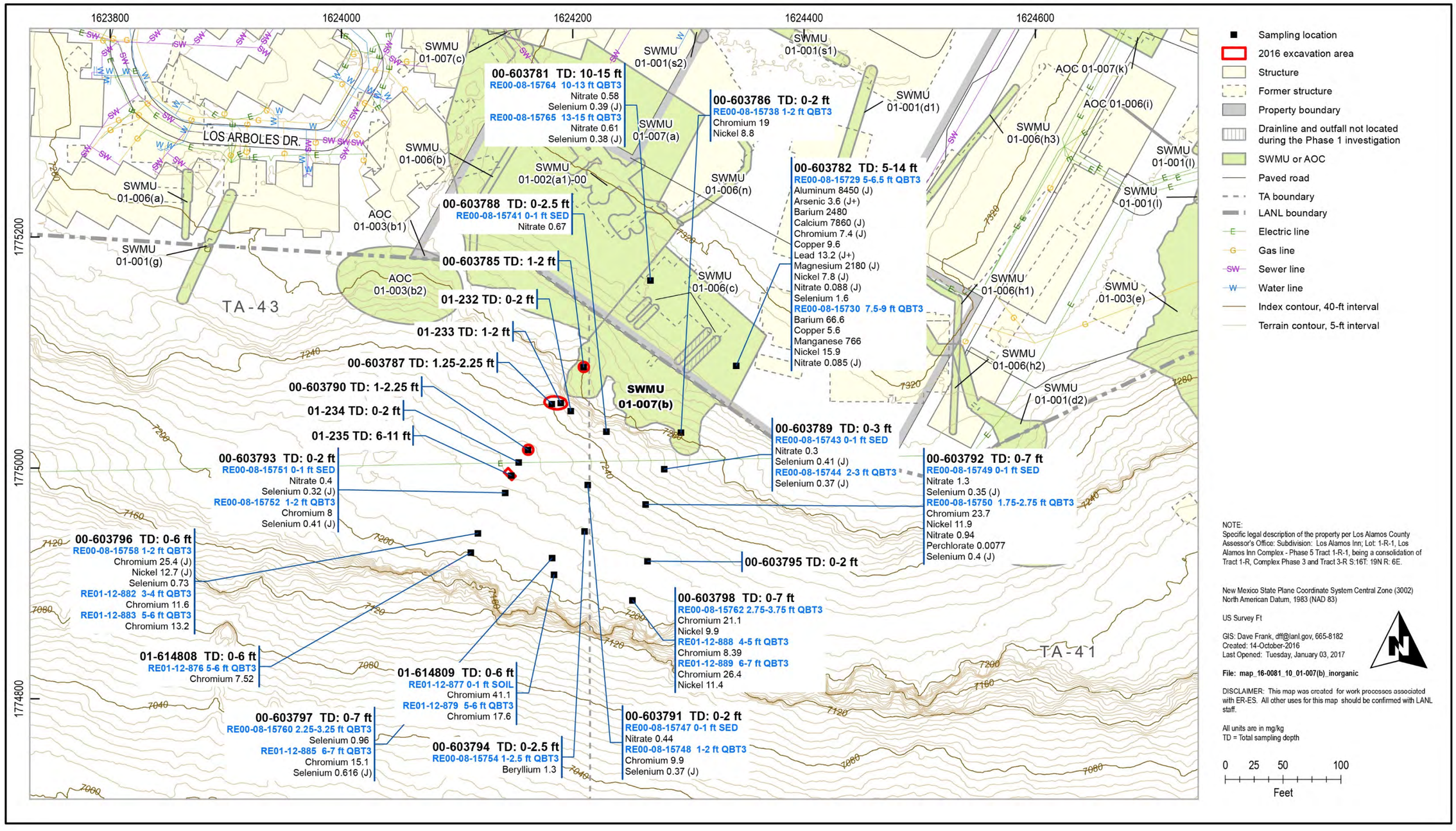

Figure 6.14-2 Inorganic chemicals detected or detected above BVs at SWMU 01-007(b)

Table 1.1-1
Sites Investigated within the Former Los Alamos Inn Property

Site	Site Description	Previous Investigation(s)	Investigations Conducted	Status
SWMU 01-001(c)	Septic tank 137, which served the building D-2 (radioactive laundry)	1975 Tank removed 1992–1993 Phase I RFI	Sampled in 2008–2009	Corrective action complete without controls
SWMU 01-001(d1)	Waste line to septic tank 138, which served buildings K (chemical stock room), V (uranium and beryllium machining), and Y (physics laboratory)	1975 Tank removed 1992–1994 Phase I RFI 1996–1997 Interim action	Sampled in 2008–2009 and 2016	Investigation report (section 6.5)
SWMU 01-001(s1)	Portion of western sanitary waste line	1973 Section of the line removed 1994 and 1996 More sections removed 1996 Interim action	Sampled in 2008–2009 and 2016	Investigation report (section 6.6)
SWMU 01-001(t)	Eastern sanitary waste line	1993 Phase I RFI	Sampled in 2008–2009	Corrective action complete without controls
SWMU 01-002(a1)-00	Portion of industrial waste line, which handled chemical and radioactive process wastes from 1943 to 1951	1974–1976 Ahlquist radiological survey 1985 Last line sections removed 1990 Interim action between Central Ave. and Rose St. 1993–1994 Phase I RFI	Sampled in 2008–2009	Investigation report (section 6.7)
AOC 01-003(b1)	Portion of a surface disposal area, used for surface disposal of construction debris	1993 Site walkover 1996 Site walkover	Sampled in 2016	Investigation report (section 6.8)
AOC 01-004(b)	Gas-fired incinerator	1957 Incinerator reported to be free of significant radioactive contamination	n/a*	No further action (EPA 2005, 088464).
SWMU 01-006(b)	Drainline and outfall, which served building D (plutonium processing)	1974–1976 Ahlquist radiological survey 1992–1993 Phase I RFI	Sampled in 2008–2009, remediated in 2012, sampled in 2013; remediated and sampled in 2016	Investigation report (section 6.9)

Table 1.1-1 (continued)

Site	Site Description	Previous Investigation(s)	Investigations Conducted	Status
SWMU 01-006(c)	Drainlines and outfalls, which served building D-2 (radioactive laundry)	1974–1976 Ahlquist radiological survey	Sampled in 2008–2009 and 2012	Investigation report (section 6.10)
SWMU 01-006(d)	Drainline and outfall, which served building D-3 (counting room)	1992–1993 Phase I RFI	Sampled in 2008-2009	Corrective action complete without controls
AOC 01-006(g)	Storm water drainage system, which served building D and several others	1974–1976 Ahlquist radiological survey 1992 Phase I RFI	Sampled in 2008-2009	Corrective action complete without controls
SWMU 01-006(h1)	Portion of storm water drainage system, which served buildings R (plumbing, carpentry, etc.) and Y (physics laboratory)	1974–1976 Ahlquist radiological survey	Sampled in 2016	Investigation report (section 6.11)
SWMU 01-006(n)	Storm water drainage system, which served building D	1974–1976 Ahlquist radiological survey	Sampled in 2008–2009 and 2012	Investigation report (section 6.12)
SWMU 01-007(a)	Suspected subsurface soil radiological contamination near building D	1974–1976 Ahlquist radiological survey 1992–1993 Phase I RFI	Sampled in 2008–2009, 2012, and 2013; remediated and sampled in 2016	Investigation report (section 6.13)
SWMU 01-007(b)	Suspected subsurface soil radiological contamination near building D-2	1974–1976 Ahlquist radiological survey 1992–1993 Phase I RFI	Sampled in 2008–2009, 2012, and 2013; remediated and sampled in 2016	Investigation report (section 6.14)
AOC 01-007(k)	Soil contamination area near buildings U and W (physics laboratories)	1993 Phase I RFI	Sampled in 2008–2009 and 2013	Corrective action complete without controls

*n/a = Not applicable.

Table 3.1-1
Surveyed Coordinates for Locations Sampled Within the Former LA Inn Property

SWMU/AOC	Location ID	Easting (ft)	Northing (ft)
01-001(d1)	00-603799	1624421.81	1775241.52
01-001(d1)	01-61507	1624504.741	1775115.235
01-001(d1)	01-61508	1624490.908	1775137.824
01-001(d1)	01-61509	1624473.631	1775165.214
01-001(d1)	01-61510	1624437.297	1775172.714
01-001(d1)	LA-61499	1624438.915	1775281.570
01-001(d1)	LA-61500	1624455.778	1775333.982
01-001(d1)	LA-61501	1624444.156	1775216.170
01-001(s1)	03-603871	1624434.67	1775352.37
01-001(s1)	00-603899	1624362.87	1775389.41
01-001(s1)	LA-61502	1624311.699	1775373.641
01-002(a1)-00	00-603899	1624362.87	1775389.41
01-002(a1)-00	00-603901	1624202.32	1775270.08
01-002(a1)-00	00-604223	1624160.86	1775298.78
01-003(b1)	01-61501	1624066.466	1775186.679
01-003(b1)	01-61502	1624080.982	1775189.984
01-006(b)	00-604223	1624160.485	1775298.682
01-006(b)	00-604225	1624103.109	1775180.405
01-006(b)	00-604226	1624129.76	1775177.42
01-006(b)	00-604237	1624113.98	1775186.98
01-006(b)	01-614801	1624071.444	1775186.91
01-006(b)	01-614802	1624062.401	1775162.525
01-006(b)	01-614803	1624146.731	1775167.826
01-006(b)	01-14	1624106.815	1775169.807
01-006(b)	01-15	1624102.745	1775179.404
01-006(b)	01-16	1624104.293	1775180.106
01-006(b)	01-17	1624102.069	1775180.769
01-006(b)	01-18	1624115.164	1775186.309
01-006(b)	01-19	1624113.520	1775185.747
01-006(b)	01-20	1624113.005	1775187.219
01-006(b)	01-201	1624114.604	1775169.698
01-006(b)	01-202	1624121.331	1775169.936
01-006(b)	01-203	1624108.734	1775164.14
01-006(b)	01-204	1624109.678	1775157.805
01-006(b)	01-205	1624100.971	1775170.778

Table 3.1-1 (continued)

SWMU/AOC	Location ID	Easting (ft)	Northing (ft)
01-006(b)	01-206	1624093.12	1775171.369
01-006(b)	01-207	1624110.371	1775177.263
01-006(b)	01-208	1624108.354	1775171.434
01-006(b)	01-254	1624108.88	1775160.63
01-006(b)	LA-61504	1624142.677	1775259.011
01-006(c)	00-603783	1624247.32	1775124.29
01-006(h1)	01-61511	1624508.09	1775161.087
01-006(h1)	01-61512	1624494.379	1775178.889
01-006(n)	00-604227	1624279.61	1775206.05
01-006(n)	00-604228	1624270.06	1775216.55
01-006(n)	00-604229	1624292.02	1775197.46
01-006(n)	00-604238	1624290.11	1775211.78
01-006(n)	01-614804	1624275.032	1775211.953
01-006(n)	01-614805	1624276.113	1775191.689
01-006(n)	01-614806	1624292.73	1775184.394
01-007(a)	00-604223	1624160.485	1775298.682
01-007(a)	00-603900	1624141.81	1775378.17
01-007(a)	00-603901	1624202.32	1775270.08
01-007(a)	00-604230	1624189.89	1775119.2
01-007(a)	00-604231	1624069.911	1775028.43
01-007(a)	00-604232	1623990.138	1775000.886
01-007(a)	00-604233	1623972.27	1774974.12
01-007(a)	00-604234	1623932.008	1774894.449
01-007(a)	00-604235	1623892.09	1774854.81
01-007(a)	00-604236	1623878.73	1774794.67
01-007(a)	00-604239	1624271.02	1775353.04
01-007(a)	00-604240	1624302.52	1775292.91
01-007(a)	01-614807	1623862.518	1774740.522
01-007(a)	01-220	1624102.55	1775057.25
01-007(a)	01-221	1624089.027	1775046.952
01-007(a)	01-222	1624063.314	1775014.498
01-007(a)	01-223	1624055.675	1775020.791
01-007(a)	01-224	1623996.995	1774988.152
01-007(a)	01-225	1623986.736	1774981.236
01-007(a)	01-226	1623966.607	1774960.022
01-007(a)	01-227	1623958.106	1774950.652
01-007(a)	01-228	1624066.092	1775046.138
01-007(a)	01-229	1624088.661	1775026.694

Table 3.1-1 (continued)

SWMU/AOC	Location ID	Easting (ft)	Northing (ft)
01-007(a)	01-230	1623959.147	1774982.597
01-007(a)	01-231	1623986.231	1774966.972
01-007(a)	LA-61504	1624142.677	1775259.011
01-007(a)	LA-61505	1624182.783	1775232.577
01-007(b)	00-603781	1624267.35	1775162.59
01-007(b)	00-603782	1624341.442	1775088.614
01-007(b)	00-603785	1624209.73	1775087.41
01-007(b)	00-603786	1624293.7	1775030.85
01-007(b)	00-603787	1624181.98	1775055.44
01-007(b)	00-603788	1624229.41	1775031.55
01-007(b)	00-603789	1624279.29	1774999.23
01-007(b)	00-603790	1624161.61	1775015.74
01-007(b)	00-603791	1624213.25	1774985.53
01-007(b)	00-603792	1624263.224	1774968.442
01-007(b)	00-603793	1624141.93	1774978.5
01-007(b)	00-603794	1624210.44	1774945.13
01-007(b)	00-603795	1624264.89	1774919.49
01-007(b)	00-603796	1624118.164	1774943.554
01-007(b)	00-603797	1624182.516	1774922.222
01-007(b)	00-603798	1624251.846	1774885.602
01-007(b)	01-614808	1624112.098	1774926.926
01-007(b)	01-614809	1624184.088	1774907.691
01-007(b)	01-232	1624198.625	1775049.318
01-007(b)	01-233	1624189.819	1775056.398
01-007(b)	01-234	1624153.586	1775005.011
01-007(b)	01-235	1624147.133	1774993.463

Table 3.6-1
Field-Screening Results for Samples Collected within the Former LA Inn Property

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-001(d1)	00-603799	3.5–5.0	RE00-08-15788	0	79	2350
01-001(d1)	00-603799	6.0–7.5	RE00-08-15789	0	86	2470
01-001(d1)	01-61507	23.0–24.0	CALA-16-121931	1.1	32	2400
01-001(d1)	01-61507	26.0–27.0	CALA-16-121935	0	16	2280
01-001(d1)	01-61507	29.0–30.0	CALA-16-121939	0	32	2380
01-001(d1)	01-61507	32.0–33.0	CALA-16-121943	0	48	2390
01-001(d1)	01-61508	16.0–17.0	CALA-16-121932	0.1	16	2010
01-001(d1)	01-61508	19.0–20.0	CALA-16-121936	0	32	2170
01-001(d1)	01-61508	22.0–23.0	CALA-16-121940	0	21	2370
01-001(d1)	01-61508	25.0–26.0	CALA-16-121944	0	5	2640
01-001(d1)	01-61509	13.0–14.0	CALA-16-121933	0.4	64	2540
01-001(d1)	01-61509	16.0–17.0	CALA-16-121937	0.5	21	2470
01-001(d1)	01-61509	19.0–20.0	CALA-16-121941	0.3	59	2470
01-001(d1)	01-61509	22.0–23.0	CALA-16-121945	0.4	59	2370
01-001(d1)	01-61510	21.5–22.5	CALA-16-121934	0.1	32	2400
01-001(d1)	01-61510	24.5–25.5	CALA-16-121938	0.2	26	2590
01-001(d1)	01-61510	27.5–28.5	CALA-16-121942	0.1	26	2610
01-001(d1)	01-61510	30.5–31.5	CALA-16-121946	0.1	5	2460
01-001(d1)	LA-61499	3.5–4.5	CALA-16-124440	0	51	1905
01-001(d1)	LA-61499	5.5–6.5	CALA-16-124443	0	20	2120
01-001(d1)	LA-61499	7.5–8.5	CALA-16-121446	0	15	2150
01-001(d1)	LA-61500	1.5–2.5	CALA-16-124441	0	20	1965
01-001(d1)	LA-61500	3.5–4.5	CALA-16-124444	0	20	2280
01-001(d1)	LA-61500	5.5–6.5	CALA-16-121447	0	15	2040
01-001(d1)	LA-61501	11.0–12.0	CALA-16-124442	0	30	2110
01-001(d1)	LA-61501	13.0–14.0	CALA-16-124445	0	15	2090
01-001(d1)	LA-61501	15.0–16.0	CALA-16-124448	0	30	2260
01-001(s1)	03-603871	1.5–2.5	RE00-08-16269	0	16.9	1991
01-001(s1)	03-603871	3.5–4.5	RE00-08-16270	0	15.9	1665
01-001(s1)	00-603899	1.25–2.25	RE00-08-16351	0	0	1721
01-001(s1)	00-603899	3.25–4.25	RE00-08-16352	0	19.75	1722
01-001(s1)	LA-61502	7.5–8.5	CALA-16-124450	0	15	2180
01-001(s1)	LA-61502	9.5–10.5	CALA-16-124451	0	15	2100
01-002(a1)-00	00-603899	1.25–2.25	RE00-08-16351	0	0	1721

Table 3.6-1 (continued)

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-002(a1)-00	00-603899	3.25–4.25	RE00-08-16352	0	19.75	1722
01-002(a1)-00	00-603901	17.5–19.0	RE00-08-16355	0	14	2280
01-002(a1)-00	00-603901	20.0–21.0	RE00-08-16356	0	36	2290
01-002(a1)-00	00-604223	15.0–16.0	RE00-09-204	0	37.4	2290
01-002(a1)-00	00-604223	17.0–18.0	RE00-09-205	0	32.5	1811
01-003(b1)	01-61501	0.0-1.0	CALA-16-121915	1.4	54	1395
01-003(b1)	01-61501	1.0-2.0	CALA-16-121916	4.6	27	1402
01-003(b1)	01-61501	2.0-3.0	CALA-16-121917	0	16	1314
01-003(b1)	01-61501	3.0-4.0	CALA-16-121918	1.0	16	1330
01-003(b1)	01-61502	0.0-1.0	CALA-16-121919	7.6	61	2170
01-003(b1)	01-61502	1.0-2.0	CALA-16-121920	4.1	25	1962
01-003(b1)	01-61502	2.0-3.0	CALA-16-121921	2.2	51	1956
01-003(b1)	01-61502	3.0-4.0	CALA-16-121922	1.1	20	2170
01-003(b1)	01-61502	4.0-5.0	CALA-16-125043	0.4	71	1902
01-003(b1)	01-61502	5.0-6.0	CALA-16-125044	0.5	35	2070
01-003(b1)	01-61502	6.0-7.0	CALA-16-125045	0.3	51	2060
01-006(b)	00-604223	15.0–16.0	RE00-09-204	0	37.4	2290
01-006(b)	00-604223	17.0–18.0	RE00-09-205	0	32.5	1811
01-006(b)	00-604223	18.0–19.0	RE01-12-828	0	12.62	1789
01-006(b)	00-604223	19.0–20.0	RE01-12-829	0	12.62	1789
01-006(b)	00-604225	4.0–5.0	RE01-12-832	0	4	1145
01-006(b)	00-604225	6.0–7.0	RE01-12-833	0	45	505
01-006(b)	00-604226	0.0–1.0	RE00-09-210	0	26	2070
01-006(b)	00-604226	1.25–2.25	RE00-09-211	0	26	2070
01-006(b)	00-604226	7.0–8.0	RE01-12-836	0	28	1050
01-006(b)	00-604226	9.0–10.0	RE01-12-837	0	9	1021
01-006(b)	00-604237	6.0–7.0	RE01-12-830	0	17.12	2280
01-006(b)	00-604237	8.0–9.0	RE01-12-831	0	17.12	2280
01-006(b)	01-14	10.0–11.0	RELA-16-106188	NA[b]	88	2410
01-006(b)	01-14	12.0–13.0	RELA-16-106189	NA	93	2380
01-006(b)	01-14	14.0–15.0	RELA-16-106190	NA	36	2550
01-006(b)	01-15	0.0–1.0	RE01-12-10080	0	50.2	2390
01-006(b)	01-15	4.0–5.0	RE01-12-10081	0	50.2	2390
01-006(b)	01-16	0.0–1.0	RE01-12-10082	0	50.2	2390
01-006(b)	01-16	4.0–5.0	RE01-12-10083	0	50.2	2390

Table 3.6-1 (continued)

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-006(b)	01-17	0.0–1.0	RE01-12-10084	0	50.2	2390
01-006(b)	01-17	4.0–5.0	RE01-12-10085	0	50.2	2390
01-006(b)	01-18	0.0–1.0	RE01-12-10086	0	19.07	1695
01-006(b)	01-18	4.0–5.0	RE01-12-10087	0	19.07	1695
01-006(b)	01-18	6.0–7.0	RE01-12-10088	0	19.07	1695
01-006(b)	01-19	0.0–1.0	RE01-12-10089	0	50.2	2390
01-006(b)	01-19	4.0–5.0	RE01-12-10090	0	50.2	2390
01-006(b)	01-19	6.0–7.0	RE01-12-10091	0	19.07	1695
01-006(b)	01-20	0.0–1.0	RE01-12-10092	0	19.07	1695
01-006(b)	01-20	4.0–5.0	RE01-12-10093	0	19.07	1695
01-006(b)	01-20	6.0–7.0	RE01-12-10094	0	19.07	1695
01-006(b)	01-614801	0.0–1.0	RE01-12-838	0	10.14	2040
01-006(b)	01-614801	4.0–5.0	RE01-12-839	0	10.14	2040
01-006(b)	01-614801	6.0–7.0	RE01-12-840	0	10.14	2040
01-006(b)	01-614802	0.0–1.0	RE01-12-841	0	16.02	1678
01-006(b)	01-614802	4.0–5.0	RE01-12-842	0	16.02	1678
01-006(b)	01-614802	6.0–7.0	RE01-12-843	0	16.02	1678
01-006(b)	01-614803	0.0–1.0	RE01-12-844	0	20.8	2270
01-006(b)	01-614803	4.0–5.0	RE01-12-845	0	20.8	2270
01-006(b)	01-614803	6.0–7.0	RE01-12-846	0	20.8	2270
01-006(b)	01-201	0.0–1.0	RE01-13-38454	0	26	1152
01-006(b)	01-201	3.0–4.0	RE01-13-38461	0	26	1152
01-006(b)	01-201	5.0–6.0	RE01-13-38468	0	26	1152
01-006(b)	01-201	7.0–8.0	RE01-13-38475	0	26	1152
01-006(b)	01-201	9.0–10.0	RE01-13-38482	0	26	1152
01-006(b)	01-202	0.0–1.0	RE01-13-38455	0	14	2260
01-006(b)	01-202	3.0–4.0	RE01-13-38462	0	14	2260
01-006(b)	01-202	5.0–6.0	RE01-13-38469	0	14	2260
01-006(b)	01-202	7.0–8.0	RE01-13-38476	0	14	2260
01-006(b)	01-202	9.0–10.0	RE01-13-38483	0	14	2260
01-006(b)	01-203	0.0–1.0	RE01-13-38456	0	24	2320
01-006(b)	01-203	3.0–4.0	RE01-13-38463	0	24	2320
01-006(b)	01-203	5.0–6.0	RE01-13-38470	0	24	2320
01-006(b)	01-203	7.0–8.0	RE01-13-38477	0	24	2320
01-006(b)	01-203	9.0–10.0	RE01-13-38484	0	24	2320

Table 3.6-1 (continued)

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-006(b)	01-204	5.0–6.0	RE01-13-38471	0	43	2230
01-006(b)	01-204	7.0–8.0	RE01-13-38478	0	43	2230
01-006(b)	01-204	9.0–10.0	RE01-13-38485	0	43	2230
01-006(b)	01-205	0.0–1.0	RE01-13-38458	0	24	2250
01-006(b)	01-205	3.0–4.0	RE01-13-38465	0	24	2250
01-006(b)	01-205	5.0–6.0	RE01-13-38472	0	24	2250
01-006(b)	01-205	7.0–8.0	RE01-13-38479	0	24	2250
01-006(b)	01-205	9.0–10.0	RE01-13-38486	0	24	2250
01-006(b)	01-206	0.0–1.0	RE01-13-38459	0	9	2290
01-006(b)	01-206	3.0–4.0	RE01-13-38466	0	9	2290
01-006(b)	01-206	5.0–6.0	RE01-13-38473	0	9	2290
01-006(b)	01-206	7.0–8.0	RE01-13-38480	0	9	2290
01-006(b)	01-206	9.0–10.0	RE01-13-38487	0	9	2290
01-006(b)	01-207	0.0–1.0	RE01-13-38460	0	33	2380
01-006(b)	01-207	3.0–4.0	RE01-13-38467	0	33	2380
01-006(b)	01-207	5.0–6.0	RE01-13-38474	0	33	2380
01-006(b)	01-207	7.0–8.0	RE01-13-38481	0	33	2380
01-006(b)	01-207	9.0–10.0	RE01-13-38488	0	33	2380
01-006(b)	01-208	10.0–11.0	RELA-16-106191	NA	57	2410
01-006(b)	01-208	12.0–13.0	RELA-16-106192	NA	52	2310
01-006(b)	01-208	14.0–15.0	RELA-16-106193	NA	46	2340
01-006(b)	01-254	0.0–1.0	RELA-16-106194	NA	99	2440
01-006(b)	01-254	3.0–4.0	RELA-16-106195	NA	67	2290
01-006(b)	01-254	5.0–6.0	RELA-16-106196	NA	31	2540
01-006(b)	01-254	7.0–8.0	RELA-16-106197	NA	20	2580
01-006(b)	01-254	9.0–10.0	RELA-16-106198	NA	88	2560
01-006(b)	LA-61504	10.5–11.5	CALA-16-124459	0.1	56	2140
01-006(b)	LA-61504	12.5–13.5	CALA-16-124460	0.1	51	2370
01-006(b)	LA-61504	14.5–15.5	CALA-16-124461	0.1	15	2340
01-006(c)	00-603783	0.0–1.0	RE00-08-15731	0	27.2	1321
01-006(c)	00-603783	2.75–4.0	RE00-08-15732	0	27.2	1321
01-006(c)	00-603783	5.0–6.0	RE01-12-584	0	10.14	2040
01-006(c)	00-603783	7.0–8.0	RE01-12-585	0	10.14	2040
01-006(h1)	01-61511	16.0–17.0	CALA-16-121949	0.1	17	2190
01-006(h1)	01-61511	19.0–20.0	CALA-16-121950	0	35	1922

Table 3.6-1 (continued)

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-006(h1)	01-61511	22.0–23.0	CALA-16-121951	0.1	29	2140
01-006(h1)	01-61511	25.0–26.0	CALA-16-121952	0	11	2290
01-006(h1)	01-61512	11.0–12.0	CALA-16-121953	0	17	2160
01-006(h1)	01-61512	14.0–15.0	CALA-16-121954	0	11	2200
01-006(h1)	01-61512	17.0–18.0	CALA-16-121955	0	5	2070
01-006(h1)	01-61512	20.0–21.0	CALA-16-121956	0	11	2210
01-006(n)	00-604227	0.0–1.0	RE00-09-212	0	26	2070
01-006(n)	00-604227	7.0–8.0	RE00-09-213	0	26	2070
01-006(n)	00-604228	0.0–1.0	RE00-09-214	0	26	2070
01-006(n)	00-604228	8.25–9.25	RE00-09-215	0	49	2180
01-006(n)	00-604229	0.0–1.0	RE00-09-216	0	49	2180
01-006(n)	00-604229	1.0–2.0	RE00-09-217	0	49	2180
01-006(n)	00-604238	0.0–1.0	RE00-09-235	0	49	2180
01-006(n)	00-604238	1.5–2.5	RE00-09-236	0	49	2180
01-006(n)	00-604238	4.0–5.0	RE00-09-237	0	49	2180
01-006(n)	00-604238	6.5–7.5	RE00-09-246	0	49	2180
01-006(n)	01-614804	10.0–11.0	RE01-12-849	0	15.39	1791
01-006(n)	01-614804	12.0–13.0	RE01-12-850	0	15.39	1791
01-006(n)	01-614805	0.0–1.0	RE01-12-851	0	15.39	1791
01-006(n)	01-614805	4.0–5.0	RE01-12-852	0	15.39	1791
01-006(n)	01-614806	0.0–1.0	RE01-12-854	0	15.39	1791
01-006(n)	01-614806	4.0–5.0	RE01-12-855	0	15.39	1791
01-006(n)	01-614806	10.0-11.0	RE01-12-856	0	15.39	1791
01-007(a)	00-603900	1.25–2.25	RE00-08-16353	0	83	2460
01-007(a)	00-603900	3.25–4.25	RE00-08-16354	0	41	2640
01-007(a)	00-603901	17.5–19.0	RE00-08-16355	0	14	2280
01-007(a)	00-603901	20.0–21.0	RE00-08-16356	0	36	2290
01-007(a)	00-604230	0.0–1.0	RE00-09-218	0	39.3	1833
01-007(a)	00-604230	1.0–2.0	RE00-09-219	0	39.3	1833
01-007(a)	00-604231	1.0–2.0	RE00-09-221	0	13	396
01-007(a)	00-604232	0.0–1.0	RE00-09-222	0	42	1116
01-007(a)	00-604232	1.0–2.0	RE00-09-223	0	42	1116
01-007(a)	00-604233	1.0–2.0	RE00-09-225	0	33	895
01-007(a)	00-604233	3.0–4.0	RE01-12-862	0	71.8	2080
01-007(a)	00-604233	5.0–6.0	RE01-12-863	0	20.8	2270

Table 3.6-1 (continued)

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-007(a)	00-604234	0.0–1.0	RE00-09-226	0	60	3000
01-007(a)	00-604234	1.0–2.0	RE00-09-227	0	60	3000
01-007(a)	00-604234	3.0–4.0	RE01-12-864	0	20.7	1844
01-007(a)	00-604234	5.0–6.0	RE01-12-865	0	20.7	1844
01-007(a)	00-604235	0.0–1.0	RE00-09-228	0	60	3000
01-007(a)	00-604235	1.0–2.0	RE00-09-229	0	60	3000
01-007(a)	00-604235	3.0–4.0	RE01-12-866	0	20.7	1844
01-007(a)	00-604235	5.0–6.0	RE01-12-867	0	20.7	1844
01-007(a)	00-604236	0.0–1.0	RE00-09-230	0	60	3000
01-007(a)	00-604236	1.0–2.0	RE00-09-231	0	60	3000
01-007(a)	00-604236	3.0–4.0	RE01-12-868	0	20.7	1844
01-007(a)	00-604236	5.0–6.0	RE01-12-869	0	20.7	1844
01-007(a)	00-604239	5.0–6.0	RE00-09-238	0	39.5	1580
01-007(a)	00-604239	8.0–9.0	RE00-09-239	0	57	2500
01-007(a)	00-604239	11.0–12.5	RE00-09-240	0	43	2270
01-007(a)	00-604239	13.5–15.0	RE00-09-241	0	23	2460
01-007(a)	00-604240	5.0–6.5	RE00-09-242	0	93	1916
01-007(a)	00-604240	8.0–9.0	RE00-09-243	0	54.3	2280
01-007(a)	00-604240	11.0–12.0	RE00-09-244	0	56.9	1964
01-007(a)	00-604240	14.0–15.0	RE00-09-245	0	56.9	1888
01-007(a)	00-604240	19.0–20.0	RE01-12-861	0	26	1433
01-007(a)	01-614807	0.0–1.0	RE01-12-858	0	9.61	1786
01-007(a)	01-614807	3.0–4.0	RE01-12-859	0	9.61	1786
01-007(a)	01-614807	5.0–6.0	RE01-12-860	0	9.61	1786
01-007(a)	01-220	0.0–1.0	RE01-13-38519	0	31	1055
01-007(a)	01-220	1.0–2.0	RE01-13-38531	0	31	1055
01-007(a)	01-221	0.0–1.0	RE01-13-38520	0	36	788
01-007(a)	01-221	1.0–2.0	RE01-13-38532	0	36	788
01-007(a)	01-222	0.0–1.0	RE01-13-38521	0	21	933
01-007(a)	01-222	1.0–2.0	RE01-13-38533	0	21	933
01-007(a)	01-223	0.0–1.0	RE01-13-38522	0	50	848
01-007(a)	01-223	1.0–2.0	RE01-13-38534	0	50	848
01-007(a)	01-224	0.0–1.0	RE01-13-38523	0	7	733
01-007(a)	01-224	1.0–2.0	RE01-13-38535	0	7	733
01-007(a)	01-225	0.0–1.0	RE01-13-38524	0	36	745

Table 3.6-1 (continued)

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-007(a)	01-225	1.0–2.0	RE01-13-38536	0	36	745
01-007(a)	01-226	0.0–1.0	RE01-13-38525	0	60	885
01-007(a)	01-226	1.0–2.0	RE01-13-38537	0	60	885
01-007(a)	01-227	1.0–2.0	RE01-13-38538	0	60	867
01-007(a)	01-228	0.0–1.0	RE01-13-38527	0	31	1067
01-007(a)	01-228	1.0–2.0	RE01-13-38539	0	31	1067
01-007(a)	01-229	0.0–1.0	RE01-13-38528	0	31	1116
01-007(a)	01-229	1.0–2.0	RE01-13-38540	0	31	1116
01-007(a)	01-230	0.0–1.0	RE01-13-38529	0	45	891
01-007(a)	01-230	1.0–2.0	RE01-13-38541	0	45	891
01-007(a)	01-231	1.0–2.0	RE01-13-38542	0	31	933
01-007(a)	LA-61504	10.5–11.5	CALA-16-124459	0.1	56	2140
01-007(a)	LA-61504	12.5–13.5	CALA-16-124460	0.1	51	2370
01-007(a)	LA-61504	14.5–15.5	CALA-16-124461	0.1	15	2340
01-007(a)	LA-61505	11.0–12.0	CALA-16-124462	0.1	15	2240
01-007(a)	LA-61505	13.0–14.0	CALA-16-124463	0.1	35	2290
01-007(a)	LA-61505	15.0–16.0	CALA-16-124464	0.1	51	2180
01-007(b)	00-603777	0.0–1.0	RE00-08-15719	0	45	2450
01-007(b)	00-603777	1.5–2.5	RE00-08-15720	0	45	2450
01-007(b)	00-603777	4.0–5.25	RE00-08-15763	0	45	2450
01-007(b)	00-603778	0.0–1.5	RE00-08-15721	0	51	2800
01-007(b)	00-603778	1.5–2.5	RE00-08-15722	0	51	2800
01-007(b)	00-603779	0.0–1.5	RE00-08-15723	0	51	2800
01-007(b)	00-603779	1.5–2.5	RE00-08-15724	0	51	2800
01-007(b)	00-603780	0.0–1.0	RE00-08-15725	0	45	2450
01-007(b)	00-603780	1.0–2.0	RE00-08-15726	0	45	2450
01-007(b)	00-603781	10.0–13.0	RE00-08-15764	0	79	2620
01-007(b)	00-603781	13.0–15.0	RE00-08-15765	0	50	2570
01-007(b)	00-603782	5.0–6.5	RE00-08-15729	0	79	2480
01-007(b)	00-603782	7.5–9.0	RE00-08-15730	0	50	2560
01-007(b)	00-603782	10.0–11.0	RE01-12-880	0	29.9	1873
01-007(b)	00-603782	13.0–14.0	RE01-12-881	0	29.9	1873
01-007(b)	00-603784	0.0–1.0	RE00-08-15733	0	27.2	1321
01-007(b)	00-603784	4.5–5.75	RE00-08-15734	0	27.2	1321
01-007(b)	00-603785	1.0–2.0	RE00-08-15736	0	45	2450

Table 3.6-1 (continued)

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-007(b)	00-603786	0.0–1.0	RE00-08-15737	0	45	2450
01-007(b)	00-603786	1.0–2.0	RE00-08-15738	0	45	2450
01-007(b)	00-603787	0.0–0.75	RE00-08-15739	0	83	2360
01-007(b)	00-603787	1.25–2.25	RE00-08-15740	0	83	2360
01-007(b)	00-603788	0.0–1.0	RE00-08-15741	0	83	2360
01-007(b)	00-603788	1.5–2.5	RE00-08-15742	0	83	2360
01-007(b)	00-603789	0.0–1.0	RE00-08-15743	0	83	2360
01-007(b)	00-603789	2.0–3.0	RE00-08-15744	0	83	2360
01-007(b)	00-603790	1.0–2.25	RE00-08-15746	0	51	2800
01-007(b)	00-603791	0.0–1.0	RE00-08-15747	0	83	2360
01-007(b)	00-603791	1.0–2.0	RE00-08-15748	0	83	2360
01-007(b)	00-603792	0.0–1.0	RE00-08-15749	0	83	2360
01-007(b)	00-603792	1.75–2.75	RE00-08-15750	0	83	2360
01-007(b)	00-603792	4.0–5.0	RE01-12-887	0	13.21	1751
01-007(b)	00-603792	6.0–7.0	RE01-12-886	0	13.21	1751
01-007(b)	00-603793	0.0–1.0	RE00-08-15751	0	83	2360
01-007(b)	00-603793	1.0–2.0	RE00-08-15752	0	83	2360
01-007(b)	00-603794	0.0–1.0	RE00-08-15753	0	51	2800
01-007(b)	00-603794	1.0–2.5	RE00-08-15754	0	51	2800
01-007(b)	00-603795	0.0–1.0	RE00-08-15756	0	51	2800
01-007(b)	00-603795	1.0–2.0	RE00-08-15755	0	51	2800
01-007(b)	00-603796	0.0–1.0	RE00-08-15757	0	83	2360
01-007(b)	00-603796	1.0–2.0	RE00-08-15758	0	83	2360
01-007(b)	00-603796	3.0–4.0	RE01-12-882	0	13.1	1687
01-007(b)	00-603796	5.0–6.0	RE01-12-883	0	18.95	1706
01-007(b)	00-603797	0.0–1.0	RE00-08-15759	0	83	2360
01-007(b)	00-603797	2.25–3.25	RE00-08-15760	0	83	2360
01-007(b)	00-603797	4.0–5.0	RE01-12-884	0	18.95	1706
01-007(b)	00-603797	6.0–7.0	RE01-12-885	0	18.95	1706
01-007(b)	00-603798	0.0–1.0	RE00-08-15761	0	83	2360
01-007(b)	00-603798	2.75–3.75	RE00-08-15762	0	83	2360
01-007(b)	00-603798	4.0–5.0	RE01-12-888	0	18.95	1706
01-007(b)	00-603798	6.0–7.0	RE01-12-889	0	13.21	1751
01-007(b)	01-614808	0.0–1.0	RE01-12-874	0	13.21	1751
01-007(b)	01-614808	3.0–4.0	RE01-12-875	0	13.21	1751

Table 3.6-1 (continued)

SMWU/AOC	Location ID	Depth (ft)	Sample ID	PID (ppm)	Alpha (dpm[a])	Beta/Gamma (dpm)
01-007(b)	01-614808	5.0–6.0	RE01-12-876	0	13.21	1751
01-007(b)	01-614809	0.0–1.0	RE01-12-877	0	13.21	1751
01-007(b)	01-614809	3.0–4.0	RE01-12-878	0	13.21	1751
01-007(b)	01-614809	5.0–6.0	RE01-12-879	0	13.21	1751
01-007(b)	01-232	0.0–1.0	RE01-13-38545	0	30	1223
01-007(b)	01-232	1.0–2.0	RE01-13-38549	0	30	1223
01-007(b)	01-233	1.0–2.0	RE01-13-38550	0	25	1047
01-007(b)	01-234	0.0–1.0	RE01-13-38547	0	20	1180
01-007(b)	01-234	1.0–2.0	RE01-13-38551	0	20	1180
01-007(b)	01-235	6.0–7.0	CALA-16-121888	NA	30	2490
01-007(b)	01-235	9.0–10.0	CALA-16-121889	NA	46	2420
01-007(b)	01-235	10.0–11.0	CALA-16-121890	NA	51	2520

[a] dpm = Disintegrations per minute.

[b] NA = Not analyzed.

Table 6.5-1
Samples Collected and Analyses Requested at SWMU 01-001(d1)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-08-15788	00-603799	3.5–5.0	FILL	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881
RE00-08-15789	00-603799	6.0–7.5	QBT3	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881	09-881
CALA-16-121931	01-61507	23.0–24.0	QBT3	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081
CALA-16-121935	01-61507	26.0–27.0	QBT3	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081
CALA-16-121939	01-61507	29.0–30.0	QBT3	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081
CALA-16-121943	01-61507	32.0–33.0	QBT3	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081
CALA-16-121932	01-61508	16.0–17.0	QBT3	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081
CALA-16-121936	01-61508	19.0–20.0	QBT3	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081
CALA-16-121940	01-61508	22.0–23.0	QBT3	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081
CALA-16-121944	01-61508	25.0–26.0	QBT3	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081	2016-2081
CALA-16-121933	01-61509	13.0–14.0	QBT3	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100
CALA-16-121937	01-61509	16.0–17.0	QBT3	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100
CALA-16-121941	01-61509	19.0–20.0	QBT3	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100
CALA-16-121945	01-61509	22.0–23.0	QBT3	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100
CALA-16-121934	01-61510	21.5–22.5	QBT3	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100
CALA-16-121938	01-61510	24.5–25.5	QBT3	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100
CALA-16-121942	01-61510	27.5–28.5	QBT3	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100
CALA-16-121946	01-61510	30.5–31.5	QBT3	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100	2016-2100
CALA-16-124440	LA-61499	3.5–4.5	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-124443	LA-61499	5.5–6.5	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-121446	LA-61499	7.5–8.5	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-124441	LA-61500	1.5–2.5	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-124444	LA-61500	3.5–4.5	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-121447	LA-61500	5.5–6.5	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-124442	LA-61501	11.0–12.0	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-124445	LA-61501	13.0–14.0	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-124448	LA-61501	15.0–16.0	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134

Note: Numbers in analyte columns are request numbers.

Table 6.5-2
Inorganic Chemicals above BVs at SWMU 01-001(d1)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Calcium	Chromium	Copper	Cyanide (Total)	Lead	Mercury	Nitrate	Perchlorate	Selenium	Thallium
Soil BV[a]				**0.83**	**295**	**6120**	**19.3**	**14.7**	**0.5**	**22.3**	**0.1**	**na[b]**	**na**	**1.52**	**0.73**
Qbt 2,3,4 BV[a]				**0.5**	**46**	**2200**	**7.14**	**4.66**	**0.5**	**11.2**	**0.1**	**na**	**na**	**0.3**	**1.1**
Construction Worker SSL[c]				**142**	**4390**	**8,850,000**	**134[d]**	**14,200**	**12.1**	**800**	**77.1**	**566,000**	**248**	**1750**	**3.54**
Industrial SSL[c]				**519**	**25,500**	**32,400,000**	**505[d]**	**51,900**	**64.4**	**800**	**389**	**2,080,000**	**908**	**6490**	**13**
Residential SSL[c]				**31.3**	**15,600**	**13,000,000**	**96.6[d]**	**3130**	**11.2**	**400**	**23.5**	**125,000**	**54.8**	**391**	**0.782**
RE00-08-15788	00-603799	3.5–5.0	FILL	—[e]	—	—	—	17.9	—	22.6 (J+)	—	0.26	—	—	—
RE00-08-15789	00-603799	6.0–7.5	QBT3	—	—	—	7.9 (J+)	—	0.53 (U)	12 (J+)	0.316	1.8	—	—	—
CALA-16-121931	01-61507	23.0–24.0	QBT3	0.992 (U)	—	—	—	—	—	—	—	7.65	0.00102 (J)	0.805 (J)	—
CALA-16-121935	01-61507	26.0–27.0	QBT3	0.983 (U)	—	3960	—	—	—	—	—	9.89	0.00148 (J)	0.689 (J)	—
CALA-16-121939	01-61507	29.0–30.0	QBT3	1.02 (U)	—	—	—	—	—	—	—	4.15	0.00125 (J)	0.804 (J)	—
CALA-16-121943	01-61507	32.0–33.0	QBT3	1.03 (U)	—	—	—	—	—	—	—	5.31	0.000766 (J)	1.01	—
CALA-16-121932	01-61508	16.0–17.0	QBT3	1.02 (U)	83.6	4670	—	4.87	—	—	—	0.505 (J)	—	1.51	—
CALA-16-121936	01-61508	19.0–20.0	QBT3	1 (U)	85.9	—	—	—	—	—	—	1.06 (J)	—	1.17	—
CALA-16-121940	01-61508	22.0–23.0	QBT3	0.995 (U)	—	—	—	—	—	—	—	0.861 (J)	—	0.929 (J)	—
CALA-16-121944	01-61508	25.0–26.0	QBT3	1 (U)	—	—	—	—	—	—	—	1.08	—	1.19	—
CALA-16-121933	01-61509	13.0–14.0	QBT3	0.95 (U)	—	—	—	—	—	—	—	4.16	0.000812 (J)	1.19	—
CALA-16-121937	01-61509	16.0–17.0	QBT3	0.995 (U)	—	—	—	—	—	—	—	5.11	0.000921 (J)	1.1	—
CALA-16-121941	01-61509	19.0–20.0	QBT3	1.03 (U)	—	—	—	—	—	11.4	—	6.06	0.000945 (J)	1.05	—
CALA-16-121945	01-61509	22.0–23.0	QBT3	0.934 (U)	—	—	—	—	—	-	—	5.32	0.00101 (J)	0.969 (J)	—
CALA-16-121934	01-61510	21.5–22.5	QBT3	0.896 (U)	—	—	—	—	—	32.5	—	0.84 (J)	0.0051	0.826 (J)	1.45
CALA-16-121938	01-61510	24.5–25.5	QBT3	0.949 (U)	—	—	—	—	—	-	—	1.08	0.000636 (J)	0.992	—
CALA-16-121942	01-61510	27.5–28.5	QBT3	1.01 (U)	—	—	—	—	—	-	—	1 (J)	0.000709 (J)	1.29	—
CALA-16-121946	01-61510	30.5–31.5	QBT3	0.954 (U)	—	—	—	—	—	16.3	—	1.3	0.00101 (J)	1.25	—
CALA-16-124440	LA-61499	3.5–4.5	QBT3	1.16 (U)	63.4 (J-)	5440 (J-)	—	—	—	—	—	0.846 (J)	—	0.962 (J)	—
CALA-16-124443	LA-61499	5.5–6.5	QBT3	1.08 (U)	—	—	—	—	—	—	—	0.809 (J)	—	1.51	—
CALA-16-121446	LA-61499	7.5–8.5	QBT3	1.07 (U)	—	—	—	—	—	—	—	1.22	—	1.09	—
CALA-16-124441	LA-61500	1.5–2.5	QBT3	1.12 (U)	—	—	—	—	—	—	1.4	—	—	1.05 (J)	—
CALA-16-124444	LA-61500	3.5–4.5	QBT3	1.19 (U)	—	—	—	—	—	—	—	—	—	0.814 (J)	—
CALA-16-121447	LA-61500	5.5–6.5	QBT3	1.17 (U)	—	—	—	—	—	—	—	0.789 (J)	—	1.07 (J)	—
CALA-16-124442	LA-61501	11.0–12.0	QBT3	1.01 (U)	—	—	—	—	—	—	0.161	2.69	—	1.11	—
CALA-16-124445	LA-61501	13.0–14.0	QBT3	1.01 (U)	—	—	—	—	—	—	0.222	2.92	—	0.879 (J)	—
CALA-16-124448	LA-61501	15.0–16.0	QBT3	1.03 (U)	—	—	—	—	—	—	—	3.95	—	0.661 (J)	—

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

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs from NMED (2015, 600915).

[d] SSLs for total chromium.

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

Table 6.5-3
Organic Chemicals Detected at SWMU 01-001(d1)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1242	Bis(2-ethylhexyl)phthalate	Di-n-butylphthalate	Methylene Chloride
Construction Worker SSL[a]				**85.3**	**5380**	**26,900**	**1210**
Industrial SSL[a]				**11.5**	**1830**	**91,600**	**5130**
Residential SSL[a]				**2.43**	**380**	**6160**	**409**
RE00-08-15788	00-603799	3.5–5.0	FILL	—[b]	—	0.058 (J)	—
CALA-16-121931	01-61507	23.0–24.0	QBT3	—	—	—	0.00213 (J)
CALA-16-121933	01-61509	13.0–14.0	QBT3	—	0.18 (J)	—	—
CALA-16-124442	LA-61501	11.0–12.0	QBT3	0.00559	—	—	—

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

[a] SSLs from NMED (2015, 600915).

[b] — = Not detected.

Table 6.5-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-001(d1)

Sample ID	Location ID	Depth (ft)	Media	Plutonium-239/240	Uranium-235/236
Soil BV[a]				**0.054[b]**	**0.2**
Qbt 2,3,4 BV[a]				**na[c]**	**0.09**
Construction Worker SAL[d]				**200**	**130**
Industrial SAL[d]				**1200**	**160**
Residential SAL[d]				**79**	**42**
RE00-08-15788	00-603799	3.5–5.0	FILL	0.97	—[e]
CALA-16-121931	01-61507	23.0–24.0	QBT3	—	0.123 (J)
CALA-16-121935	01-61507	26.0–27.0	QBT3	—	0.12
CALA-16-121932	01-61508	16.0–17.0	QBT3	—	0.149
CALA-16-121936	01-61508	19.0–20.0	QBT3	—	0.425
CALA-16-121940	01-61508	22.0–23.0	QBT3	—	0.108
CALA-16-121944	01-61508	25.0–26.0	QBT3	—	0.125
CALA-16-121933	01-61509	13.0–14.0	QBT3	—	0.115
CALA-16-121941	01-61509	19.0–20.0	QBT3	—	0.133
CALA-16-121945	01-61509	22.0–23.0	QBT3	—	0.14
CALA-16-121934	01-61510	21.5–22.5	QBT3	—	0.118
CALA-16-121942	01-61510	27.5–28.5	QBT3	—	0.116
CALA-16-121946	01-61510	30.5–31.5	QBT3	—	0.11

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

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

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

[c] na = Not available.

[d] SALs from LANL (2015, 600929).

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

Table 6.6-1
Samples Collected and Analyses Requested at SWMU 01-001(s1)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-08-16351	00-603899	1.25–2.25	QBT3	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464
RE00-08-16352	00-603899	3.25–4.25	QBT3	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464
RE00-08-16269	03-603871	1.5–2.5	QBT3	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465
RE00-08-16270	03-603871	3.5–4.5	QBT3	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465	09-465
CALA-16-124450	LA-61502	7.5–8.5	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134
CALA-16-124451	LA-61502	9.5–10.5	QBT3	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134	2016-2134

Note: Numbers in analyte columns are request numbers.

Table 6.6-2
Inorganic Chemicals above BVs at SWMU 01-001(s1)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Chromium	Copper	Cyanide (Total)	Lead	Mercury	Nickel	Nitrate	Selenium
Qbt 2,3,4 BV[a]				**0.5**	**7.14**	**4.66**	**0.5**	**11.2**	**0.1**	**6.58**	**na[b]**	**0.3**
Construction Worker SSL[c]				**142**	**134[d]**	**14,200**	**12.1**	**800**	**77.1**	**753**	**566,000**	**1750**
Industrial SSL[c]				**519**	**505[d]**	**51,900**	**64.4**	**800**	**389**	**25,700**	**2,080,000**	**6490**
Residential SSL[c]				**31.3**	**96.6[d]**	**3130**	**11.2**	**400**	**23.5**	**1560**	**125,000**	**391**
RE00-08-16351	00-603899	1.25–2.25	QBT3	—[e]	—	—	0.83 (J)	11.9 (J-)	—	—	—	—
RE00-08-16352	00-603899	3.25–4.25	QBT3	0.61 (U)	13.7 (J-)	—	—	—	—	—	0.36	0.61 (U)
RE00-08-16269	03-603871	1.5–2.5	QBT3	0.61 (U)	20.4 (J-)	—	0.84 (J)	15.7	—	10.7	0.29	0.61 (U)
RE00-08-16270	03-603871	3.5–4.5	QBT3	0.61 (U)	20.4 (J-)	—	—	—	—	9.3	—	—
CALA-16-124450	LA-61502	7.5–8.5	QBT3	1.06 (U)	—	—	—	—	—	—	0.832 (J)	0.823 (J)
CALA-16-124451	LA-61502	9.5–10.5	QBT3	1.06 (U)	—	6.52	—	—	0.109	—	0.815 (J)	0.873 (J)

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

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs from NMED (2015, 600915).

[d] SSLs for total chromium.

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

Table 6.6-3
Organic Chemicals Detected at SWMU 01-001(s1)

Sample ID	Location ID	Depth (ft)	Media	Butylbenzylphthalate	Methylene Chloride
Construction Worker SSL[a]				**54,500[b]**	**1210**
Industrial SSL[a]				**12,000[c]**	**5130**
Residential SSL[a]				**2900[c]**	**409**
RE00-08-16351	00-603899	1.25–2.25	QBT3	—[d]	0.0026 (J)
RE00-08-16352	00-603899	3.25–4.25	QBT3	—	0.0024 (J)
RE00-08-16269	03-603871	1.5–2.5	QBT3	0.09	0.0033 (J)
RE00-08-16270	03-603871	3.5–4.5	QBT3	—	0.0016 (J)

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

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915)

[c] SSLs from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

[d] — = Not detected.

Table 6.6-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-001(s1)

Sample ID	Location ID	Depth (ft)	Media	Plutonium-238	Plutonium-239/240	Tritium	Uranium-235/236
Qbt 2,3,4 BV[a]				**na[b]**	**na**	**na**	**0.09**
Construction Worker SAL[c]				**230**	**200**	**1,600,000**	**130**
Industrial SAL[c]				**1300**	**1200**	**2,400,000**	**160**
Residential SAL[c]				**84**	**79**	**1700**	**42**
RE00-08-16351	00-603899	1.25–2.25	QBT3	—[d]	—	—	0.167
RE00-08-16352	00-603899	3.25–4.25	QBT3	0.117	0.122	—	—
RE00-08-16269	03-603871	1.5–2.5	QBT3	—	—	0.94	—
CALA-16-124451	LA-61502	9.5–10.5	QBT3	—	0.03	—	—

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

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

[b] na = Not available.

[c] SALs from LANL (2015, 600929).

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

Table 6.7-1
Samples Collected and Analyses Requested at SWMU 01-002(a1)-00

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-08-16351	00-603899	1.25–2.25	QBT3	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464
RE00-08-16352	00-603899	3.25–4.25	QBT3	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464	09-464
RE00-08-16355	00-603901	17.5–19.0	QBT3	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874
RE00-08-16356	00-603901	20.0–21.0	QBT3	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874
RE00-09-204	00-604223	15.0–16.0	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-205	00-604223	17.0–18.0	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE01-12-828	00-604223	18.0–19.0	QBT3	—*	—	—	—	12-710	—	—	—	—	—	—	—	—
RE01-12-829	00-604223	19.0–20.0	QBT3	—	—	—	—	12-710	—	—	—	—	—	—	—	—

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

Table 6.7-2
Inorganic Chemicals above BVs at SWMU 01-002(a1)-00

Sample ID	Location ID	Depth (ft)	Media	Antimony	Chromium	Cyanide (Total)	Lead	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2,3,4 BV[a]				**0.5**	**7.14**	**0.5**	**11.2**	**6.58**	**na**[b]	**na**	**0.3**
Construction Worker SSL[c]				**142**	**134**[d]	**12.1**	**800**	**753**	**566,000**	**248**	**1750**
Industrial SSL[c]				**519**	**505**[d]	**64.4**	**800**	**25,700**	**2,080,000**	**908**	**6490**
Residential SSL[c]				**31.3**	**96.6**[d]	**11.2**	**400**	**1560**	**125,000**	**54.8**	**391**
RE00-08-16351	00-603899	1.25–2.25	QBT3	—[e]	—	0.83 (J)	11.9 (J-)	—	—	—	—
RE00-08-16352	00-603899	3.25–4.25	QBT3	0.61 (U)	13.7 (J-)	—	—	—	0.36	—	0.61 (U)
RE00-08-16355	00-603901	17.5–19.0	QBT3	—	—	0.54 (U)	—	—	2.5	0.0027 (J)	—
RE00-08-16356	00-603901	20.0–21.0	QBT3	—	—	0.53 (U)	—	—	3.8	—	—
RE00-09-204	00-604223	15.0–16.0	QBT3	0.54 (U)	—	0.54 (UJ)	—	—	4.9	—	0.54 (U)
RE00-09-205	00-604223	17.0–18.0	QBT3	—	29.9 (J-)	—	—	14	4.2	—	0.53 (U)

Notes: Results are in mg/kg. Data qualifiers are presented in Appendix A.
[a] BVs from LANL (1998, 059730).
[b] na = Not available.
[c] SSLs from NMED (2015, 600915).
[d] SSLs for total chromium.
[e] — = Not detected or not detected above BV.

Table 6.7-3
Organic Chemicals Detected at SWMU 01-002(a1)-00

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1260	Benzene	Bis(2-ethylhexyl)phthalate	Butylbenzene[tert-]	Dinitro-2-methylphenol[4,6-]	Isopropylbenzene	Methylene Chloride
Construction Worker SSL[a]				**85.3**	**142**	**5380**	**35,400[b]**	**21.5**	**2740**	**1210**
Industrial SSL[a]				**11.5**	**87.2**	**1830**	**120,000[c]**	**73.3**	**14,200**	**5130**
Residential SSL[a]				**2.43**	**17.8**	**380**	**7800[c]**	**4.93**	**2360**	**409**
RE00-08-16351	00-603899	1.25–2.25	QBT3	—[d]	—	—	—	—	—	0.0026 (J)
RE00-08-16352	00-603899	3.25–4.25	QBT3	—	—	—	—	—	—	0.0024 (J)
RE00-08-16355	00-603901	17.5–19.0	QBT3	—	—	—	—	—	0.00012 (J)	—
RE00-08-16356	00-603901	20.0–21.0	QBT3	—	0.0002 (J)	0.075 (J)	0.00015 (J)	—	—	—
RE00-09-204	00-604223	15.0–16.0	QBT3	0.0081 (J)	—	—	—	—	—	0.0064
RE00-09-205	00-604223	17.0–18.0	QBT3	—	—	—	—	0.41 (J)	—	—

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

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915)

[c] SSLs from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

[d] — = Not detected.

Table 6.7-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-002(a1)-00

Sample ID	Location ID	Depth (ft)	Media	Plutonium-238	Plutonium-239/240	Uranium-235/236
Qbt 2,3,4 BV[a]				**na[b]**	**na**	**0.09**
Construction Worker SAL[c]				**230**	**200**	**130**
Industrial SAL[c]				**1300**	**1200**	**160**
Residential SAL[c]				**84**	**79**	**42**
RE00-08-16351	00-603899	1.25–2.25	QBT3	—[d]	—	0.167
RE00-08-16352	00-603899	3.25–4.25	QBT3	0.117	0.122	—
RE00-09-204	00-604223	15.0–16.0	QBT3	—	0.476	—

Notes: Results are in mg/kg.

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

[b] na = Not available.

[c] SALs from LANL (2015, 600929).

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

Table 6.8-1
Samples Collected and Analyses Requested at AOC 01-003(b1)

Sample ID	Location ID	Depth (ft)	Media	Nitrate	Gamma-Emitting Radionuclides	Strontium-90	Tritium	Americium-241	Isotopic Plutonium	Isotopic Uranium	TAL Metals	Perchlorate	PCBs	VOCs	SVOCs	Cyanide (Total)
CALA-16-121915	01-61501	0.0−1.0	SOIL	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401
CALA-16-121916	01-61501	1.0−2.0	SOIL	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401
CALA-16-121917	01-61501	2.0−3.0	SOIL	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401
CALA-16-121918	01-61501	3.0−4.0	SOIL	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401	2016-1401
CALA-16-121919	01-61502	0.0−1.0	SOIL	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419
CALA-16-121920	01-61502	1.0−2.0	SOIL	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419
CALA-16-121921	01-61502	2.0−3.0	SOIL	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419
CALA-16-121922	01-61502	3.0−4.0	SOIL	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419	2016-1419
CALA-16-125043	01-61502	4.0−5.0	QBT3	—*	—	—	—	—	2016-2202	—	—	—	—	—	—	—
CALA-16-125044	01-61502	5.0−6.0	QBT3	—	—	—	—	—	2016-2202	—	—	—	—	—	—	—
CALA-16-125045	01-61502	6.0−7.0	QBT3	—	—	—	—	—	2016-2202	—	—	—	—	—	—	—

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

Table 6.8-2
Inorganic Chemicals above BVs at AOC 01-003(b1)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Cadmium	Calcium	Copper	Lead	Mercury	Nitrate	Perchlorate	Zinc
Soil BV[a]				**0.83**	**0.4**	**6120**	**14.7**	**22.3**	**0.1**	**na[b]**	**na**	**48.8**
Construction Worker SSL[c]				**142**	**72.1**	**8,850,000**	**14,200**	**800**	**77.1**	**566,000**	**248**	**106,000**
Industrial SSL[c]				**519**	**1110**	**32,400,000**	**51,900**	**800**	**389**	**2,080,000**	**908**	**389,000**
Residential SSL[c]				**31.3**	**70.5**	**13,000,000**	**3130**	**400**	**23.5**	**125,000**	**54.8**	**23,500**
CALA-16-121915	01-61501	0.0−1.0	SOIL	1.04 (U)	—[d]	—	—	—	—	1.54	0.00168 (J)	—
CALA-16-121916	01-61501	1.0−2.0	SOIL	1.03 (U)	0.539 (U)	—	—	—	—	0.472 (J)	0.00111 (J)	—
CALA-16-121917	01-61501	2.0−3.0	SOIL	—	0.518 (U)	—	—	147	—	—	0.0012 (J)	108
CALA-16-121918	01-61501	3.0−4.0	SOIL	1.14 (U)	0.531 (U)	—	—	—	—	—	—	—
CALA-16-121919	01-61502	0.0−1.0	SOIL	1.03 (U)	0.517 (U)	8790 (J-)	18.2 (J)	—	—	0.362 (J)	—	—
CALA-16-121920	01-61502	1.0−2.0	SOIL	1.05 (U)	0.523 (U)	—	—	—	—	0.425 (J)	—	—
CALA-16-121921	01-61502	2.0−3.0	SOIL	1.09 (U)	0.545 (U)	—	—	26.6	0.378	—	—	52.2
CALA-16-121922	01-61502	3.0−4.0	SOIL	1.1 (U)	0.548 (U)	—	—	23.8	—	—	—	53.2

Notes: Results are in mg/kg. Data qualifiers are presented in Appendix A.
[a] BVs from LANL (1998, 059730).
[b] na = Not available.
[c] SSLs from NMED (2015, 600915).
[d] — = Not detected or not detected above BV.

Table 6.8-3
Organic Chemicals Detected at AOC 01-003(b1)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Aroclor-1254	Aroclor-1260	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
Construction Worker SSL[a]				**242,000**	**4.91**	**85.3**	**240**	**24**	**240**	**7530**	**2310**	**23,100**	**10,000**	**240**	**7530**	**7530**
Industrial SSL[a]				**960,000**	**11.5**	**11.5**	**32.3**	**3.23**	**32.3**	**25,300**	**323**	**3230**	**33,700**	**32.3**	**25,300**	**25,300**
Residential SSL[a]				**66,300**	**1.14**	**2.43**	**1.53**	**0.153**	**1.53**	**1740**	**15.3**	**153**	**2320**	**1.53**	**1740**	**1740**
CALA-16-121915	01-61501	0.0−1.0	SOIL	—[b]	—	0.00703	0.0145 (J)	0.0152 (J)	0.0195 (J)	0.0113 (J)	—	0.012 (J)	0.0223 (J)	—	—	0.0145 (J)
CALA-16-121916	01-61501	1.0−2.0	SOIL	—	—	0.00707	0.0136 (J)	0.0136 (J)	0.0158 (J)	—	—	—	0.0168 (J)	—	—	0.0147 (J)
CALA-16-121917	01-61501	2.0−3.0	SOIL	0.00206 (J)	—	0.0196	0.0395	0.0399	0.049	0.0236 (J)	0.0185 (J)	0.0417	0.0657	0.0218 (J)	0.0381	0.0686
CALA-16-121918	01-61501	3.0−4.0	SOIL	—	—	0.00412	—	—	—	—	—	—	—	—	—	—
CALA-16-121919	01-61502	0.0−1.0	SOIL	—	—	0.00673	0.0196 (J)	0.0179 (J)	0.0298 (J)	0.0179 (J)	0.0133 (J)	0.0165 (J)	0.0238 (J)	—	—	0.0182 (J)
CALA-16-121920	01-61502	1.0−2.0	SOIL	—	—	0.00267 (J)	0.0151 (J)	0.0176 (J)	0.0161 (J)	—	—	0.0129 (J)	0.0187 (J)	—	0.0133 (J)	0.0183 (J)
CALA-16-121921	01-61502	2.0−3.0	SOIL	—	—	0.00257 (J)	—	—	0.0451 (J)	—	—	—	0.048 (J)	—	—	—
CALA-16-121922	01-61502	3.0−4.0	SOIL	—	0.0296	0.0236	0.023 (J)	0.0205 (J)	0.0249 (J)	0.0121 (J)	—	0.0186 (J)	0.0365	—	—	0.0311 (J)

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

[a] SSLs from NMED (2015, 600915).

[b] — = Not detected.

Table 6.8-4
Radionuclides Detected or Detected above BVs/FVs at AOC 01-003(b1)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Plutonium-239/240
Qbt 2,3,4 BV[a]				**na**[b]	**na**	**na**
Soil BV[a]				**0.013**[c]	**1.65**[c]	**0.054**[c]
Construction Worker SAL[d]				**230**	**37**	**200**
Industrial SAL[d]				**1000**	**41**	**1200**
Residential SAL[d]				**83**	**12**	**79**
CALA-16-121915	01-61501	0.0−1.0	SOIL	—[e]	—	1.15
CALA-16-121916	01-61501	1.0−2.0	SOIL	0.0627 (J-)	0.121	1.43
CALA-16-121917	01-61501	2.0−3.0	SOIL	0.0565 (J-)	—	2.28
CALA-16-121918	01-61501	3.0−4.0	SOIL	—	—	0.501
CALA-16-121919	01-61502	0.0−1.0	SOIL	0.0291	—	1.11
CALA-16-121920	01-61502	1.0−2.0	SOIL	0.0189	—	12
CALA-16-121921	01-61502	2.0−3.0	SOIL	—	—	1.1
CALA-16-121922	01-61502	3.0−4.0	SOIL	0.384	—	21.5 (J+)
CALA-16-125043	01-61502	4.0−5.0	QBT3	NA[f]	NA	2.83 (J)
CALA-16-125044	01-61502	5.0−6.0	QBT3	NA	NA	1.11
CALA-16-125045	01-61502	6.0−7.0	QBT3	NA	NA	0.159

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

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

[b] na = Not available.

[c] FV applies to soil samples collected from 0–1 ft only.

[d] SALs from LANL (2015, 600929).

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

[f] NA = Not analyzed.

Table 6.9-1
Samples Collected and Analyses Requested at SWMU 01-006(b)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-09-204	00-604223	15.0–16.0	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-205	00-604223	17.0–18.0	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE01-12-828	00-604223	18.0–19.0	QBT3	—*	—	—	—	12-710	—	—	—	—	—	—	—	—
RE01-12-829	00-604223	19.0–20.0	QBT3	—	—	—	—	12-710	—	—	—	—	—	—	—	—
RE01-12-832	00-604225	4.0–5.0	QBT3	12-656	—	—	—	12-656	—	—	—	—	—	—	—	—
RE01-12-833	00-604225	6.0–7.0	QBT3	12-656	—	—	—	12-656	—	—	—	—	—	—	—	—
RE00-09-210	00-604226	0.0–1.0	SOIL	09-398	09-397	09-398	09-398	09-398	09-398	09-397	09-396	09-397	09-398	09-396	09-396	09-397
RE00-09-211	00-604226	1.25–2.25	QBT3	09-398	09-397	09-398	09-398	09-398	09-398	09-397	09-396	09-397	09-398	09-396	09-396	09-397
RE01-12-836	00-604226	7.0–8.0	QBT3	—	—	—	—	12-656	—	—	—	—	—	—	—	—
RE01-12-837	00-604226	9.0–10.0	QBT3	—	—	—	—	12-656	—	—	—	—	—	—	—	—
RE01-12-830	00-604237	6.0–7.0	QBT3	12-717	—	—	—	12-717	—	—	—	—	—	—	—	—
RE01-12-831	00-604237	8.0–9.0	QBT3	12-717	—	—	—	12-717	—	—	—	—	—	—	—	—
RELA-16-106188	01-14	10.0–11.0	QBT3	—	—	—	—	2016-170	—	—	—	—	—	—	—	—
RELA-16-106189	01-14	12.0–13.0	QBT3	—	—	—	—	2016-170	—	—	—	—	—	—	—	—
RELA-16-106190	01-14	14.0–15.0	QBT3	—	—	—	—	2016-170	—	—	—	—	—	—	—	—
RE01-12-10080	01-15	0.0–1.0	SOIL	—	—	—	—	12-1008	—	—	—	—	—	—	—	—
RE01-12-10081	01-15	4.0–5.0	QBT3	—	—	—	—	12-1008	—	—	—	—	—	—	—	—
RE01-12-10082	01-16	0.0–1.0	SOIL	—	—	—	—	12-1008	—	—	—	—	—	—	—	—
RE01-12-10083	01-16	4.0–5.0	QBT3	—	—	—	—	12-1008	—	—	—	—	—	—	—	—
RE01-12-10084	01-17	0.0–1.0	SOIL	—	—	—	—	12-1008	—	—	—	—	—	—	—	—
RE01-12-10085	01-17	4.0–5.0	SOIL	—	—	—	—	12-1008	—	—	—	—	—	—	—	—
RE01-12-10086	01-18	0.0–1.0	SOIL	—	—	—	—	12-1013	—	—	—	—	—	—	—	—
RE01-12-10087	01-18	4.0–5.0	QBT3	—	—	—	—	12-1013	—	—	—	—	—	—	—	—
RE01-12-10088	01-18	6.0–7.0	QBT3	—	—	—	—	12-1013	—	—	—	—	—	—	—	—
RE01-12-10089	01-19	0.0–1.0	SOIL	—	—	—	—	12-1008	—	—	—	—	—	—	—	—
RE01-12-10090	01-19	4.0–5.0	QBT3	—	—	—	—	12-1008	—	—	—	—	—	—	—	—
RE01-12-10091	01-19	6.0–7.0	QBT3	—	—	—	—	12-1013	—	—	—	—	—	—	—	—
RE01-12-10092	01-20	0.0–1.0	SOIL	—	—	—	—	12-1013	—	—	—	—	—	—	—	—
RE01-12-10093	01-20	4.0–5.0	QBT3	—	—	—	—	12-1013	—	—	—	—	—	—	—	—
RE01-12-10094	01-20	6.0–7.0	QBT3	—	—	—	—	12-1013	—	—	—	—	—	—	—	—
RE01-12-838	01-614801	0.0–1.0	SOIL	12-618	—	—	—	12-618	—	—	—	—	—	—	—	—
RE01-12-839	01-614801	4.0–5.0	QBT3	12-618	—	—	—	12-618	—	—	—	—	—	—	—	—

Table 6.9-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE01-12-840	01-614801	6.0–7.0	QBT3	12-618	—	—	—	12-618	—	—	—	—	—	—	—	—
RE01-12-841	01-614802	0.0–1.0	SOIL	12-527	—	—	—	12-527	—	—	—	—	—	—	—	—
RE01-12-842	01-614802	4.0–5.0	QBT3	12-527	—	—	—	12-527	—	—	—	—	—	—	—	—
RE01-12-843	01-614802	6.0–7.0	QBT3	12-527	—	—	—	12-527	—	—	—	—	—	—	—	—
RE01-12-844	01-614803	0.0–1.0	SOIL	12-558	—	—	—	12-558	—	—	—	—	—	—	—	—
RE01-12-845	01-614803	4.0–5.0	QBT3	12-558	—	—	—	12-558	—	—	—	—	—	—	—	—
RE01-12-846	01-614803	6.0–7.0	QBT3	12-558	—	—	—	12-558	—	—	—	—	—	—	—	—
RE01-13-38454	01-201	0.0–1.0	SOIL	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38461	01-201	3.0–4.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38468	01-201	5.0–6.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38475	01-201	7.0–8.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38482	01-201	9.0–10.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38455	01-202	0.0–1.0	SOIL	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38462	01-202	3.0–4.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38469	01-202	5.0–6.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38476	01-202	7.0–8.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38483	01-202	9.0–10.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38456	01-203	0.0–1.0	SOIL	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38463	01-203	3.0–4.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38470	01-203	5.0–6.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38477	01-203	7.0–8.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38484	01-203	9.0–10.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38471	01-204	5.0–6.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38478	01-204	7.0–8.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38485	01-204	9.0–10.0	QBT3	—	—	—	—	2013-1723	—	—	—	—	—	—	—	—
RE01-13-38458	01-205	0.0–1.0	SOIL	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38465	01-205	3.0–4.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38472	01-205	5.0–6.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38479	01-205	7.0–8.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38486	01-205	9.0–10.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38459	01-206	0.0–1.0	SOIL	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—

Table 6.9-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE01-13-38466	01-206	3.0–4.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38473	01-206	5.0–6.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38480	01-206	7.0–8.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38487	01-206	9.0–10.0	QBT3	—	—	—	—	2013-1741	—	—	—	—	—	—	—	—
RE01-13-38460	01-207	0.0–1.0	SOIL	—	—	—	—	2013-1820	—	—	—	—	—	—	—	—
RE01-13-38467	01-207	3.0–4.0	QBT3	—	—	—	—	2013-1820	—	—	—	—	—	—	—	—
RE01-13-38474	01-207	5.0–6.0	QBT3	—	—	—	—	2013-1820	—	—	—	—	—	—	—	—
RE01-13-38481	01-207	7.0–8.0	QBT3	—	—	—	—	2013-1820	—	—	—	—	—	—	—	—
RE01-13-38488	01-207	9.0–10.0	QBT3	—	—	—	—	2013-1820	—	—	—	—	—	—	—	—
RELA-16-106191	01-208	10.0–11.0	QBT3	—	—	—	—	2016-197	—	—	—	—	—	—	—	—
RELA-16-106192	01-208	12.0–13.0	QBT3	—	—	—	—	2016-197	—	—	—	—	—	—	—	—
RELA-16-106193	01-208	14.0–15.0	QBT3	—	—	—	—	2016-197	—	—	—	—	—	—	—	—
RELA-16-106194	01-254	0.0–1.0	SOIL	—	—	—	—	2016-170	—	—	—	—	—	—	—	—
RELA-16-106195	01-254	3.0–4.0	QBT3	—	—	—	—	2016-170	—	—	—	—	—	—	—	—
RELA-16-106196	01-254	5.0–6.0	QBT3	—	—	—	—	2016-170	—	—	—	—	—	—	—	—
RELA-16-106197	01-254	7.0–8.0	QBT3	—	—	—	—	2016-170	—	—	—	—	—	—	—	—
RELA-16-106198	01-254	9.0–10.0	QBT3	—	—	—	—	2016-170	—	—	—	—	—	—	—	—
CALA-16-124459	LA-61504	10.5–11.5	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177
CALA-16-124460	LA-61504	12.5–13.5	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177
CALA-16-124461	LA-61504	14.5–15.5	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177

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

Table 6.9-2
Inorganic Chemicals above BVs at SWMU 01-006(b)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Barium	Beryllium	Chromium	Copper	Cyanide (Total)	Lead	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2,3,4 BV[a]				**0.5**	**46**	**1.21**	**7.14**	**4.66**	**0.5**	**11.2**	**6.58**	**na[b]**	**na**	**0.3**
Soil BV[a]				**0.83**	**295**	**1.83**	**19.3**	**14.7**	**0.5**	**22.3**	**15.4**	**na**	**na**	**1.52**
Construction Worker SSL[c]				**142**	**4390**	**148**	**134[d]**	**14,200**	**12.1**	**800**	**753**	**566,000**	**248**	**1750**
Industrial SSL[c]				**519**	**25,500**	**2580**	**505[d]**	**51,900**	**64.4**	**800**	**25,700**	**2,080,000**	**908**	**6490**
Residential SSL[c]				**31.3**	**15,600**	**156**	**96.6[d]**	**3130**	**11.2**	**400**	**1560**	**125,000**	**54.8**	**391**
RE00-09-204	00-604223	15.0–16.0	QBT3	0.54 (U)	—[e]	—	—	—	0.54 (UJ)	—	—	4.9	—	0.54 (U)
RE00-09-205	00-604223	17.0–18.0	QBT3	—	—	—	29.9 (J-)	—	—	—	14	4.2	—	0.53 (U)
RE00-09-210	00-604226	0.0–1.0	SOIL	—	—	—	—	—	—	—	—	0.16 (J)	—	—
RE00-09-211	00-604226	1.25–2.25	QBT3	—	—	—	—	4.7	0.62	21.2	8.4 (J)	0.14 (J)	—	0.51 (U)
CALA-16-124459	LA-61504	10.5–11.5	QBT3	0.984 (U)	—	1.25	—	—	—	—	—	0.938 (J)	—	1.44 (J-)
CALA-16-124460	LA-61504	12.5–13.5	QBT3	1.04 (U)	102	1.61	—	—	—	—	8.09	0.707 (J)	0.00101 (J)	1.16
CALA-16-124461	LA-61504	14.5–15.5	QBT3	0.976 (U)	—	—	—	—	—	—	—	0.597 (J)	—	1.14

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

[a] BVs from LANL (1998, 059730).
[b] na = Not available.
[c] SSLs from NMED (2015, 600915).
[d] SSLs for total chromium.
[e] — = Not detected or not detected above BV.

Table 6.9-3
Organic Chemicals Detected at SWMU 01-006(b)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Chrysene	Dinitro-2-methylphenol[4,6-]	Fluoranthene	Methylene Chloride	Phenanthrene	Pyrene
Construction Worker SSL[a]				**4.91**	**85.3**	**240**	**24**	**240**	**2310**	**5380**	**23,100**	**21.5**	**10,000**	**1210**	**7530**	**7530**
Industrial SSL[a]				**11.5**	**11.5**	**32.3**	**3.23**	**32.3**	**323**	**1830**	**3230**	**73.3**	**33,700**	**5130**	**25,300**	**25,300**
Residential SSL[a]				**1.14**	**2.43**	**1.53**	**0.153**	**1.53**	**15.3**	**380**	**153**	**4.93**	**2320**	**409**	**1740**	**1740**
RE00-09-204	00-604223	15.0–16.0	QBT3	—[b]	0.0081 (J)	—	—	—	—	—	—	—	—	0.0064	—	—
RE00-09-205	00-604223	17.0–18.0	QBT3	—	—	—	—	—	—	—	—	0.41 (J)	—	—	—	—
RE00-09-210	00-604226	0.0–1.0	SOIL	0.037 (J)	0.033 (J)	0.038 (J)	0.045 (J)	0.058 (J)	0.052 (J)	—	0.051 (J)	—	0.092 (J)	—	0.047 (J)	0.069 (J)
RE00-09-211	00-604226	1.25–2.25	QBT3	—	0.0062 (J)	—	—	—	—	—	—	—	—	—	—	—
CALA-16-124459	LA-61504	10.5–11.5	QBT3	—	—	—	—	—	—	0.391	—	—	—	—	—	—
CALA-16-124460	LA-61504	12.5–13.5	QBT3	—	—	—	—	—	—	0.321 (J)	—	—	—	—	—	—
CALA-16-124461	LA-61504	14.5–15.5	QBT3	—	—	—	—	—	—	0.401	—	—	—	—	—	—

Notes: Results are in mg/kg. Data qualifiers are presented in Appendix A.
[a] SSLs from NMED (2015, 600915).
[b] — = Not detected.

Table 6.9-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-006(b)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239/240
Qbt 2,3,4 BV[a]				**na**[b]	**na**	**na**
Soil BV[a]				**0.013**[c]	**0.023**[c]	**0.054**[c]
Construction Worker SAL[d]				**230**	**230**	**200**
Industrial SAL[d]				**1000**	**1300**	**1200**
Residential SAL[d]				**83**	**84**	**79**
RE00-09-204	00-604223	15.0–16.0	QBT3	—[e]	—	0.476
RE01-12-832	00-604225	4.0–5.0	QBT3	—	—	0.222
RE01-12-833	00-604225	6.0–7.0	QBT3	—	—	0.36
RE00-09-210	00-604226	0.0–1.0	SOIL	0.116	—	4.49
RE00-09-211	00-604226	1.25–2.25	QBT3	—	—	4.44
RE01-12-836	00-604226	7.0–8.0	QBT3	NA[f]	—	0.643
RE01-12-837	00-604226	9.0–10.0	QBT3	NA	—	1.97
RE01-12-830	00-604237	6.0–7.0	QBT3	—	—	0.079
RE01-12-831	00-604237	8.0–9.0	QBT3	—	—	1.08
RELA-16-106188	01-14	10.0–11.0	QBT3	NA	0.0886	23.9
RELA-16-106189	01-14	12.0–13.0	QBT3	NA	—	33.4
RELA-16-106190	01-14	14.0–15.0	QBT3	NA	0.0419	12.6
RE01-12-10080	01-15	0.0–1.0	SOIL	NA	—	3.33
RE01-12-10081	01-15	4.0–5.0	QBT3	NA	—	0.491
RE01-12-10082	01-16	0.0–1.0	SOIL	NA	—	2.97
RE01-12-10083	01-16	4.0–5.0	QBT3	NA	—	0.269
RE01-12-10084	01-17	0.0–1.0	SOIL	NA	—	6.83
RE01-12-10085	01-17	4.0–5.0	SOIL	NA	—	0.523
RE01-12-10086	01-18	0.0–1.0	SOIL	NA	—	0.416
RE01-12-10087	01-18	4.0–5.0	QBT3	NA	—	0.933
RE01-12-10088	01-18	6.0–7.0	QBT3	NA	—	0.383
RE01-12-10089	01-19	0.0–1.0	SOIL	NA	—	0.793
RE01-12-10090	01-19	4.0–5.0	QBT3	NA	—	0.488
RE01-12-10091	01-19	6.0–7.0	QBT3	NA	—	0.233
RE01-12-10092	01-20	0.0–1.0	SOIL	NA	—	0.413
RE01-12-10093	01-20	4.0–5.0	QBT3	NA	—	2.98
RE01-12-10094	01-20	6.0–7.0	QBT3	NA	—	0.265
RE01-12-838	01-614801	0.0–1.0	SOIL	0.0221	—	0.934
RE01-12-839	01-614801	4.0–5.0	QBT3	—	—	1.67

Table 6.9-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239/240
Qbt 2,3,4 BV[a]				**na**[b]	**na**	**na**
Soil BV[a]				**0.013**[c]	**0.023**[c]	**0.054**[c]
Construction Worker SAL[c]				**230**	**230**	**200**
Industrial SAL[c]				**1000**	**1300**	**1200**
Residential SAL[c]				**83**	**84**	**79**
RE01-12-840	01-614801	6.0–7.0	QBT3	—	—	0.351
RE01-12-841	01-614802	0.0–1.0	SOIL	—	—	0.787
RE01-12-844	01-614803	0.0–1.0	SOIL	0.0549	—	4.17
RE01-12-845	01-614803	4.0–5.0	QBT3	—	—	0.219
RE01-12-846	01-614803	6.0–7.0	QBT3	—	—	0.118
RE01-13-38454	01-201	0.0–1.0	SOIL	NA	—	0.515 (J)
RE01-13-38461	01-201	3.0–4.0	QBT3	NA	0.0433	12.4
RE01-13-38468	01-201	5.0–6.0	QBT3	NA	0.0201	5.71
RE01-13-38475	01-201	7.0–8.0	QBT3	NA	0.063	24.3
RE01-13-38482	01-201	9.0–10.0	QBT3	NA	0.0389	9.94
RE01-13-38455	01-202	0.0–1.0	SOIL	NA	0.0337	9.37 (J)
RE01-13-38462	01-202	3.0–4.0	QBT3	NA	—	0.324
RE01-13-38469	01-202	5.0–6.0	QBT3	NA	—	0.549
RE01-13-38476	01-202	7.0–8.0	QBT3	NA	—	0.587
RE01-13-38483	01-202	9.0–10.0	QBT3	NA	—	0.456
RE01-13-38456	01-203	0.0–1.0	SOIL	NA	0.0275	8.59
RE01-13-38463	01-203	3.0–4.0	QBT3	NA	—	2.43
RE01-13-38470	01-203	5.0–6.0	QBT3	NA	—	5.43
RE01-13-38477	01-203	7.0–8.0	QBT3	NA	—	2.51
RE01-13-38484	01-203	9.0–10.0	QBT3	NA	—	1.45
RE01-13-38471	01-204	5.0–6.0	QBT3	NA	—	0.103
RE01-13-38478	01-204	7.0–8.0	QBT3	NA	—	0.266
RE01-13-38485	01-204	9.0–10.0	QBT3	NA	—	0.0612
RE01-13-38458	01-205	0.0–1.0	SOIL	NA	0.0404	10.4
RE01-13-38465	01-205	3.0–4.0	QBT3	NA	—	0.269
RE01-13-38472	01-205	5.0–6.0	QBT3	NA	—	1.95
RE01-13-38479	01-205	7.0–8.0	QBT3	NA	—	3.32
RE01-13-38486	01-205	9.0–10.0	QBT3	NA	—	7.11

Table 6.9-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239/240
Qbt 2,3,4 BV[a]				**na**[b]	**na**	**na**
Soil BV[a]				**0.013**[c]	**0.023**[c]	**0.054**[c]
Construction Worker SAL[c]				**230**	**230**	**200**
Industrial SAL[c]				**1000**	**1300**	**1200**
Residential SAL[c]				**83**	**84**	**79**
RE01-13-38459	01-206	0.0–1.0	SOIL	NA	—	3.86
RE01-13-38466	01-206	3.0–4.0	QBT3	NA	—	0.0618
RE01-13-38473	01-206	5.0–6.0	QBT3	NA	—	0.0583
RE01-13-38460	01-207	0.0–1.0	SOIL	NA	—	1.59 (J)
RE01-13-38467	01-207	3.0–4.0	QBT3	NA	—	5.09
RE01-13-38474	01-207	5.0–6.0	QBT3	NA	—	0.186
RE01-13-38481	01-207	7.0–8.0	QBT3	NA	—	0.0683
RE01-13-38488	01-207	9.0–10.0	QBT3	NA	—	0.114
RELA-16-106191	01-208	10.0–11.0	QBT3	NA	0.381	138
RELA-16-106192	01-208	12.0–13.0	QBT3	NA	0.0682	17.9
RELA-16-106193	01-208	14.0–15.0	QBT3	NA	—	8.24
RELA-16-106194	01-254	0.0–1.0	SOIL	NA	0.0684	24.4
RELA-16-106195	01-254	3.0–4.0	QBT3	NA	—	2.14
RELA-16-106196	01-254	5.0–6.0	QBT3	NA	—	0.94
RELA-16-106197	01-254	7.0–8.0	QBT3	NA	—	0.761
RELA-16-106198	01-254	9.0–10.0	QBT3	NA	—	0.46

Notes: Results are in pCi/g. Data qualifiers are presented in Appendix A.

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

[b] na = Not available.

[c] FV applies to soil samples collected from 0–1 ft only.

[d] SALs from LANL (2015, 600929).

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

[f] NA = Not analyzed.

Table 6.10-1
Samples Collected and Analyses Requested at SWMU 01-006(c)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-08-15731	00-603783	0.0–1.0	Fill	09-364	09-362	09-364	09-364	09-364	09-364	09-362	09-363	09-362	09-364	09-363	09-363	09-362
RE00-08-15732	00-603783	2.75–4.0	QBT3	09-364	09-362	09-364	09-364	09-364	09-364	09-362	09-363	09-362	09-364	09-363	09-363	09-362
RE01-12-584	00-603783	5.0-6.0	QBT3	—[a]	—	—	—	12-620	—	12-620[b]	—	—	—	12-620	12-620[c]	—
RE01-12585	00-603783	7.0-8.0	QBT3	—	—	—	—	12-620	—	12-620[b]	—	—	—	12-620	12-620[c]	—

Note: Numbers in analyte columns are request numbers.

[a] — = Analysis not requested.

[b] Analyzed for chromium and nickel.

[c] Analyzed for methylene chloride.

Table 6.10-2
Inorganic Chemicals above BVs at SWMU 01-006(c)

Sample ID	Location ID	Dept (ft)	Media	Barium	Chromium	Cobalt	Cyanide (Total)	Lead	Manganese	Nickel	Nitrate	Perchlorate	Selenium	Thallium	Zinc
Qbt 2,3,4 BV[a]				**46**	**7.14**	**3.14**	**0.5**	**11.2**	**482**	**6.58**	**na[b]**	**na**	**0.3**	**1.1**	**63.5**
Soil BV[a]				**295**	**19.3**	**8.64**	**0.5**	**22.3**	**671**	**15.4**	**na**	**na**	**1.52**	**0.73**	**48.8**
Construction Worker SSL[c]				**4390**	**134[d]**	**36.6[e]**	**12.1**	**800**	**464**	**753**	**566,000**	**248**	**1750**	**3.54**	**106,000**
Industrial SSL[c]				**25,500**	**505[d]**	**350[f]**	**64.4**	**800**	**160,000**	**25,700**	**2,080,000**	**908**	**6490**	**13**	**389,000**
Residential SSL[c]				**15,600**	**96.6[d]**	**23[f]**	**11.2**	**400**	**10,500**	**1560**	**125,000**	**54.8**	**391**	**0.782**	**23,500**
RE00-08-15731	00-603783	0.0–1.0	Fill	—[g]	—	8.8	0.52 (UJ)	67.9 (J-)	764 (J-)	—	—	—	2.6 (U)	1 (U)	76.7
RE00-08-15732	00-603783	2.75–4.0	QBT3	82.1	29.2	—	0.53 (UJ)	—	—	15.8	0.34	0.0025 (J)	0.53 (U)	—	—

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

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs from NMED (2015, 600915) unless otherwise noted.

[d] SSLs for total chromium.

[e] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915).

[f] SSLs from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

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

Table 6.10-3
Organic Chemicals Detected at SWMU 01-006(c)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenzofuran	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Methylene Chloride	Methylnaphthalene[2-]	Naphthalene	Phenanthrene	Pyrene
Construction Worker SSL[a]				**15,100**	**75,300**	**240**	**24**	**240**	**7530[b]**	**2310**	**23,100**	**354[c]**	**10,000**	**10,000**	**240**	**1210**	**1420[c]**	**159**	**7530**	**7530**
Industrial SSL[a]				**50,500**	**253,000**	**32.3**	**3.23**	**32.3**	**25,300[b]**	**323**	**3230**	**1000[d]**	**33,700**	**33,700**	**32.3**	**5130**	**3000[d]**	**241**	**25,300**	**25,300**
Residential SSL[a]				**3480**	**17,400**	**1.53**	**0.153**	**1.53**	**1740[b]**	**15.3**	**153**	**73[d]**	**2320**	**2320**	**1.53**	**409**	**240[d]**	**49.7**	**1740**	**1740**
RE00-08-15731	00-603783	0.0–1.0	Fill	—[e]	0.037 (J)	0.046 (J)	0.037 (J)	—	—	0.041 (J)	0.053 (J)	—	0.1 (J)	—	—	—	—	—	0.12 (J)	0.093 (J)
RE00-08-15732	00-603783	2.75–4.0	QBT3	0.28 (J)	0.47	0.41	0.37	0.29 (J)	0.13 (J)	0.35	0.45	0.14 (J)	0.95	0.25 (J)	0.11 (J)	0.00088 (J)	0.045 (J)	0.11 (J)	1.4	0.89

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

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Pyrene used as surrogate based on structural similarity.

[c] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915)

[d] SSLs from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

[e] — = Not detected.

Table 6.10-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-006(c)

Sample ID	Location ID	Depth (ft)	Media	Plutonium-239/240
Qbt 2,3,4 BV[a]				**na[b]**
Soil BV[a]				**0.054[c]**
Construction Worker SAL[d]				**200**
Industrial SAL[d]				**1200**
Residential SAL[d]				**79**
RE00-08-15731	00-603783	0.0–1.0	Fill	0.492
RE00-08-15732	00-603783	2.75–4.0	QBT3	0.679
RE01-12-584	00-603783	5.0-6.0	QBT3	0.174
RE01-12-585	00-603783	7.0-8.0	QBT3	0.0632

Note: Results are in pCi/g.

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

[b] na = Not available.

[c] FV applies to soil samples collected from 0–1 ft only.

[d] SALs from LANL (2015, 600929).

Table 6.11-1
Samples Collected and Analyses Requested at SWMU 01-006(h1)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
CALA-16-121949	01-61511	16.0–17.0	QBT3	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166
CALA-16-121950	01-61511	19.0–20.0	QBT3	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166
CALA-16-121951	01-61511	22.0–23.0	QBT3	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166
CALA-16-121952	01-61511	25.0–26.0	QBT3	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166
CALA-16-121953	01-61512	11.0–12.0	QBT3	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166
CALA-16-121954	01-61512	14.0–15.0	QBT3	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166
CALA-16-121955	01-61512	17.0–18.0	QBT3	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166
CALA-16-121956	01-61512	20.0–21.0	QBT3	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166	2016-2166

Note: Numbers in analyte columns are request numbers.

Table 6.11-2
Inorganic Chemicals above BVs at SWMU 01-006(h1)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Calcium	Cobalt	Lead	Magnesium	Nickel	Nitrate	Selenium
Qbt 2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**2200**	**3.14**	**11.2**	**1690**	**6.58**	**na[b]**	**0.3**
Construction Worker SSL[c]				**41,400**	**142**	**57.4**	**4390**	**148**	**8,850,000**	**36.6[d]**	**800**	**1,550,000**	**753**	**566,000**	**1750**
Industrial SSL[c]				**1,290,000**	**519**	**21.5**	**255,000**	**2580**	**32,400,000**	**350[e]**	**800**	**5,680,000**	**25,700**	**20,80,000**	**6490**
Residential SSL[c]				**78,000**	**31.3**	**4.25**	**15,600**	**156**	**13,000,000**	**23[e]**	**400**	**339,000**	**1560**	**125,000**	**391**
CALA-16-121949	01-61511	16.0–17.0	QBT3	8100 (J+)	1.09 (U)	2.92	101 (J-)	1.56	2460 (J-)	3.61 (J)	15.7	1880 (J+)	10 (J-)	—[f]	1.45 (J-)
CALA-16-121950	01-61511	19.0–20.0	QBT3	—	1.08 (U)	—	—	—	—	—	—	—	—	—	1.71
CALA-16-121951	01-61511	22.0–23.0	QBT3	—	1.02 (U)	—	53.7	—	—	—	—	—	—	—	1.82
CALA-16-121952	01-61511	25.0–26.0	QBT3	—	0.914 (U)	—	—	—	—	—	—	—	—	0.501 (J)	1.66
CALA-16-121953	01-61512	11.0–12.0	QBT3	—	0.99 (U)	—	—	—	—	—	—	—	—	—	1.78
CALA-16-121954	01-61512	14.0–15.0	QBT3	—	0.926 (U)	—	—	—	—	—	—	—	—	0.505 (J)	1.99
CALA-16-121955	01-61512	17.0–18.0	QBT3	—	0.95 (U)	—	—	—	—	—	—	—	—	0.584 (J)	1.59
CALA-16-121956	01-61512	20.0–21.0	QBT3	—	0.982 (U)	—	—	—	—	—	—	—	—	0.607 (J)	2.05

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

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs from NMED (2015, 600915) unless otherwise noted.

[d] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915)

[e] SSLs from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

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

Table 6.11-3
Organic Chemicals Detected at SWMU 01-006(h1)

Sample ID	Location ID	Depth (ft)	Media	Bis(2-ethylhexyl)phthalate
Construction Worker SSL*				**5380**
Industrial SSL*				**1830**
Residential SSL*				**380**
CALA-16-121950	01-61511	19.0−20.0	QBT3	0.127 (J)

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

* SSLs from NMED (2015, 600915).

Table 6.11-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-006(h1)

Sample ID	Location ID	Depth (ft)	Media	Uranium-235/236
Qbt 2,3,4 BV[a]				**0.09**
Construction Worker SAL[b]				**130**
Industrial SAL[b]				**160**
Residential SAL[b]				**42**
CALA-16-121949	01-61511	16.0−17.0	QBT3	0.116

Note: Results are in pCi/g.

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

[b] SALs from LANL (2015, 600929).

Table 6.12-1
Samples Collected and Analyses Requested at SWMU 01-006(n)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-09-212	00-604227	0.0–1.0	FILL	09-398	09-397	09-398	09-398	09-398	09-398	09-397	09-396	09-397	09-398	09-396	09-396	09-397
RE00-09-213	00-604227	7.0–8.0	QBT3	09-398	09-397	09-398	09-398	09-398	09-398	09-397	09-396	09-397	09-398	09-396	09-396	09-397
RE00-09-214	00-604228	0.0–1.0	FILL	09-398	09-397	09-398	09-398	09-398	09-398	09-397	09-396	09-397	09-398	09-396	09-396	09-397
RE00-09-215	00-604228	8.25–9.25	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-216	00-604229	0.0–1.0	FILL	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-217	00-604229	1.0–2.0	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-235	00-604238	0.0–1.0	FILL	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-236	00-604238	1.5–2.5	FILL	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-237	00-604238	4.0–5.0	FILL	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-246	00-604238	6.5–7.5	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE01-12-849	01-614804	10.0–11.0	QBT3	—*	—	—	—	12-641	—	—	—	—	—	—	—	—
RE01-12-850	01-614804	12.0–13.0	QBT3	—	—	—	—	12-641	—	—	—	—	—	—	—	—
RE01-12-851	01-614805	0.0–1.0	FILL	—	—	—	—	12-641	—	—	—	—	—	—	—	—
RE01-12-852	01-614805	4.0–5.0	QBT3	—	—	—	—	12-641	—	—	—	—	—	—	—	—
RE01-12-853	01-814805	10.0−11.0	QBT3	—	—	—	—	12-641	—	—	—	—	—	—	—	—
RE01-12-854	01-614806	0.0–1.0	FILL	—	—	—	—	12-641	—	—	—	—	—	—	—	—
RE01-12-855	01-614806	4.0–5.0	QBT3	—	—	—	—	12-641	—	—	—	—	—	—	—	—
RE01-12-856	01-614806	10.0-11.0	QBT3	—	—	—	—	12-641	—	—	—	—	—	—	—	—

Note: Numbers in analyte columns are request numbers.

* — = Analysis not requested.

Table 6.12-2
Inorganic Chemicals above BVs at SWMU 01-006(n)

Sample ID	Location ID	Depth (ft)	Media	Antimony	Calcium	Chromium	Cyanide (Total)	Lead	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Zinc
Qbt 2,3,4 BV[a]				**0.5**	**2200**	**7.14**	**0.5**	**11.2**	**0.1**	**6.58**	**na**[b]	**na**	**0.3**	**63.5**
Soil BV[a]				**0.83**	**6120**	**19.3**	**0.5**	**22.3**	**0.1**	**15.4**	**na**	**na**	**1.52**	**48.8**
Construction Worker SSL[c]				**142**	**8,850,000**	**134**[d]	**12.1**	**800**	**77.1**	**753**	**566,000**	**248**	**1750**	**106,000**
Industrial SSL[c]				**519**	**32,400,000**	**505**[d]	**64.4**	**800**	**389**	**25,700**	**2,080,000**	**908**	**6490**	**389,000**
Residential SSL[c]				**31.3**	**13,000,000**	**96.6**[d]	**11.2**	**400**	**23.5**	**1560**	**125,000**	**54.8**	**391**	**23,500**
RE00-09-212	00-604227	0.0–1.0	FILL	—[e]	—	—	0.52 (U)	—	0.124	—	0.62	—	—	—
RE00-09-213	00-604227	7.0–8.0	QBT3	0.51 (U)	—	—	—	—	—	—	0.19 (J)	—	—	—
RE00-09-214	00-604228	0.0–1.0	FILL	—	—	—	—	—	—	—	0.38	—	—	—
RE00-09-215	00-604228	8.25–9.25	QBT3	0.51 (U)	—	—	—	—	—	—	0.12 (J)	—	0.51 (U)	—
RE00-09-216	00-604229	0.0–1.0	FILL	—	—	—	0.52 (UJ)	—	0.121 (J)	—	0.13 (J)	—	—	—
RE00-09-217	00-604229	1.0–2.0	QBT3	0.51 (U)	—	—	0.51 (UJ)	—	—	—	—	0.0027 (J)	0.51 (U)	—
RE00-09-235	00-604238	0.0–1.0	FILL	—	—	—	—	—	—	—	26 (J-)	—	—	—
RE00-09-236	00-604238	1.5–2.5	FILL	—	—	—	0.53 (UJ)	—	0.143 (J)	—	0.66	0.0055	—	—
RE00-09-237	00-604238	4.0–5.0	FILL	—	6220	—	—	44.1	0.555 (J)	—	0.47	0.016	—	54.3
RE00-09-246	00-604238	6.5–7.5	QBT3	—	—	18.9 (J-)	0.51 (UJ)	—	—	9.3	0.085 (J)	—	0.42 (J)	—

Notes: Results are in mg/kg. Data qualifiers are presented in Appendix A.
[a] BVs from LANL (1998, 059730).
[b] na = Not available.
[c] SSLs from NMED (2015, 600915).
[d] SSLs for total chromium.
[e] — = Not detected or not detected above BV.

Table 6.12-3
Organic Chemicals Detected at SWMU 01-006(n)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1260	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Chrysene	Fluoranthene	Methylene Chloride	Phenanthrene	Pyrene	Trichlorofluoromethane
Construction Worker SSL[a]				**85.3**	**240**	**24**	**240**	**2310**	**5380**	**23,100**	**10,000**	**1210**	**7530**	**7530**	**1130**
Industrial SSL[a]				**11.5**	**32.3**	**3.23**	**32.3**	**323**	**1830**	**3230**	**33,700**	**5130**	**25,300**	**25,300**	**6030**
Residential SSL[a]				**2.43**	**1.53**	**0.153**	**1.53**	**15.3**	**380**	**153**	**2320**	**409**	**1740**	**1740**	**1230**
RE00-09-212	00-604227	0.0–1.0	FILL	—[b]	0.043 (J)	0.053 (J)	0.039 (J)	0.065 (J)	0.67	0.051 (J)	0.094 (J)	—	0.078 (J)	0.081 (J)	0.0012 (J)
RE00-09-213	00-604227	7.0–8.0	QBT3	0.011 (J)	—	—	—	—	—	—	—	—	—	—	—
RE00-09-215	00-604228	8.25–9.25	QBT3	—	—	—	—	—	—	—	—	0.0046 (J)	—	—	—
RE00-09-216	00-604229	0.0–1.0	FILL	0.52	—	—	—	—	—	—	0.053 (J)	0.0066	0.046 (J)	0.047 (J)	—
RE00-09-217	00-604229	1.0–2.0	QBT3	0.14	—	—	—	—	—	—	0.043 (J)	0.0059	0.043 (J)	0.035 (J)	—
RE00-09-235	00-604238	0.0–1.0	FILL	0.015 (J)	—	—	—	—	—	—	—	0.0079	—	—	—
RE00-09-236	00-604238	1.5–2.5	FILL	0.013 (J)	0.06 (J)	0.043 (J)	0.044 (J)	0.042 (J)	—	0.07 (J)	0.099 (J)	—	—	0.089 (J)	—
RE00-09-237	00-604238	4.0–5.0	FILL	0.17	—	—	—	—	—	—	—	—	—	—	—

Notes: Results are in mg/kg. Data qualifiers are presented in Appendix A.
[a] SSLs from NMED (2015, 600915).
[b] — = Not detected.

Table 6.12-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-006(n)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-134	Plutonium-239/240	Tritium
Qbt 2,3,4 BV[a]				**na[b]**	**na**	**na**	**na**
Soil BV[a]				**0.013[c]**	**na**	**0.054[c]**	**na**
Construction Worker SAL[d]				**230**	**15**	**200**	**1,600,000**
Industrial SAL[d]				**1000**	**17**	**1200**	**2,400,000**
Residential SAL[d]				**83**	**5**	**79**	**1700**
RE00-09-212	00-604227	0.0–1.0	FILL	—[e]	—	0.13	—
RE00-09-213	00-604227	7.0–8.0	QBT3	—	—	0.752	—
RE00-09-214	00-604228	0.0–1.0	FILL	—	—	—	0.62
RE00-09-215	00-604228	8.25–9.25	QBT3	—	—	0.523	—
RE00-09-216	00-604229	0.0–1.0	FILL	—	—	7.98	—
RE00-09-217	00-604229	1.0–2.0	QBT3	—	—	0.849	—
RE00-09-235	00-604238	0.0–1.0	FILL	—	0.052	—	—
RE00-09-236	00-604238	1.5–2.5	FILL	—	—	0.206	—
RE00-09-237	00-604238	4.0–5.0	FILL	0.264	—	8.22	—
RE00-09-246	00-604238	6.5–7.5	QBT3	—	—	0.354	—
RE01-12-849	01-614804	10.0–11.0	QBT3	NA[f]	NA	1.38	NA
RE01-12-850	01-614804	12.0–13.0	QBT3	NA	NA	1.13	NA
RE01-12-851	01-614805	0.0–1.0	FILL	NA	NA	0.114	NA
RE01-12-852	01-614805	4.0–5.0	QBT3	NA	NA	0.0169	NA
RE01-12-854	01-614806	0.0–1.0	FILL	NA	NA	1.78	NA
RE01-12-855	01-614806	4.0–5.0	QBT3	NA	NA	1.32	NA
RE01-12-856	01-614806	10.0-11.0	QBT3	NA	NA	0.141	NA

Notes: Results are in pCi/g.

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

[b] na = Not available.

[c] FV applies to soil samples collected from 0–1 ft only.

[d] SALs from LANL (2015, 600929).

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

[f] NA = Not analyzed.

Table 6.13-1
Samples Collected and Analyses Requested at SWMU 01-007(a)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-08-16353	00-603900	1.25–2.25	QBT3	09-641	09-640	09-641	09-641	09-641	09-641	09-640	09-639	09-640	09-641	09-639	09-639	09-640
RE00-08-16354	00-603900	3.25–4.25	QBT3	09-641	09-640	09-641	09-641	09-641	09-641	09-640	09-639	09-640	09-641	09-639	09-639	09-640
RE01-12-578	00-603900	5.0–6.0	QBT3	—[a]	—	—	—	—	—	12-751[b]	—	—	—	—	—	—
RE01-12-579	00-603900	7.0–8.0	QBT3	—	—	—	—	—	—	12-751[b]	—	—	—	—	—	—
RE00-08-16355	00-603901	17.5–19.0	QBT3	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874
RE00-08-16356	00-603901	20.0–21.0	QBT3	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874	09-874
RE00-09-204	00-604223	15.0–16.0	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE00-09-205	00-604223	17.0–18.0	QBT3	09-426	09-425	09-426	09-426	09-426	09-426	09-425	09-424	09-425	09-426	09-424	09-424	09-425
RE01-12-828	00-604223	18.0–19.0	QBT3	—	—	—	—	12-710	—	—	—	—	—	—	—	—
RE01-12-829	00-604223	19.0–20.0	QBT3	—	—	—	—	12-710	—	—	—	—	—	—	—	—
RE00-09-218	00-604230	0.0–1.0	SOIL	09-398	09-397	09-398	09-398	09-398	09-398	09-397	09-396	09-397	09-398	09-396	09-396	09-397
RE00-09-219	00-604230	1.0–2.0	QBT3	09-398	09-397	09-398	09-398	09-398	09-398	09-397	09-396	09-397	09-398	09-396	09-396	09-397
RE00-09-221	00-604231	1.0–2.0	QBT3	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE00-09-222	00-604232	0.0–1.0	SED	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE00-09-223	00-604232	1.0–2.0	QBT3	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE00-09-225	00-604233	1.0–2.0	QBT3	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE01-12-862	00-604233	3.0–4.0	QBT3	—	—	—	—	—	—	12-555[b]	—	—	—	12-555[c]	—	—
RE01-12-863	00-604233	5.0–6.0	QBT3	—	—	—	—	—	—	12-555[b]	—	—	—	12-555[c]	—	—
RE00-09-226	00-604234	0.0–1.0	SED	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE00-09-227	00-604234	1.0–2.0	QBT3	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE01-12-864	00-604234	3.0–4.0	QBT3	—	—	—	—	—	—	12-588[b]	—	—	—	12-587[c]	—	—
RE01-12-865	00-604234	5.0–6.0	QBT3	—	—	—	—	—	—	12-588[b]	—	—	—	12-587[c]	—	—
RE00-09-228	00-604235	0.0–1.0	SED	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE00-09-229	00-604235	1.0–2.0	QBT1G	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE01-12-866	00-604235	3.0–4.0	QBT1G	—	—	—	—	—	—	12-588[b]	—	—	—	12-587[c]	—	—
RE01-12-867	00-604235	5.0–6.0	QBT1G	—	—	—	—	—	—	12-588[b]	—	—	—	12-587[c]	—	—
RE00-09-230	00-604236	0.0–1.0	SED	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE00-09-231	00-604236	1.0–2.0	QBT1G	09-373	09-372	09-373	09-373	09-373	09-373	09-372	09-371	09-372	09-373	09-371	09-371	09-372
RE01-12-868	00-604236	3.0–4.0	QCT	—	—	—	—	—	—	12-588[b]	—	—	—	12-587[c]	—	—
RE01-12-869	00-604236	5.0–6.0	QCT	—	—	—	—	—	—	12-588[b]	—	—	—	12-587[c]	—	—
RE00-09-238	00-604239	5.0–6.0	FILL	09-451	09-450	09-451	09-451	09-451	09-451	09-450	09-449	09-450	09-451	09-449	09-449	09-450
RE00-09-239	00-604239	8.0–9.0	FILL	09-877	09-876	09-877	09-877	09-877	09-877	09-876	09-875	09-876	09-877	09-875	09-875	09-876
RE00-09-240	00-604239	11.0–12.5	FILL	09-877	09-876	09-877	09-877	09-877	09-877	09-876	09-875	09-876	09-877	09-875	09-875	09-876

Table 6.13-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-09-241	00-604239	13.5–15.0	QBT3	09-877	09-876	09-877	09-877	09-877	09-877	09-876	09-875	09-876	09-877	09-875	09-875	09-876
RE00-09-242	00-604240	5.0–6.5	FILL	09-451	09-450	09-451	09-451	09-451	09-451	09-450	09-449	09-450	09-451	09-449	09-449	09-450
RE00-09-243	00-604240	8.0–9.0	FILL	09-451	09-450	09-451	09-451	09-451	09-451	09-450	09-449	09-450	09-451	09-449	09-449	09-450
RE00-09-244	00-604240	11.0–12.0	FILL	09-451	09-450	09-451	09-451	09-451	09-451	09-450	09-449	09-450	09-451	09-449	09-449	09-450
RE00-09-245	00-604240	14.0–15.0	QBT3	09-451	09-450	09-451	09-451	09-451	09-451	09-450	09-449	09-450	09-451	09-449	09-449	09-450
RE01-12-861	00-604240	19.0–20.0	QBT3	—	—	—	—	—	—	12-707[b]	—	—	—	12-707[c]	—	—
RE01-12-858	01-614807	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	12-573[c]	—	—
RE01-12-859	01-614807	3.0–4.0	QBT1G	—	—	—	—	—	—	—	—	—	—	12-573[c]	—	—
RE01-12-860	01-614807	5.0–6.0	QBT1G	—	—	—	—	—	—	—	—	—	—	12-573[c]	—	—
RE01-13-38519	01-220	0.0–1.0	SOIL	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38531	01-220	1.0–2.0	QBT3	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38520	01-221	0.0–1.0	SOIL	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38532	01-221	1.0–2.0	QBT3	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38521	01-222	0.0–1.0	SOIL	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38533	01-222	1.0–2.0	QBT3	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38522	01-223	0.0–1.0	SOIL	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38534	01-223	1.0–2.0	QBT3	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38523	01-224	0.0–1.0	SOIL	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38535	01-224	1.0–2.0	QBT3	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38524	01-225	0.0–1.0	SOIL	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38536	01-225	1.0–2.0	SOIL	—	—	—	—	2013-1690	—	—	—	—	—	—	—	—
RE01-13-38525	01-226	0.0–1.0	SOIL	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38537	01-226	1.0–2.0	QBT3	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38538	01-227	1.0–2.0	QBT3	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38527	01-228	0.0–1.0	SOIL	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38539	01-228	1.0–2.0	QBT3	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38528	01-229	0.0–1.0	SOIL	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38540	01-229	1.0–2.0	QBT3	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38529	01-230	0.0–1.0	SOIL	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38541	01-230	1.0–2.0	SOIL	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
RE01-13-38542	01-231	1.0–2.0	SOIL	—	—	—	—	2013-1695	—	—	—	—	—	—	—	—
CALA-16-124459	LA-61504	10.5–11.5	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177
CALA-16-124460	LA-61504	12.5–13.5	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177
CALA-16-124461	LA-61504	14.5–15.5	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177

Table 6.13-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
CALA-16-124462	LA-61505	11.0–12.0	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177
CALA-16-124463	LA-61505	13.0–14.0	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177
CALA-16-124464	LA-61505	15.0–16.0	QBT3	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177	2016-2177

Note: Numbers in analyte columns are request numbers.

[a] — = Analysis not requested.

[b] Samples analyzed for only chromium and nickel.

[c] Samples analyzed only for bis(2-ethylhexyl)phthalate.

Table 6.13-2
Inorganic Chemicals above BVs at SWMU 01-007(a)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Calcium	Chromium	Copper	Cyanide (Total)	Lead	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Thallium	Zinc
Qbt 2,3,4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**2200**	**7.14**	**4.66**	**0.5**	**11.2**	**482**	**0.1**	**6.58**	**na[b]**	**na**	**0.3**	**1.1**	**63.5**
Qbt 1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**1900**	**2.6**	**3.96**	**0.5**	**13.5**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1.22**	**40**
Sediment BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**4420**	**10.5**	**11.2**	**0.82**	**19.7**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**0.73**	**60.2**
Soil BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**6120**	**19.3**	**14.7**	**0.5**	**22.3**	**671**	**0.1**	**15.4**	**na**	**na**	**1.52**	**0.73**	**48.8**
Construction Worker SSL[c]				**41,400**	**142**	**57.4**	**4390**	**148**	**8,850,000**	**134[d]**	**14,200**	**12.1**	**800**	**464**	**77.1**	**753**	**566,000**	**248**	**1750**	**3.54**	**106,000**
Industrial SSL[c]				**1,290,000**	**519**	**21.5**	**255,000**	**2580**	**32,400,000**	**505[d]**	**51,900**	**64.4**	**800**	**160,000**	**389**	**25,700**	**2,080,000**	**908**	**6490**	**13**	**389,000**
Residential SSL[c]				**78,000**	**31.3**	**4.25**	**15,600**	**156**	**13,000,000**	**96.6[d]**	**3130**	**11.2**	**400**	**10,500**	**23.5**	**1560**	**125,000**	**54.8**	**391**	**0.782**	**23,500**
RE00-08-16353	00-603900	1.25–2.25	QBT3	—[e]	—	—	—	—	—	10.3 (J+)	—	0.54 (U)	—	—	—	—	0.18 (J)	—	0.31 (J)	—	—
RE00-08-16354	00-603900	3.25–4.25	QBT3	—	0.54 (U)	—	—	—	—	25.8 (J+)	—	0.54 (U)	—	—	—	12.3	—	—	0.31 (J)	—	—
RE00-08-16355	00-603901	17.5–19.0	QBT3	—	—	—	—	—	—	—	—	0.54 (U)	—	—	—	—	2.5	0.0027 (J)	—	—	—
RE00-08-16356	00-603901	20.0–21.0	QBT3	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	3.8	—	—	—	—
RE00-09-204	00-604223	15.0–16.0	QBT3	—	0.54 (U)	—	—	—	—	—	—	0.54 (UJ)	—	—	—	—	4.9	—	0.54 (U)	—	—
RE00-09-205	00-604223	17.0–18.0	QBT3	—	—	—	—	—	—	29.9 (J-)	—	—	—	—	—	14	4.2	—	0.53 (U)	—	—
RE00-09-218	00-604230	0.0–1.0	SOIL	—	—	—	—	—	—	—	—	0.51 (U)	—	—	0.11	39.5 (J)	0.27	—	—	—	—
RE00-09-219	00-604230	1.0–2.0	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.15 (J)	—	—	—	—
RE00-09-221	00-604231	1.0–2.0	QBT3	—	—	—	—	—	—	—	—	0.52 (U)	—	—	—	—	0.18 (J)	—	0.41 (J)	—	—
RE00-09-222	00-604232	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	69.1 (J)
RE00-09-223	00-604232	1.0–2.0	QBT3	—	—	—	—	—	—	9.1 (J)	—	0.52 (U)	—	—	—	—	—	—	0.52 (UJ)	—	—
RE00-09-225	00-604233	1.0–2.0	QBT3	—	—	—	—	—	—	49.5 (J)	—	0.54 (U)	—	537	—	22.7 (J)	—	—	—	—	—
RE01-12-863	00-604233	5.0–6.0	QBT3	NA[f]	NA	NA	NA	NA	NA	9.25	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA

Table 6.13-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Calcium	Chromium	Copper	Cyanide (Total)	Lead	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Thallium	Zinc
Qbt 2,3,4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**2200**	**7.14**	**4.66**	**0.5**	**11.2**	**482**	**0.1**	**6.58**	**na[b]**	**na**	**0.3**	**1.1**	**63.5**
Qbt 1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**1900**	**2.6**	**3.96**	**0.5**	**13.5**	**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1.22**	**40**
Sediment BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**4420**	**10.5**	**11.2**	**0.82**	**19.7**	**543**	**0.1**	**9.38**	**na**	**na**	**0.3**	**0.73**	**60.2**
Soil BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**6120**	**19.3**	**14.7**	**0.5**	**22.3**	**671**	**0.1**	**15.4**	**na**	**na**	**1.52**	**0.73**	**48.8**
Construction Worker SSL[c]				**41,400**	**142**	**57.4**	**4390**	**148**	**8,850,000**	**134[d]**	**14,200**	**12.1**	**800**	**464**	**77.1**	**753**	**566,000**	**248**	**1750**	**3.54**	**106,000**
Industrial SSL[c]				**1,290,000**	**519**	**21.5**	**255,000**	**2580**	**32,400,000**	**505[d]**	**51,900**	**64.4**	**800**	**160,000**	**389**	**25,700**	**2,080,000**	**908**	**6490**	**13**	**389,000**
Residential SSL[c]				**78,000**	**31.3**	**4.25**	**15,600**	**156**	**13,000,000**	**96.6[d]**	**3130**	**11.2**	**400**	**10,500**	**23.5**	**1560**	**125,000**	**54.8**	**391**	**0.782**	**23,500**
RE00-09-226	00-604234	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	0.27	—	0.31 (J)	—	—
RE00-09-227	00-604234	1.0–2.0	QBT3	—	—	—	—	—	—	10.2 (J)	—	0.54 (U)	—	—	—	—	—	—	0.34 (J)	—	—
RE00-09-228	00-604235	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	0.49	—	0.51 (UJ)	—	—
RE00-09-229	00-604235	1.0–2.0	QBT1G	6920 (J)	0.54 (U)	1 (U)	—	1.7 (J)	—	6.4 (J)	—	0.54 (U)	—	257 (J)	—	3.1 (J)	—	—	0.33 (J)	—	—
RE00-09-230	00-604236	0.0–1.0	SED	—	—	—	—	1.9 (J)	—	—	—	—	—	—	—	—	—	—	0.55 (U)	0.86 (U)	—
RE00-09-231	00-604236	1.0–2.0	QBT1G	9080 (J)	0.6 (U)	0.97 (U)	—	3 (J)	—	6.3 (J)	—	0.6 (U)	—	221 (J)	—	4 (J)	—	—	0.6 (U)	—	—
RE01-12-868	00-604236	3.0–4.0	QCT	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	2.32	NA	NA	NA	NA	NA
RE00-09-238	00-604239	5.0–6.0	FILL	—	—	—	—	—	—	—	—	—	24.2 (J-)	—	0.209 (J)	—	6.9	—	—	—	—
RE00-09-239	00-604239	8.0–9.0	FILL	—	0.97 (J)	—	—	—	8030	30.9 (J+)	—	—	63.6 (J+)	—	2.12	—	7.5	0.0082 (J)	—	—	55.5
RE00-09-240	00-604239	11.0–12.5	FILL	—	—	—	—	—	21000	74.7 (J+)	—	—	55.8 (J+)	—	—	—	9.1	0.0054 (J)	—	—	65.3
RE00-09-241	00-604239	13.5–15.0	QBT3	—	—	—	—	—	—	—	5.3	0.53 (U)	—	—	—	—	8.4	—	0.4 (J)	—	—
RE00-09-242	00-604240	5.0–6.5	FILL	—	—	—	—	—	—	—	—	0.58 (U)	—	—	0.527 (J)	—	0.19 (J)	—	—	—	—
RE00-09-243	00-604240	8.0–9.0	FILL	—	—	—	—	—	—	—	—	—	24 (J-)	—	0.129 (J)	—	0.55	—	—	—	—
RE00-09-244	00-604240	11.0–12.0	FILL	—	—	—	—	—	—	—	—	—	—	—	—	—	0.4	—	—	—	—
RE00-09-245	00-604240	14.0–15.0	QBT3	—	0.55 (U)	—	—	—	—	63.1 (J-)	—	—	—	—	—	29.5	0.17 (J)	—	0.55 (U)	—	—
RE01-12-861	00-604240	19.0–20.0	QBT3	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	7.78 (J+)	NA	NA	NA	NA	NA
CALA-16-124459	LA-61504	10.5–11.5	QBT3	—	0.984 (U)	—	—	1.25	—	—	—	—	—	—	—	—	0.938 (J)	—	1.44 (J-)	—	—
CALA-16-124460	LA-61504	12.5–13.5	QBT3	—	1.04 (U)	—	102	1.61	—	—	—	—	—	—	—	8.09	0.707 (J)	0.00101	1.16	—	—
CALA-16-124461	LA-61504	14.5–15.5	QBT3	—	0.976 (U)	—	—	—	—	—	—	—	—	—	—	—	0.597 (J)	—	1.14	—	—
CALA-16-124462	LA-61505	11.0–12.0	QBT3	—	1.02 (U)	—	—	—	—	—	—	—	—	—	—	—	2.87	—	1.08	—	—
CALA-16-124463	LA-61505	13.0–14.0	QBT3	—	1.06 (U)	—	—	—	—	—	—	—	—	—	—	—	2.77	—	1.19	—	—
CALA-16-124464	LA-61505	15.0–16.0	QBT3	—	1.07 (U)	—	—	—	—	—	—	—	—	—	—	—	2.5	—	1.17	—	—

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

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs from NMED (2015, 600915).

[d] SSLs for total chromium.

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

[f] NA = Not analyzed.

Table 6.13-3
Organic Chemicals Detected at SWMU 01-007(a)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthylene	Acetone	Anthracene	Aroclor-1260	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(k)fluoranthene	Benzyl Alcohol	Bis(2-ethylhexyl)phthalate	Butylbenzene[tert-]
Construction Worker SSL[a]				**7530[b]**	**242,000**	**75,300**	**85.3**	**142**	**240**	**24**	**2310**	**26,900[c]**	**5380**	**35,400[c]**
Industrial SSL[a]				**25,300[b]**	**960,000**	**253,000**	**11.5**	**87.2**	**32.3**	**3.23**	**323**	**82,000[d]**	**1830**	**120,000[d]**
Residential SSL[a]				**1740[b]**	**66,300**	**17,400**	**2.43**	**17.8**	**1.53**	**0.153**	**15.3**	**6300[d]**	**380**	**7800[d]**
RE00-08-16355	00-603901	17.5–19.0	QBT3	—[e]	—	—	—	—	—	—	—	—	—	—
RE00-08-16356	00-603901	20.0–21.0	QBT3	—	—	—	—	0.0002 (J)	—	—	—	—	0.075 (J)	0.00015 (J)
RE00-09-204	00-604223	15.0–16.0	QBT3	—	—	—	0.0081 (J)	—	—	—	—	—	—	—
RE00-09-205	00-604223	17.0–18.0	QBT3	—	—	—	—	—	—	—	—	—	—	—
RE00-09-218	00-604230	0.0–1.0	SOIL	—	NA[f]	—	0.055	—	—	—	—	—	0.45	—
RE00-09-219	00-604230	1.0–2.0	QBT3	—	—	—	—	—	—	—	—	—	—	—
RE00-09-222	00-604232	0.0–1.0	SED	—	0.0044 (J)	—	0.017 (J)	—	—	—	—	—	—	—
RE00-09-225	00-604233	1.0–2.0	QBT3	—	—	—	—	—	—	—	—	0.036 (J-)	1.6 (J-)	—
RE00-09-226	00-604234	0.0–1.0	SED	—	NA	—	—	—	—	—	—	—	1.2	—
RE00-09-227	00-604234	1.0–2.0	QBT3	—	—	—	—	—	—	—	—	—	0.85	—
RE00-09-228	00-604235	0.0–1.0	SED	—	NA	—	—	—	—	—	—	—	—	—
RE00-09-229	00-604235	1.0–2.0	QBT1G	—	—	—	—	—	—	—	—	—	1.7	—
RE00-09-230	00-604236	0.0–1.0	SED	—	NA	—	—	—	—	—	—	—	0.14 (J)	—
RE00-09-231	00-604236	1.0–2.0	QBT1G	—	—	—	—	—	—	—	—	—	1.3	—
RE00-09-238	00-604239	5.0–6.0	FILL	—	—	—	0.0068 (J)	—	—	—	—	—	—	—
RE00-09-240	00-604239	11.0–12.5	FILL	—	—	—	0.042	—	—	—	—	—	0.2 (J)	—
RE00-09-242	00-604240	5.0–6.5	FILL	—	—	—	0.021 (J)	—	—	—	—	—	—	—
RE00-09-243	00-604240	8.0–9.0	FILL	—	—	—	0.0082 (J)	—	—	—	—	—	—	—
RE00-09-244	00-604240	11.0–12.0	FILL	0.047 (J)	—	0.16 (J)	0.0073 (J)	—	0.14 (J)	0.045 (J)	0.043 (J)	—	—	—
RE00-09-245	00-604240	14.0–15.0	QBT3	—	—	—	—	—	—	—	—	—	—	—
CALA-16-124459	LA-61504	10.5–11.5	QBT3	—	—	—	—	—	—	—	—	—	0.391	—
CALA-16-124460	LA-61504	12.5–13.5	QBT3	—	—	—	—	—	—	—	—	—	0.321 (J)	—
CALA-16-124461	LA-61504	14.5–15.5	QBT3	—	—	—	—	—	—	—	—	—	0.401	—

Table 6.13-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Chrysene	Di-n-butylphthalate	Dintiro-2-methylphenol[4,6-]	Fluoranthene	Isopropylbenzene	Isopropyltoluene[4-]	Methylene Chloride	Phenanthrene	Pyrene	Tetrachloroethene	Trichlorofluoromethane
Construction Worker SSL[a]				**23,100**	**26,900**	**21.5**	**10,000**	**2740**	**2740[g]**	**1210**	**7530**	**7530**	**120**	**1130**
Industrial SSL[a]				**3230**	**91,600**	**73.3**	**33,700**	**14,200**	**14,200[g]**	**5130**	**25,300**	**25,300**	**629**	**6030**
Residential SSL[a]				**153**	**6160**	**4.93**	**2320**	**2360**	**2360[g]**	**409**	**1740**	**1740**	**111**	**1230**
CALA-16-124463	LA-61505	13.0–14.0	QBT3	—	—	—	—	—	—	—	—	—	0.422	—
CALA-16-124464	LA-61505	15.0–16.0	QBT3	—	—	—	—	—	—	—	—	—	0.439	—
RE00-08-16355	00-603901	17.5–19.0	QBT3	—	—	—	—	0.00012 (J)	—	—	—	—	—	—
RE00-08-16356	00-603901	20.0–21.0	QBT3	—	—	—	—	—	—	—	—	—	—	—
RE00-09-204	00-604223	15.0–16.0	QBT3	—	—	—	—	—	—	0.0064	—	—	—	—
RE00-09-205	00-604223	17.0–18.0	QBT3	—	—	0.41 (J)	—	—	—	—	—	—	—	—
RE00-09-218	00-604230	0.0–1.0	SOIL	—	—	—	—	—	—	—	—	—	—	0.0012 (J+)
RE00-09-219	00-604230	1.0–2.0	QBT3	—	—	—	—	—	—	—	—	—	—	0.0012 (J)
RE00-09-222	00-604232	0.0–1.0	SED	—	—	—	—	—	0.0041 (J)	—	—	—	—	—
RE00-09-225	00-604233	1.0–2.0	QBT3	—	—	—	—	—	—	—	—	—	—	—
RE00-09-226	00-604234	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—
RE00-09-227	00-604234	1.0–2.0	QBT3	—	—	—	—	—	—	—	—	—	—	—
RE00-09-228	00-604235	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	0.00011 (J)	—
RE00-09-229	00-604235	1.0–2.0	QBT1G	—	—	—	—	—	—	—	—	—	—	—
RE00-09-230	00-604236	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—
RE00-09-231	00-604236	1.0–2.0	QBT1G	—	—	—	—	—	—	—	—	—	—	—
RE00-09-238	00-604239	5.0–6.0	FILL	—	0.065 (J)	—	0.063 (J)	—	—	0.0065	0.32 (J)	0.088 (J)	—	—
RE00-09-240	00-604239	11.0–12.5	FILL	—	—	—	—	—	—	—	—	—	—	—
RE00-09-242	00-604240	5.0–6.5	FILL	—	—	—	—	—	—	0.0059	—	—	—	—
RE00-09-243	00-604240	8.0–9.0	FILL	—	—	—	—	—	—	0.0055 (J)	—	—	—	—
RE00-09-244	00-604240	11.0–12.0	FILL	0.18 (J)	—	—	0.36 (J)	—	—	0.0083	0.86	0.65	—	—
RE00-09-245	00-604240	14.0–15.0	QBT3	—	—	—	—	—	—	0.0058	—	—	—	—
CALA-16-124459	LA-61504	10.5–11.5	QBT3	—	—	—	—	—	—	—	—	—	—	—

Table 6.13-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Chrysene	Di-n-butylphthalate	Dintiro-2-methylphenol[4,6-]	Fluoranthene	Isopropylbenzene	Isopropyltoluene[4-]	Methylene Chloride	Phenanthrene	Pyrene	Tetrachloroethene	Trichlorofluoromethane
Construction Worker SSL[a]				**23,100**	**26,900**	**21.5**	**10,000**	**2740**	**2740[g]**	**1210**	**7530**	**7530**	**120**	**1130**
Industrial SSL[a]				**3230**	**91,600**	**73.3**	**33,700**	**14,200**	**14,200[g]**	**5130**	**25,300**	**25,300**	**629**	**6030**
Residential SSL[a]				**153**	**6160**	**4.93**	**2320**	**2360**	**2360[g]**	**409**	**1740**	**1740**	**111**	**1230**
CALA-16-124460	LA-61504	12.5–13.5	QBT3	—	—	—	—	—	—	—	—	—	—	—
CALA-16-124461	LA-61504	14.5–15.5	QBT3	—	—	—	—	—	—	—	—	—	—	—
CALA-16-124463	LA-61505	13.0–14.0	QBT3	—	—	—	—	—	—	—	—	—	—	—
CALA-16-124464	LA-61505	15.0–16.0	QBT3	—	—	—	—	—	—	—	—	—	—	—

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

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Pyrene used as a surrogate based on structural similarity.

[c] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915)

[d] SSLs from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

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

[f] NA = Not analyzed.

[g] Isopropylbenzene used as a surrogate based on structural similarity.

Table 6.13-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-007(a)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239/240	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Qbt 2,3,4 BV[a]				**na[b]**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Qbt 1g, Qct, Qbo BV[a]				**na**	**na**	**na**	**na**	**4.00**	**0.18**	**3.90**
Sediment BV[a]				**0.04**	**0.006**	**0.068**	**0.093**	**2.59**	**0.2**	**2.29**
Soil BV[a]				**0.013[c]**	**0.023[c]**	**0.054[c]**	**na**	**2.59**	**0.2**	**2.29**
Construction Worker SAL[d]				**230**	**230**	**200**	**1,600,000**	**1000**	**130**	**470**
Industrial SAL[d]				**1000**	**1300**	**1200**	**2,400,000**	**3100**	**160**	**710**
Residential SAL[d]				**83**	**84**	**79**	**1700**	**290**	**42**	**150**
RE00-08-16353	00-603900	1.25–2.25	QBT3	—[e]	0.112	0.272	—	—	—	—
RE00-09-204	00-604223	15.0–16.0	QBT3	—	—	0.476	—	—	—	—
RE00-09-218	00-604230	0.0–1.0	SOIL	0.187	—	6.34	—	—	—	—
RE00-09-219	00-604230	1.0–2.0	QBT3	—	—	0.221	—	—	—	—
RE00-09-221	00-604231	1.0–2.0	QBT3	0.125	—	20	—	—	—	—
RE00-09-222	00-604232	0.0–1.0	SED	0.164	—	10.8	—	—	—	—
RE00-09-223	00-604232	1.0–2.0	QBT3	—	—	6.07	—	—	—	—
RE00-09-225	00-604233	1.0–2.0	QBT3	0.121	0.063	7.62	—	—	—	—
RE00-09-226	00-604234	0.0–1.0	SED	—	0.053	2.01	—	—	—	—
RE00-09-227	00-604234	1.0–2.0	QBT3	—	—	0.101 (J)	—	—	—	—
RE00-09-228	00-604235	0.0–1.0	SED	—	—	5.82	—	—	—	—
RE00-09-229	00-604235	1.0–2.0	QBT1G	—	—	0.247 (J)	—	—	—	—
RE00-09-230	00-604236	0.0–1.0	SED	—	—	1.89	—	—	—	—
RE00-09-231	00-604236	1.0–2.0	QBT1G	—	—	0.426 (J)	—	—	—	—
RE00-09-238	00-604239	5.0–6.0	FILL	—	—	0.235	1.68	—	—	—
RE00-09-239	00-604239	8.0–9.0	FILL	0.189	—	10.4	2.08	—	—	—
RE00-09-240	00-604239	11.0–12.5	FILL	—	—	5.78	1.84	—	—	—
RE00-09-241	00-604239	13.5–15.0	QBT3	—	—	0.133	1.72	—	—	—
RE00-09-242	00-604240	5.0–6.5	FILL	—	—	0.531	—	—	—	—
RE00-09-243	00-604240	8.0–9.0	FILL	—	—	1.94	—	—	—	—
RE00-09-244	00-604240	11.0–12.0	FILL	0.197	—	11.3	—	—	—	—
RE00-09-245	00-604240	14.0–15.0	QBT3	—	—	0.17	—	—	—	—
RE01-13-38531	01-220	0.0–1.0	SOIL	NA[f]	—	0.17 (J)	NA	NA	NA	NA
RE01-13-38520	01-221	0.0–1.0	SOIL	NA	—	0.536	NA	NA	NA	NA
RE01-13-38532	01-221	1.0–2.0	QBT3	NA	—	0.463	NA	NA	NA	NA
RE01-13-38521	01-222	0.0–1.0	SOIL	NA	—	1.19	NA	NA	NA	NA

Table 6.13-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239/240	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Qbt 2,3,4 BV[a]				**na[b]**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Qbt 1g, Qct, Qbo BV[a]				**na**	**na**	**na**	**na**	**4.00**	**0.18**	**3.90**
Sediment BV[a]				**0.04**	**0.006**	**0.068**	**0.093**	**2.59**	**0.2**	**2.29**
Soil BV[a]				**0.013[c]**	**0.023[c]**	**0.054[c]**	**na**	**2.59**	**0.2**	**2.29**
Construction Worker SAL[d]				**230**	**230**	**200**	**1,600,000**	**1000**	**130**	**470**
Industrial SAL[d]				**1000**	**1300**	**1200**	**2,400,000**	**3100**	**160**	**710**
Residential SAL[d]				**83**	**84**	**79**	**1700**	**290**	**42**	**150**
RE01-13-38533	01-222	1.0–2.0	QBT3	NA	—	0.24	NA	NA	NA	NA
RE01-13-38522	01-223	0.0–1.0	SOIL	NA	—	7.75	NA	NA	NA	NA
RE01-13-38534	01-223	1.0–2.0	QBT3	NA	—	0.165	NA	NA	NA	NA
RE01-13-38523	01-224	0.0–1.0	SOIL	NA	—	0.522	NA	NA	NA	NA
RE01-13-38535	01-224	1.0–2.0	QBT3	NA	—	1.58	NA	NA	NA	NA
RE01-13-38524	01-225	0.0–1.0	SOIL	NA	0.0281	10.5	NA	NA	NA	NA
RE01-13-38536	01-225	1.0–2.0	SOIL	NA	—	4.26	NA	NA	NA	NA
RE01-13-38525	01-226	0.0–1.0	SOIL	NA	—	21.6 (J)	NA	NA	NA	NA
RE01-13-38537	01-226	1.0–2.0	QBT3	NA	—	7.84	NA	NA	NA	NA
RE01-13-38538	01-227	1.0–2.0	QBT3	NA	—	0.584	NA	NA	NA	NA
RE01-13-38527	01-228	0.0–1.0	SOIL	NA	—	4.14	NA	NA	NA	NA
RE01-13-38539	01-228	1.0–2.0	QBT3	NA	—	0.407	NA	NA	NA	NA
RE01-13-38528	01-229	0.0–1.0	SOIL	NA	—	6.39	NA	NA	NA	NA
RE01-13-38540	01-229	1.0–2.0	QBT3	NA	—	4.37	NA	NA	NA	NA
RE01-13-38529	01-230	0.0–1.0	SOIL	NA	—	22.3	NA	NA	NA	NA
RE01-13-38541	01-230	1.0–2.0	SOIL	NA	—	21.7	NA	NA	NA	NA
RE01-13-38542	01-231	1.0–2.0	SOIL	NA	—	25.6	NA	NA	NA	NA
CALA-16-124462	LA-61505	11.0–12.0	QBT3	—	—	—	—	2.65	0.147	2.87
CALA-16-124463	LA-61505	13.0–14.0	QBT3	—	—	—	—	3.35	0.191	3.04
CALA-16-124464	LA-61505	15.0–16.0	QBT3	—	—	—	—	3.19	0.202	3.06

Notes: Results are in pCi/g. Data qualifiers are presented in Appendix A.

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

[b] na = Not available.

[c] FV applies to soil samples collected from 0–1 ft only.

[d] SALs from LANL (2015, 600929).

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

[f] NA = Not analyzed.

Table 6.14-1
Samples Collected and Analyses Requested at SWMU 01-007(b)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
RE00-08-15764	00-603781	10.0–13.0	QBT3	09-880	09-879	09-880	09-880	09-880	09-880	09-879	09-878	09-879	09-880	09-878	09-878	09-879
RE00-08-15765	00-603781	13.0–15.0	QBT3	09-880	09-879	09-880	09-880	09-880	09-880	09-879	09-878	09-879	09-880	09-878	09-878	09-879
RE00-08-15729	00-603782	5.0–6.5	QBT3	09-880	09-879	09-880	09-880	09-880	09-880	09-879	09-878	09-879	09-880	09-878	09-878	09-879
RE00-08-15730	00-603782	7.5–9.0	QBT3	09-880	09-879	09-880	09-880	09-880	09-880	09-879	09-878	09-879	09-880	09-878	09-878	09-879
RE01-12-880	00-603782	10.0–11.0	QBT3	—[a]	—	—	—	—	—	12-630[b]	—	—	—	12-630[c]	—	—
RE01-12-881	00-603782	13.0–14.0	QBT3	—	—	—	—	—	—	12-630[b]	—	—	—	12-630[c]	—	—
RE00-08-15736	00-603785	1.0–2.0	QBT3	09-121	09-120	09-121	09-121	09-121	09-121	09-120	09-119	09-120	09-121	09-119	09-119	09-120
RE00-08-15737	00-603786	0.0–1.0	SOIL	09-121	09-120	09-121	09-121	09-121	09-121	09-120	09-119	09-120	09-121	09-119	09-119	09-120
RE00-08-15738	00-603786	1.0–2.0	QBT3	09-121	09-120	09-121	09-121	09-121	09-121	09-120	09-119	09-120	09-121	09-119	09-119	09-120
RE00-08-15740	00-603787	1.25–2.25	QBT3	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15741	00-603788	0.0–1.0	SED	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15742	00-603788	1.50–2.5	QBT3	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15743	00-603789	0.0–1.0	SED	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15744	00-603789	2.0–3.0	QBT3	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15746	00-603790	1.0–2.25	QBT3	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE00-08-15747	00-603791	0.0–1.0	SED	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15748	00-603791	1.0–2.0	QBT3	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15749	00-603792	0.0–1.0	SED	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15750	00-603792	1.75–2.75	QBT3	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE01-12-887	00-603792	4.0–5.0	QBT3	—	—	—	—	—	—	12-546[b]	—	—	—	12-546[c]	—	—
RE01-12-886	00-603792	6.0–7.0	QBT3	—	—	—	—	—	—	12-546[b]	—	—	—	12-546[c]	—	—
RE00-08-15751	00-603793	0.0–1.0	SED	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15752	00-603793	1.0–2.0	QBT3	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15753	00-603794	0.0–1.0	SED	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE00-08-15754	00-603794	1.0–2.5	QBT3	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE00-08-15756	00-603795	0.0–1.0	QBT3	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE00-08-15755	00-603795	1.0–2.0	QBT3	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE00-08-15757	00-603796	0.0–1.0	SED	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE00-08-15758	00-603796	1.0–2.0	QBT3	09-78	09-77	09-78	09-78	09-78	09-78	09-77	09-76	09-77	09-78	09-76	09-76	09-77
RE01-12-882	00-603796	3.0–4.0	QBT3	—	—	—	—	—	—	12-532[b]	—	—	—	12-532[c]	—	—
RE01-12-883	00-603796	5.0–6.0	QBT3	—	—	—	—	—	—	12-543[b]	—	—	—	12-543[c]	—	—

Table 6.14-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-Emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (total)
RE00-08-15759	00-603797	0.0–1.0	SED	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE00-08-15760	00-603797	2.25–3.25	QBT3	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE01-12-884	00-603797	4.0–5.0	QBT3	—	—	—	—	—	—	12-543[b]	—	—	—	12-542[c]	—	—
RE01-12-885	00-603797	6.0–7.0	QBT3	—	—	—	—	—	—	12-543[b]	—	—	—	12-542[c]	—	—
RE00-08-15761	00-603798	0.0–1.0	SED	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE00-08-15762	00-603798	2.75–3.75	QBT3	09-92	09-91	09-92	09-92	09-92	09-92	09-91	09-90	09-91	09-92	09-90	09-90	09-91
RE01-12-888	00-603798	4.0–5.0	QBT3	—	—	—	—	—	—	12-543[b]	—	—	—	12-542[c]	—	—
RE01-12-889	00-603798	6.0–7.0	QBT3	—	—	—	—	—	—	12-546[b]	—	—	—	12-546[c]	—	—
RE01-12-874	01-614808	0.0–1.0	SOIL	—	—	—	—	—	—	12-546[b]	—	—	—	—	—	—
RE01-12-875	01-614808	3.0–4.0	QBT3	—	—	—	—	—	—	12-546[b]	—	—	—	—	—	—
RE01-12-876	01-614808	5.0–6.0	QBT3	—	—	—	—	—	—	12-546[b]	—	—	—	—	—	—
RE01-12-877	01-614809	0.0–1.0	SOIL	—	—	—	—	—	—	12-546[b]	—	—	—	—	—	—
RE01-12-878	01-614809	3.0–4.0	QBT3	—	—	—	—	—	—	12-546[b]	—	—	—	—	—	—
RE01-12-879	01-614809	5.0–6.0	QBT3	—	—	—	—	—	—	12-546[b]	—	—	—	—	—	—
RE01-13-38545	01-232	0.0–1.0	SOIL	—	—	—	—	2013-1703	—	—	—	—	—	—	—	—
RE01-13-38549	01-232	1.0–2.0	QBT3	—	—	—	—	2013-1703	—	—	—	—	—	—	—	—
RE01-13-38550	01-233	1.0–2.0	QBT3	—	—	—	—	2013-1703	—	—	—	—	—	—	—	—
RE01-13-38547	01-234	0.0–1.0	SOIL	—	—	—	—	2013-1703	—	—	—	—	—	—	—	—
RE01-13-38551	01-234	1.0–2.0	QBT3	—	—	—	—	2013-1703	—	—	—	—	—	—	—	—
CALA-16-121888	01-235	6.0–7.0	QBT3	—	—	—	—	2016-1418	—	—	—	—	—	—	—	—
CALA-16-121889	01-235	9.0–10.0	QBT3	—	—	—	—	2016-1418	—	—	—	—	—	—	—	—
CALA-16-121890	01-235	10.0–11.0	QBT3	—	—	—	—	2016-1418	—	—	—	—	—	—	—	—

Note: Numbers in analyte columns are request numbers.

[a] — = Analysis not requested.

[b] Samples analyzed for only chromium, nickel, and selenium.

[c] Samples analyzed only for bis(2-ethylhexyl)phthalate.

Table 6.14-2
Inorganic Chemicals above BVs at SWMU 01-007(b)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Calcium	Chromium	Copper	Cyanide (Total)	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2,3,4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**2200**	**7.14**	**4.66**	**0.5**	**11.2**	**1690**	**482**	**6.58**	**na[b]**	**na**	**0.3**
Sediment BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**4420**	**10.5**	**11.2**	**0.82**	**19.7**	**2370**	**543**	**9.38**	**na**	**na**	**0.3**
Soil BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**6120**	**19.3**	**14.7**	**0.5**	**22.3**	**4610**	**671**	**15.4**	**na**	**na**	**1.52**
Construction Worker SSL[c]				**41,400**	**142**	**57.4**	**4390**	**148**	**8,850,000**	**134[d]**	**14,200**	**12.1**	**800**	**1,550,000**	**464**	**753**	**566,000**	**248**	**1750**
Industrial SSL[c]				**1,290,000**	**519**	**21.5**	**255,000**	**2580**	**32,400,000**	**505[d]**	**51,900**	**64.4**	**800**	**5,680,000**	**160,000**	**25,700**	**2,080,000**	**908**	**6490**
Residential SSL[c]				**78,000**	**31.3**	**4.25**	**15,600**	**156**	**13,000,000**	**96.6[d]**	**3130**	**11.2**	**400**	**339,000**	**10,500**	**1560**	**125,000**	**54.8**	**391**
RE00-08-15764	00-603781	10.0–13.0	QBT3	—[e]	—	—	—	—	—	—	—	—	—	—	—	—	0.58	—	0.39 (J)
RE00-08-15765	00-603781	13.0–15.0	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.61	—	0.38 (J)
RE00-08-15729	00-603782	5.0–6.5	QBT3	8450 (J)	—	3.6 (J+)	2480	—	7860 (J)	7.4 (J)	9.6	—	13.2 (J+)	2180 (J)	—	7.8 (J)	0.088 (J)	—	1.6
RE00-08-15730	00-603782	7.5–9.0	QBT3	—	—	—	66.6	—	—	—	5.6	—	—	—	766	15.9	0.085 (J)	—	1.4 (U)
RE01-12-880	00-603782	10.0–11.0	QBT3	NA[f]	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	1.06 (U)
RE01-12-881	00-603782	13.0–14.0	QBT3	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	1.01 (U)
RE00-08-15738	00-603786	1.0–2.0	QBT3	—	0.52 (UJ)	—	—	—	—	19	—	0.51 (U)	—	—	—	8.8	—	—	—
RE00-08-15741	00-603788	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	0.67	—	—
RE00-08-15743	00-603789	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	0.3	—	0.41 (J)
RE00-08-15744	00-603789	2.0–3.0	QBT3	—	—	—	—	—	—	—	—	0.51 (UJ)	—	—	—	—	—	—	0.37 (J)
RE00-08-15746	00-603790	1.0–2.25	QBT3	—	—	—	—	—	—	—	—	0.51 (U)	—	—	—	—	—	—	—
RE00-08-15747	00-603791	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	0.44	—	—
RE00-08-15748	00-603791	1.0–2.0	QBT3	—	—	—	—	—	—	9.9	—	—	—	—	—	—	—	—	0.37 (J)
RE00-08-15749	00-603792	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3	—	0.35 (J)
RE00-08-15750	00-603792	1.75–2.75	QBT3	—	—	—	—	—	—	23.7	—	—	—	—	—	11.9	0.94	0.0077	0.4 (J)
RE01-12-887	00-603792	4.0–5.0	QBT3	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	3.07 (U)
RE01-12-886	00-603792	6.0–7.0	QBT3	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	2.72 (U)
RE00-08-15751	00-603793	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	0.4	—	0.32 (J)
RE00-08-15752	00-603793	1.0–2.0	QBT3	—	—	—	—	—	—	8	—	—	—	—	—	—	—	—	0.41 (J)
RE00-08-15754	00-603794	1.0–2.5	QBT3	—	—	—	—	1.3	—	—	—	—	—	—	—	—	—	—	—
RE00-08-15756	00-603795	0.0–1.0	QBT3	—	0.52 (UJ)	—	—	—	—	—	—	0.52 (U)	—	—	—	—	—	—	—
RE00-08-15758	00-603796	1.0–2.0	QBT3	—	—	—	—	—	—	25.4 (J)	—	0.51 (UJ)	—	—	—	12.7 (J)	—	—	0.73
RE01-12-882	00-603796	3.0–4.0	QBT3	NA	NA	NA	NA	NA	NA	11.6	NA	NA	NA	NA	NA	—	NA	NA	2.99 (U)
RE01-12-883	00-603796	5.0–6.0	QBT3	NA	NA	NA	NA	NA	NA	13.2	NA	NA	NA	NA	NA	—	NA	NA	2.98 (U)
RE00-08-15759	00-603797	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.55 (U)
RE00-08-15760	00-603797	2.25–3.25	QBT3	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	0.96

Table 6.14-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Calcium	Chromium	Copper	Cyanide (Total)	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Selenium
Qbt 2,3,4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**2200**	**7.14**	**4.66**	**0.5**	**11.2**	**1690**	**482**	**6.58**	**na[b]**	**na**	**0.3**
Sediment BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**4420**	**10.5**	**11.2**	**0.82**	**19.7**	**2370**	**543**	**9.38**	**na**	**na**	**0.3**
Soil BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**6120**	**19.3**	**14.7**	**0.5**	**22.3**	**4610**	**671**	**15.4**	**na**	**na**	**1.52**
Construction Worker SSL[c]				**41,400**	**142**	**57.4**	**4390**	**148**	**8,850,000**	**134[d]**	**14,200**	**12.1**	**800**	**1,550,000**	**464**	**753**	**566,000**	**248**	**1750**
Industrial SSL[c]				**1,290,000**	**519**	**21.5**	**255,000**	**2580**	**32,400,000**	**505[d]**	**51,900**	**64.4**	**800**	**5,680,000**	**160,000**	**25,700**	**2,080,000**	**908**	**6490**
Residential SSL[c]				**78,000**	**31.3**	**4.25**	**15,600**	**156**	**13,000,000**	**96.6[d]**	**3130**	**11.2**	**400**	**339,000**	**10,500**	**1560**	**125,000**	**54.8**	**391**
RE01-12-884	00-603797	4.0–5.0	QBT3	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	2.98 (U)
RE01-12-885	00-603797	6.0–7.0	QBT3	NA	NA	NA	NA	NA	NA	15.1	NA	NA	NA	NA	NA	—	NA	NA	0.616 (J)
RE00-08-15762	00-603798	2.75–3.75	QBT3	—	—	—	—	—	—	21.1	—	0.51 (U)	—	—	—	9.9	—	—	—
RE01-12-888	00-603798	4.0–5.0	QBT3	NA	NA	NA	NA	NA	NA	8.39	NA	NA	NA	NA	NA	—	NA	NA	3.04 (U)
RE01-12-889	00-603798	6.0–7.0	QBT3	NA	NA	NA	NA	NA	NA	26.4	NA	NA	NA	NA	NA	11.4	NA	NA	2.91 (U)
RE01-12-874	01-614808	0.0–1.0	SOIL	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	3.04 (U)
RE01-12-875	01-614808	3.0–4.0	QBT3	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	2.79 (U)
RE01-12-876	01-614808	5.0–6.0	QBT3	NA	NA	NA	NA	NA	NA	7.52	NA	NA	NA	NA	NA	—	NA	NA	2.72 (U)
RE01-12-877	01-614809	0.0–1.0	SOIL	NA	NA	NA	NA	NA	NA	41.1	NA	NA	NA	NA	NA	—	NA	NA	2.91 (U)
RE01-12-878	01-614809	3.0–4.0	QBT3	NA	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	NA	—	NA	NA	2.94 (U)
RE01-12-879	01-614809	5.0–6.0	QBT3	NA	NA	NA	NA	NA	NA	17.6	NA	NA	NA	NA	NA	—	NA	NA	2.81 (U)

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

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs from NMED (2015, 600915).

[d] SSLs for total chromium.

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

[f] NA = Not analyzed.

Table 6.14-3
Organic Chemicals Detected at SWMU 01-007(b)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1260	Bis(2-ethylhexyl)phthalate	Chloromethane	Di-n-butylphthalate	Isopropylbenzene	Isopropyltoluene[4-]	Methylene Chloride	Toluene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]
Construction Worker SSL[a]				**85.3**	**5380**	**235**	**26,900**	**2740**	**2740[b]**	**1210**	**14,000**	**1130**	**245[c]**
Industrial SSL[a]				**11.5**	**1830**	**201**	**91,600**	**14,200**	**14,200[b]**	**5130**	**61,300**	**6030**	**240[d]**
Residential SSL[a]				**2.43**	**380**	**41.1**	**6160**	**2360**	**2360[b]**	**409**	**5230**	**1230**	**58[d]**
RE00-08-15764	00-603781	10.0–13.0	QBT3	—[e]	—	0.00029 (J)	—	—	—	—	—	—	—
RE00-08-15729	00-603782	5.0–6.5	QBT3	0.049	—	—	—	0.00012 (J)	—	—	—	—	—
RE00-08-15730	00-603782	7.5–9.0	QBT3	—	0.47	—	—	—	—	—	—	0.00024 (J)	—
RE00-08-15740	00-603787	1.25–2.25	QBT3	0.035	—	—	—	—	—	—	—	—	—
RE00-08-15741	00-603788	0.0–1.0	SED	—	—	—	—	—	—	—	0.00039 (J)	—	—
RE00-08-15743	00-603789	0.0–1.0	SED	—	0.054 (J)	—	—	—	—	—	—	—	—
RE00-08-15744	00-603789	2.0–3.0	QBT3	—	—	—	—	—	—	0.00073 (J)	—	—	—
RE00-08-15746	00-603790	1.0–2.25	QBT3	0.024 (J)	—	—	—	—	—	—	—	—	—
RE00-08-15747	00-603791	0.0–1.0	SED	—	—	—	—	—	—	—	0.00037 (J)	—	—
RE00-08-15748	00-603791	1.0–2.0	QBT3	—	0.055 (J)	—	—	—	—	—	—	—	—
RE00-08-15750	00-603792	1.75–2.75	QBT3	—	—	—	—	—	0.00019 (J)	—	—	—	—
RE00-08-15752	00-603793	1.0–2.0	QBT3	—	—	—	0.036 (J)	—	—	—	—	—	—
RE00-08-15757	00-603796	0.0–1.0	SED	—	—	—	—	—	—	0.00094 (J+)	—	—	—
RE00-08-15759	00-603797	0.0–1.0	SED	—	—	—	—	—	—	—	—	—	0.0004 (J)

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

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Isopropylbenzene used as a surrogate based on structural similarity.

[c] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915)

[d] SSLs from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

[e] — = Not detected.

Table 6.14-4
Radionuclides Detected or Detected above BVs/FVs at SWMU 01-007(b)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239/240
Qbt 2,3,4 BV[a]				**na[b]**	**na**	**na**
Sediment BV[a]				**0.04**	**0.006**	**0.068**
Soil BV[a]				**0.013[c]**	**0.023[c]**	**0.054[c]**
Construction Worker SAL[d]				**230**	**230**	**200**
Industrial SAL[d]				**1000**	**1300**	**1200**
Residential SAL[d]				**83**	**84**	**79**
RE00-08-15736	00-603785	1.0–2.0	QBT3	0.123	—[e]	15.6
RE00-08-15737	00-603786	0.0–1.0	SOIL	—	—	3.5
RE00-08-15738	00-603786	1.0–2.0	QBT3	—	—	1.31 (J)
RE00-08-15740	00-603787	1.25–2.25	QBT3	—	—	4.77
RE00-08-15741	00-603788	0.0–1.0	SED	—	—	3.96
RE00-08-15743	00-603789	0.0–1.0	SED	—	—	1.28
RE00-08-15744	00-603789	2.0–3.0	QBT3	—	—	0.993 (J)
RE00-08-15746	00-603790	1.0–2.25	QBT3	—	—	7.75
RE00-08-15747	00-603791	0.0–1.0	SED	—	—	8.54
RE00-08-15748	00-603791	1.0–2.0	QBT3	—	—	6.35
RE00-08-15749	00-603792	0.0–1.0	SED	—	—	1.3 (J)
RE00-08-15750	00-603792	1.75–2.75	QBT3	—	—	0.49 (J)
RE00-08-15751	00-603793	0.0–1.0	SED	0.22	—	20.1
RE00-08-15752	00-603793	1.0–2.0	QBT3	—	—	0.596 (J)
RE00-08-15753	00-603794	0.0–1.0	SED	—	—	3.76
RE00-08-15759	00-603797	0.0–1.0	SED	0.24	—	9.07
RE00-08-15760	00-603797	2.25–3.25	QBT3	—	—	0.382
RE00-08-15761	00-603798	0.0–1.0	SED	—	—	0.471
RE01-13-38545	01-232	0.0–1.0	SOIL	NA[f]	—	1.88 (J)
RE01-13-38549	01-232	1.0–2.0	QBT3	NA	—	0.135
RE01-13-38550	01-233	1.0–2.0	QBT3	NA	—	8.46
RE01-13-38547	01-234	0.0–1.0	SOIL	NA	—	7.04
RE01-13-38551	01-234	1.0–2.0	QBT3	NA	0.0367	17
CALA-16-121888	01-235	6.0–7.0	QBT3	NA	—	6.07
CALA-16-121889	01-235	9.0–10.0	QBT3	NA	—	9.53
CALA-16-121890	01-235	10.0–11.0	QBT3	NA	—	3.63

Notes: Results are in pCi/g. Data qualifiers are presented in Appendix A.
[a] BVs/FVs from LANL (1998, 059730).
[b] na = Not available.
[c] FV applies to soil samples collected from 0–1 ft only.
[d] SALs from LANL (2015, 600929).
[e] — = Not detected or not detected above BV/FV.
[f] NA = Not analyzed.

Table 8.1-1
Summary of Investigation Results and Recommendations

SWMU/AOC	Brief Description	Nature and Extent Defined?	Potential Unacceptable Risk?	Recommendation
01-001(d1)	Waste Line for Septic Tank 138	Yes	No	Corrective action complete without controls
01-001(s1)	Portion of WSWL within the Former LA Inn Property	Yes	No	Corrective action complete without controls
01-002(a1)-00	Portion of Industrial Waste Line within the Former LA Inn Property	Yes	No	Corrective action complete without controls
01-003(b1)	Portion of Surface Disposal Area within the Former LA Inn Property	Yes	No	Corrective action complete without controls
01-006(b)	Drainline and Outfall	Yes	No	Corrective action complete without controls
01-006(c)	Drainlines and Outfalls	Yes	No	Corrective action complete without controls
01-006(h1)	Portion of Storm Water Drainage System within the Former LA Inn Property	Yes	No	Corrective action complete without controls
01-006(n)	Storm Water Drainage System	Yes	No	Corrective action complete without controls
01-007(a)	Suspected Subsurface Soil Radiological Contamination	Yes	No	Corrective action complete without controls
01-007(b)	Suspected Subsurface Soil Radiological Contamination	Yes	No	Corrective action complete without controls

Appendix A

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

A-1.0 ACRONYMS AND ABBREVIATIONS

AK	acceptable knowledge
ALARA	as low as reasonably achievable
AOC	area of concern
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	area use factor
bgs	below ground surface
BMP	best management practice
BV	background value
CCV	continuing calibration verification
COC	chain of custody
Consent Order	Compliance Order on Consent
COPEC	chemical of potential ecological concern
COPC	chemical of potential concern
CVAA	cold vapor atomic absorption
DAF	dilution attenuation factor
DL	detection limit
DGPS	differential global positioning system
DOE	Department of Energy (U.S.)
DOT	Department of Transportation (U.S.)
dpm	disintegrations per minute
Eh	oxidation-reduction potential
EPA	Environmental Protection Agency (U.S.)
EPC	exposure point concentration
EQL	estimated quantitation limit
ESH	Environment, Safety, and Health
ESL	ecological screening level
FV	fallout value
GC/MS	gas chromatography mass spectrometry
GNSS	global navigation satellite system
GPS	global positioning system
HI	hazard index
HQ	hazard quotient
HR	home range

ICS	interference check sample
ICV	initial calibration verification
I.D.	inside diameter
ID	identification
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
LA	Los Alamos
LAL	lower acceptance limit
LANL	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory
LCS	laboratory control sample
LLW	low-level waste
LOAEL	lowest observed adverse effect level
MDA	material disposal area
MDL	method detection limit
mm Hg	millimeters of mercury
MS	matrix spike
MSW	municipal solid waste
NMED	New Mexico Environment Department
NOAEL	no observed adverse effect level
PAH	polycyclic aromatic hydrocarbon
PAUF	population area use factor
PCB	polychlorinated biphenyl
PID	photoionization detector
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCT	radiological control technician
RESRAD	residual radioactivity (computer code)
RfD	reference dose
RFI	Resource Conservation and Recovery Act facility investigation

RWP	Radiological Work Permit
SAL	screening action level
SCL	sample collection log
SF	slope factor
SMO	Sample Management Office
SOP	standard operating procedure
SOW	statement of work
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
T&E	threatened and endangered
TA	technical area
TAL	target analyte list
TPMC	TerranearPMC
TRV	toxicity reference value
UAL	upper acceptance limit
UCL	upper confidence limit
UTL	upper tolerance limit
VOC	volatile organic compound
WCSF	waste characterization strategy form
WSWL	western sanitary waste line

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 parameters.

Appendix B

Field Methods

B-1.0 INTRODUCTION

This appendix summarizes field methods used during the 2008, 2009, 2012, 2013, 2015, and 2016 investigations of sites within the former Los Alamos (LA) Inn property, which are part of the Upper Los Alamos Canyon Aggregate Area at the Los Alamos National Laboratory (LANL or Laboratory). Table B-1.0-1 provides a general summary of methods used, and the following sections provide more detailed description of the field methods. All activities were conducted in accordance with the applicable Associate Directorate for Environmental Management standard operating procedures (SOPs) and quality procedures, which are listed in Table B-1.0-2 and are available at http://www.lanl.gov/environment/plans-procedures.php.

B-2.0 EXPLORATORY DRILLING CHARACTERIZATION

No exploratory drilling characterization was conducted. All drilling was conducted for the purpose of collecting investigation samples.

B-3.0 FIELD-SCREENING METHODS

This section summarizes the field-screening methods used during the investigation activities. Samples were screened in the field for organic vapors and for radioactivity. Samples collected by hand methods (hand auger or spade and scoop) were screened in collection bowls or sample containers after the samples were collected. Cores collected by split-spoon core barrel were screened immediately upon opening the core barrel. Screening results were recorded on the corresponding sample collection log (SCL)/chain-of-custody (COC) forms at the time of sample collection. The SCL/COCs are provided in Appendix E. The field-screening results are presented in Table 3.6-1 of the investigation report.

B-3.1 Field Screening for Organic Vapors

Each sample was field-screened for organic vapors using a MiniRae 2000 or Ion Science PhoCheck 2000+ photoionization detector (PID) with 11.7 electronvolt lamp. The PID was subject to bench calibration yearly by the vendor and field calibrated daily by field personnel using a standard source of 100 ppm isobutylene. All daily calibration procedures for the PID met the manufacturer's specifications for standard reference gas calibration and the requirements of SOP-5006, Control of Measuring and Test Equipment. Results of PID screening are presented for each sample in Table 3.6-1 of the investigation report.

No organic vapors were detected at more than 10 ppm above ambient air during PID screening of subsurface cores. No changes to sampling or other activities occurred as a result of field-screening results.

B-3.2 Field Screening for Radioactivity

Each sample was field screened immediately at collection for gross alpha and beta/gamma radiation using an Eberline E-600 with an SHP-380AB alpha/beta scintillation detector or a ThermoFisher Model SHP-380 with Eberline Model E600 Geiger Counter held within 1 in. of the sample. Radiological field screening of all samples was conducted by Laboratory radiological control technicians (RCTs) using appropriately calibrated instruments. Calibration of radiological instruments was performed and documented by the RCTs. All calibrations performed met the manufacturer's specifications, the

requirements of SOP-5006, and the applicable radiation detection instrument manual. Field radiation-screening results are presented in Table 3.6-1.

No radiological screening results exceeded twice the daily site background levels. No changes to sampling or other activities occurred as a result of field-screening results.

B-4.0 FIELD-INSTRUMENT CALIBRATION

All instruments were calibrated before use. Calibration of the PIDs was conducted at least daily by the site crew. Calibration of the radiation screening instruments was conducted by the RCT. All calibrations were performed according to the manufacturer's specifications and requirements.

B-4.1 PID Instrument Calibration

The PIDs were calibrated both to ambient air and a standard reference gas (100 ppm isobutylene). The ambient-air calibration determined the zero point of the instrument sensor calibration curve in ambient air. Calibration with the standard reference gas determined a second point of the sensor calibration curve. Each calibration was within 3% of 100 ppm isobutylene, qualifying the instrument for use.

The following calibration information was recorded daily on operational calibration logs:

- instrument identification number
- final span settings
- date and time
- concentration and type of calibration gas used (isobutylene at 100 ppm)
- name of the personnel performing the calibration

All daily calibration procedures for the PIDs met the manufacturer's specifications for standard reference gas calibration and the requirements of SOP-5006, Control of Measuring and Test Equipment.

B-4.2 Radiation Instrument Calibration

The radiation screening instruments were 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 met the manufacturer's specifications, the requirements of SOP-5006, and the applicable radiation detection instrument manual.

B-5.0 SURFACE AND SUBSURFACE SAMPLING

This section summarizes the methods used for collecting surface and subsurface samples, including soil, fill, tuff, and sediment samples.

B-5.1 Surface Sampling Methods

Surface samples were collected in 2008, 2009, 2012, and 2013 using either hand-auger or spade and scoop methods. Surface samples were collected in accordance with SOP-06.10, R3, Hand Auger and Thin-Wall Tube Sampler or SOP-06.09, Spade and Scoop Method for Collection of Soil Samples. A hand auger or spade and scoop were used to collect material in approximately 6-in. increments. A stainless-steel scoop and bowl were used to homogenize the samples that were transferred to sterile sample collection jars or bags. Samples were preserved using coolers to maintain the required temperature and by using chemical preservatives such as nitric acid, as required by EP-ERSS-SOP-5056, Sample Containers and Preservation.

In 2015 and 2016, surface and shallow subsurface soil, tuff, and sediment samples were collected in accordance with TerranearPMC (TPMC) SOP-20069, equivalent to ER-SOP-20069, R0, Soil, Tuff, and Sediment Sampling. At Area of Concern (AOC) 01-003(b1) and Solid Waste Management Unit (SWMU) 01-007(b), a stainless-steel hand auger was used to collect material in approximately 6-in. increments.

Samples for volatile organic chemical (VOC) analysis were collected immediately to minimize loss of VOCs during the sample-collection process. Sample bottles were filled as completely as possible to eliminate headspace and potential loss of VOCs. After collection of the VOC samples, a stainless-steel scoop and bowl were used to homogenize the samples for the remaining analytical suites, which were then transferred to sterile sample collection jars or bags for transport to the SMO.

Samples were appropriately labeled, sealed with custody seals, and documented before transporting to the Sample Management Office (SMO). Samples were managed according to EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples, and EP-ERSS-SOP-5058, Sample Control and Field Documentation.

Sample collection tools were decontaminated (see section B-5.7) immediately before collection of each sample in accordance with SOP-5061, Field Decontamination of Drilling and Sampling Equipment.

B-5.2 Subsurface Tuff Sampling Methods

Subsurface samples were collected in 2008, 2009, 2012, and 2013 using a hand auger in accordance with SOP-06.10, or using a hollow-stem auger drill rig in accordance with SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials. Borehole samples were collected in a stainless-steel split-spoon core-barrel sampler, transferred to a stainless-steel bowl, and then transferred to sterile sample collection jars.

In 2015 and 2016, subsurface samples were collected at SWMUs 01-001(d1), 01-001(s1), 01-006(h1), and 01-007(a) using a hollow-stem Gefco Strata Star 10 auger rig equipped with a 6 in. diameter split-spoon core barrel sampler. Samples were collected in accordance with TPMC SOP-20069, equivalent to ER-SOP-20069, R0, Soil, Tuff, and Sediment Sampling. The sample material was transferred from the split-spoon to a stainless-steel bowl and then transferred to sterile sample collection jars.

Samples were appropriately labeled, sealed with custody seals, and documented before transport to the SMO. Samples were managed according to EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples, and EP-ERSS-SOP-5058, Sample Control and Field Documentation.

Core retrieved from the subsurface was field screened for organic vapors and radioactivity and was visually inspected and logged. Following inspection, the core section to be sampled was removed from the core barrel and placed in a stainless-steel bowl.

Samples for VOC analysis were collected immediately to minimize loss of subsurface VOCs during the sample-collection process. Sample bottles were filled as completely as possible to eliminate headspace and potential loss of VOCs. After collection of the VOC samples, a stainless-steel scoop and bowl were used to homogenize the samples for the remaining analytical suites, which were then transferred to sterile sample collection jars or bags for transport to the SMO.

The tools used to collect samples were decontaminated (see section B-5.7) immediately before each sample was collected in accordance with SOP-5061.

B-5.3 Quality Control Samples

In 2008, 2009, 2012, and 2013, quality control (QC) samples were collected in accordance with SOP-5059, Field Quality Control Samples. QC samples included field duplicates, field rinsate blanks, and field trip blanks. Field duplicate samples were collected from the same material as a regular investigation sample 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, sampling bowls and spoons) after it was decontaminated 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, perchlorate, and total cyanide) and were collected from sampling equipment at a frequency of at least 1 rinsate sample for every 10 solid samples.

Field trip blanks also were collected at a frequency of 1 per 10 samples when samples were collected for VOC analysis. Trip blanks consisted of containers of certified clean sand opened and kept with the other sample containers during the sampling process.

In 2015 and 2016, quality assurance/QC samples were collected in accordance with TPMC SOP-20235, adapted from ER-SOP-20235, R0, Sample Containers, Preservation, and Field Quality Control. Field duplicate samples were collected at a frequency of at least 1 per 10 samples (10%) or 1 per day. Field rinsate samples were also collected at a frequency of at least 1 per day for samples analyzed for metals. Field trip blanks were collected at a frequency of at least 1 per day if the samples were analyzed for VOCs.

B-5.4 Sample Documentation and Handling

In 2008, 2009, 2012, and 2013, 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 SOP-5057 and with SOP-5056, Sample Containers and Preservation. Samples were transported to the SMO for processing and shipment to off-site contract analytical laboratories. The SMO personnel reviewed and approved the SCL/COC forms and accepted custody of the samples.

In 2015 and 2016, field personnel completed a SCL/COC form for each sample. Sample containers were sealed with signed COC seals and placed in coolers at approximately 4°C. Samples were preserved as required, handled and shipped in accordance with TPMC SOP-20236, Handling, Packaging, and Transporting Field Samples, equivalent to ER-SOP-20236, R0, and TPMC SOP-20235, Sample Containers, Preservation, and Field Quality Control, equivalent to ER-SOP-20235, R0. Samples were transported to the SMO in sealed coolers containing ice packs, and shipped from the SMO to the analytical laboratory. The SMO personnel reviewed and approved the SCL/COC forms before taking custody of the sample.

B-5.5 Borehole Abandonment

All boreholes were abandoned in accordance with SOP-5034, "Monitoring Well and Borehole Abandonment," by filling the boreholes with a bentonite/concrete mixture. A tremie pipe was used to fill the boreholes upward from the bottom of the boreholes to the surface. All cuttings were managed as investigation-derived waste (IDW) as described in Appendix C. Shallow borings in this investigation were abandoned by placing bentonite chips in the borehole up to 2.0 to 3.0 ft from the ground surface. The chips were hydrated and clean soil was placed on top. Pavement was patched as necessary depending on existing site conditions.

B-5.6 Decontamination of Sampling Equipment

In 2008, 2009, 2012, and 2013, the split-spoon core barrels and all other sampling equipment that made (or could have made) contact with sample material were decontaminated after each core was retrieved and logged. Decontamination included wiping the equipment with Fantastik and paper towels. Decontamination of the drilling equipment was conducted before mobilization of the drill rig to another borehole to avoid cross-contamination between samples and borehole locations. 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 SOP-5061, and field rinsate blank samples were collected in accordance with SOP-5059.

In 2015 and 2016, all sampling equipment was decontaminated immediately before each sample was collected to avoid outside contamination and cross-contamination between samples. Decontamination included cleaning the equipment with Fantastik and clean paper towels. To evaluate decontamination activities, field rinsate samples were collected in accordance with TPMC-SOP-7007, Field Decontamination of Equipment, equivalent to EP-ERSS-SOP-5061, R1, and TPMC-SOP-20235, Sample Containers, Preservation, and Field Quality Control, equivalent to ER-SOP-20235, R0.

B-5.7 Geodetic Surveying

In 2008, 2009, 2012, and 2013, geodetic surveys of all sample locations were performed by a certified surveyor using a Trimble RTK 5700 differential global positioning system (DGPS) referenced from published and monumented external Laboratory survey control points in the vicinity. All sampling locations were surveyed in accordance with SOP-5028, Coordinating and Evaluating Geodetic Surveys. Horizontal accuracy of the monumented control points is within 0.1 ft. The DGPS instrument referenced from Laboratory control points is accurate within 0.2 ft. The surveyed coordinates are presented in Table 3.1-1 of the investigation report.

In 2015 and 2016, global positioning system (GPS) surveying was conducted with a Javad Triumph-1 Global Navigation Satellite System (GNSS) coupled with a Juniper Allegro2 Controller. This system was used to stake sampling locations, locations to be left unexcavated (i.e., uncontaminated locations),

locations excavated, excavation boundaries as defined by the scope of work, pre- and post-excavation topographic elevations. Surveying activities were performed in accordance with Engineering Standards Manual ISD 341-2 Ch. 3 G10-30 GEN, General Civil Requirements. The surveyed coordinates for all sampling locations are presented in Table 3.1-1.

If a planned sampling location needed to be offset because of surface or subsurface obstructions, the relocated point was resurveyed.

B-6.0 EXCAVATION AND SITE RESTORATION

Plutonium-239/240–contaminated soil was excavated from SWMUs 01-006(b), 01-007(a), and 01-007(b). A CAT 303.5E CR mini excavator was used for most of the excavation and restoration work. At the deeper excavation associated with SWMU 01-006(b), a Kobelco ED160 excavator with extended reach was used to achieve a depth of 10 ft. A Yanmar crawler carrier, or CAT front-end loader was used to transport clean fill and topsoil to the excavation sites, where necessary. Whenever clean fill was used to restore an excavation, it was compacted either by the excavator or mini excavator in 6-in. lifts to 6 in. belowgrade, and a pocket penetrometer was used to confirm that fill compaction exceeded 4.5 tons/ft^2 before application of clean topsoil. Coir Net coconut erosion-control matting was installed according to ADEP-SPEC-C-32-9219 and the product's specifications. Clean fill, clean topsoil, and erosion-control matting were used in restoration at some excavation areas, while other excavation areas used local native material (i.e. nearby cobbles, brush, and/or logs) for restoration.

B-6.1 Radiological Controls

Adherence to Radiological Work Permit (RWP) ID 2016-0148 was required for excavations associated with SWMU 01-006(b), where the maximum soil activity was 467 pCi/g. Every day when excavation occurred at SWMU 01-006(b), the RCT conducted an RWP briefing for personnel assigned to assist in excavation or waste container sealing activities. The RWP required the following: (1) air sampling was conducted during excavation activities; (2) the RCT was dressed in Level 1 personal protective equipment (PPE) to screen the filled waste container before sealing; (3) personnel sealing the waste container wore Tyvek boot covers and nitrile gloves; and 4) following waste container sealing, an RCT screened and released the outside of the waste container before it was transported offsite.

Screening smears taken by the RCT were counted by the Ludlum Model 3030 Alpha Beta Sample Counter for detection of removable alpha and beta contamination; an Eberline Model RO-20 Ion Chamber was used for beta and gamma contamination dose rate surveys on sealed waste bags; Eberline Model ESP-1 NRD Meter was used for neutron dose surveys on sealed waste bags; and a ThermoFisher Model SHP-380, with Eberline Model E600 Geiger Counter, was used for direct screening of alpha and beta contamination both before and after waste bag sealing and for screening personnel after removal of Level-1 PPE or gloves and boot covers. For all SWMUs, any tools and personnel entering an excavation or exclusion area were screened out by an RCT.

At all excavations, an RCT performed direct screening of alpha and beta contamination on the filled, open waste containers before bag closure was approved. After sealing the container according to manufacturer's specifications, an RCT performed a direct screen for alpha and beta contamination, screened all sides of the closed bag for removable alpha and beta contamination, and performed a beta and gamma contamination dose rate survey and a neutron dose survey before releasing the container for transfer to the flatbed trailer. Personnel sealing the waste bags wore nitrile gloves and Tyvek boot covers, as did any personnel entering the areas being remediated.

B-6.2 SWMU 01-006(b)

During the Phase II investigation, soil and tuff containing elevated activities of plutonium-239/240 were excavated (approximately 8 yd^3) until activities were below the residential screening action level. Soil removal occurred at locations 00-604224, 00-604225, and 00-604237 to depths of 1.0 ft below ground surface (bgs) at location 00-604224; 4.0 ft bgs at location 00-604225; and 6.0 ft bgs at location 00-604237. Confirmation samples were collected following soil removal and analyzed for isotopic plutonium.

In 2016, approximately 50.6 yd^3 of plutonium-239/240 contaminated soil was removed from two areas. The larger, northern excavation had final dimensions of 13 ft wide × 13 ft long × 10 ft deep; the smaller excavation, at and around location 01-204, had final dimensions of 2.5 ft × 4.5 ft × 5 ft. The larger excavation was bounded by locations 01-201, 01-203, 01-205, and 01-207. Confirmation samples or samples previously collected were used to verify the lateral and vertical extent of the excavations. In addition, topography, terrain, and vegetation often restricted access to areas on the canyon slope and determined the areas remediated. Further excavation laterally and downgradient of location 01-204 was restricted because of terrain and obstacles, such as trees and boulders, and the steep topography. The excavation was bounded to the north by location 01-254. Approximately 47.4 yd^3 of material was excavated at the larger, northern location, and approximately 3.2 yd^3 of material was excavated at and around location 01-204.

A CAT 303.5E CR mini excavator was used to excavate the smaller area and was initially used to excavate the larger, northern excavation. However, because of the requirement to reach the depth of 10 ft and the position of the excavator the Kobelco ED160 excavator with extended reach was used to complete the excavation to the depth of 10 ft. Deeper excavation at the larger, northern area was restricted by the capability of the excavator as well as limited safe access to the site. The excavation area was on a steep canyon slope and required construction of an earthen pad to support the excavator. The 10-ft excavation depth was at the limit of the extended reach of the excavator, and deeper excavation was not technically feasible or safe. Excavated material was placed in 1.77-yd^3 soft-sided IP-1 bags fitted with 10-mil inner plastic liners and supported in a loading frame. The filled waste bags were approved for closure by the RCT, the inner liner was sealed per manufacturer's instructions, the bags were zipped shut, and the outside of bags was screened and released by the RCT. The released bags were removed from the loading frame with a 10-point lifting frame secured to the CAT TL943C telehandler, which took the bags up the access ramp and placed them on a flatbed for transit off-site.

Dimensions of the larger, northern excavation were verified using the Javad GPS system. Personnel approaching the open, 10 ft deep excavation to verify its dimensions donned Level 1 PPE and appropriate fall protection. GPS points defining the shape of the excavation were captured without incident. Dimensions of the excavation at location 01-204 were verified using a measuring tape, and without the need to be within a proximity that would require fall protection.

Restoration at SWMU 01-006(b) consisted of clean fill, topsoil, fertilizer, seed, and erosion-control matting. Fill was placed by the front-end loader and compacted by the excavator in 6-in. lifts up to 6 in. belowgrade. Topsoil was placed above the fill after compaction testing was complete and then fertilizer, seed, and erosion-control matting were applied. Fertilizer and seed were applied in accordance with ADEP-SPEC-C-32-9219, Environmental Programs Specification for Seeding, and matting was installed in accordance with the March 2011 "Los Alamos National Laboratory Storm Water BMP [Best Management Practice] Manual" and the product's specifications.

B-6.3 SWMU 01-007(a)

Approximately 31.75 yd^3 of plutonium-239/240 contaminated soil was removed from three areas using a CAT 303.5E CR mini excavator. Material removed from each excavation was placed in 1-yd^3 self-supporting bags set within the 1.77-yd^3 loading frame. SWMU 01-007(a) was not included in the RWP. However, an RCT was present during all excavation activities and screened the waste bags before sealing. Personnel sealing the bags wore Tyvek boot covers and nitrile gloves. After the bags were sealed, an RCT screened and released the outside of the bags before they were transferred to a flatbed trailer for transit off-site.

The area at and around location 00-604231 was excavated to 10 ft × 10 ft × 1 ft; at and around location 01-227 was excavated to 2 ft 3 in. × 2 ft 3 in. × 1 ft; and the excavation associated with locations 00-604233 and 01-231 was excavated to 31 ft × 26 ft × 1 ft. Confirmation samples or samples previously collected were used to verify the lateral and vertical extent of the excavations. In addition, topography, terrain, and vegetation often restricted access to areas on the canyon slope and determined the areas remediated. The excavation at and around location 00-604231 was bounded by locations 01-221, 01-222, 01-228, and 01-229. When location 00-604233 was surveyed in the field, the coordinates were located on a broad boulder without any clear indication (within a foot of the survey) of where the previous sample had been collected. Uncontaminated locations 01-226, 01-230, and 01-225 were used as the south, west, and north bounding locations for the larger excavation. The eastern bound of the expanded excavation was 1 ft east of location 01-231. Further excavation to the east of location 01-231 was restricted because of terrain and obstacles, such as trees and boulders.

The Javad GPS system was used to verify that the larger, expanded excavation associated with locations 00-604233 and 01-231 was complete; GPS points were recorded and compared with preexcavation topographic points. All tools entering an excavation were screened by an RCT and personnel entering the excavation wore Tyvek boot covers and nitrile gloves when inside the excavation area. Personnel leaving an excavation or exclusion area were screened out by an RCT.

Restoration was completed at location 00-604231 with 1.5 yd^3 of clean fill compacted in one 6-in. lift, then 1.5 yd^3 of topsoil was placed to bring the excavation level with existing grade. Topsoil was seeded, fertilized, and raked before erosion-control matting was installed. The excavation at and around location 01-227 and the excavation associated with locations 00-604233 and 01-231 were restored using only local, native materials (e.g., cobbles, brush, and logs).

B-6.4 SWMU 01-007(b)

Approximately 7 yd^3 of plutonium-239/240 contaminated soil was removed from four areas. The excavation associated with locations 01-233 and 00-603787 was 19 ft × 12 ft × 1 ft; at and around location 00-603790 was excavated to 3 ft 6 in. × 3 ft 6 in. × 1 ft; at and around location 00-603785 was excavated to 3 ft × 3 ft x 1 ft; and at and around location 01-235 was excavated to 3 ft × 5.5 ft × 6 ft. Confirmation samples or samples previously collected were used to verify the lateral and vertical extent of the excavations. In addition, topography, terrain, and vegetation often restricted access to areas on the canyon slope and determined the areas remediated.

A CAT 303.5E CR mini excavator was used for excavations centered on locations 00-603790 and 01-235. Hand tools (shovels and spades) were used at all other locations. Excavated material was placed in 1-yd^3 self-supporting bags, approved for sealing by the RCT, sealed, and released by RCT after the exterior of the bags was screened. The waste bags were transferred to a flatbed for transit off-site.

Dimensions were verified by measuring tape and all tools, including heavy equipment, were screened and released by an RCT after an excavation was completed.

Restoration at SWMU 01-007(b) was completed at three of four locations using only local, native materials (e.g., cobbles, brush, and logs). At location 01-235, 3.25 yd^3 of clean fill was compacted in 6-in. lifts up to 6 in. belowgrade. Local soil was used to bring the excavated area to grade without changing the slope of the overall area or leaving a dip in the road.

B-7.0 IDW STORAGE AND DISPOSAL

The IDW was managed in accordance with the waste characterization strategy form and TPMC-SOP-7016, Characterization and Management of Environmental Program Waste, equivalent to EP-DIR-SOP-10021, R1, Characterization and Management of Environmental Programs Waste. The 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. Details of IDW management for the Upper Los Alamos Canyon Aggregate Area investigations are presented in Appendix C.

All excavated media resulting from the 2016 site remediation were placed in either 1.0-yd^3 self-supporting IP-1 containers or 1.77-yd^3 soft-side IP-1 containers positioned in a loading frame. Once filled, the open container was screened by an RCT before it was approved for sealing. After the container was sealed, an RCT screened all sides before releasing it for transfer to a flatbed trailer using the telehandler. At the end of each day, the waste was transferred to Technical Area 21 for temporary storage within a posted radiological waste storage area before final disposition. All waste containers were placed on bermed secondary containment and covered with heavy tarps for additional protection from the elements. Waste bags were shipped to Energy Solutions in Clive, Utah, in 10 shipments.

B-8.0 DEVIATIONS

The following deviations from the approved work plan or proposed activities were made as a result of site conditions encountered during sampling activities.

- SWMU 01-007(b): Locations 01-233 and 01-234 were relocated 26 ft south and 10 ft south, respectively, because of a health and safety hazard (cliff face).
- Because of obstructions, concrete, or borehole/hand-auger refusal, and health and safety concerns, several sampling locations were moved slightly from the planned locations. These sampling locations were resurveyed and all coordinates were recorded and uploaded appropriately.

Table B-1.0-1
Summary of Field Investigation Methods

Method	Summary
Spade and Scoop Collection of Soil Samples	This method is typically used for collection of shallow (i.e., approximately 0.0 to 1.0 ft) soil or sediment samples. The spade-and-scoop method involves digging a hole to the desired depth, as prescribed in the investigation work plan, and collecting a discrete grab sample. The sample is typically placed in a clean stainless-steel bowl for transfer into various sample containers.
Hand Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10.0 to 15.0 ft but in some cases may be used for collecting samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3.0 to 4.0 in. inside diameter [I.D.]), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth was reached, the auger was decontaminated before the hole was advanced through the sample depth. The sample material was transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers were filled.
Split-Spoon Core-Barrel Sampling	In this method, a stainless-steel core barrel (typically 4-in. I.D., 2.5 ft long) is advanced using a powered drilling rig. The core barrel extracts a continuous length of soil and/or rock that can be examined as a unit. The split-spoon core barrel is a cylindrical barrel split lengthwise so the two halves can be separated to expose the core sample. Once extracted, the section of core was screened for radioactivity and organic vapors, and described in a geologic log. A portion of the core was then collected as a discrete sample from the desired depth.
Handling, Packaging, and Shipping of Samples	Field team members sealed and labeled samples before packing to ensure the sample containers and the transport containers were free of external contamination. Field team members packaged all samples to minimize the possibility of breakage during transportation. After all environmental samples were collected, packaged, and preserved, a field team member transported them to the SMO. The SMO arranged for shipping the samples to analytical laboratories.
Sample Control and Field Documentation	The collection, screening, and transport of samples were documented on standard forms generated by the SMO. These included SCLs, COC forms, and sample container labels. SCLs were completed at the time of sample collection and the logs were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around each sample container. COC forms were completed and signed to verify the samples had not been left unattended.
Field Quality Control Samples	Field QC samples were collected as follows. *Field duplicates*: at a frequency 10%; collected at the same time as a regular sample and submitted for the same analyses *Equipment rinsate blank*: at a frequency of 10%; collected by rinsing sampling equipment with deionized water, which was collected in a sample container and submitted for laboratory analysis *Trip blanks*: required for all field events, including collecting samples for VOC analysis. Trip blanks containers of certified clean sand were opened and kept with the other sample containers during the sampling process.
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination was used to minimize the generation of liquid waste. Dry decontamination included the use of a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes.

Table B-1.0-1 (continued)

Method	Summary
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample were printed in the SCLs provided by the SMO (size and type of container [e.g., glass, amber glass, and polyethylene]). All samples were preserved by being placed in insulated containers with ice to maintain a temperature of 4˚C.
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys focused on obtaining survey data of acceptable quality for use during project investigations. The survey data conformed to Laboratory Information Architecture project standards IA-CB02, GIS Horizontal Spatial Reference System, and IA-D802, Geospatial Positioning Accuracy Standard for A/E/C/ and Facility Management. All coordinates were expressed as State Plain Coordinate System 83, NM Central, U.S. feet coordinates. All elevation data were reported relative to the National Geodetic Vertical Datum of 1983.
Management of Environmental Restoration Project Waste, Waste Characterization	IDW is managed, characterized, and stored in accordance with an approved waste characterization strategy form that documents site history, field activities, and the characterization approach for each waste stream managed. Waste characterization complied with on- or off-site waste acceptance criteria. All stored IDW was marked with appropriate signage and labels. Drummed IDW was stored on pallets to prevent deterioration of containers. A waste storage area was established before waste was generated. Waste storage areas located in controlled areas of the laboratory to prevent unauthorized personnel from inadvertently adding or managing wastes. Each container of waste generated was individually labeled with the waste classification and item identification number and as radioactive (if applicable), immediately following containerization. All waste was segregated by classification and compatibility to prevent cross-contamination. Management of IDW is discussed in Appendix C.

Table B-1.0-2
Quality Procedures and Standard Operating Procedures
Used for the Investigation Activities at Former Los Alamos Inn Property Sites

P101-17, R1, Excavation/Fill/Soil Disturbance Permit Process
P101-18, R2, Procedure for Pause/Stop Work
P315, R3, Conduct of Operations Manual
P409, R4, Waste Management
SOP-5006, Control of Measuring and Test Equipment
EP-ERSS-SOP-5018, Integrated Fieldwork Planning and Authorization
EP-DIR-SOP-10021, R1, Characterization and Management of Environmental Programs Waste
EP-ERSS-SOP-5028, Coordinating and Evaluating Geodetic Surveys
SOP-5034, Monitor Well and RFI Borehole Abandonment
EP-ERSS-SOP-5055, General Instructions for Field Investigations
EP-ERSS-SOP-5056, Sample Containers and Preservation
EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples
EP-ERSS-SOP-5058 Sample Control and Field Documentation
EP-ERSS-SOP-5059 Field Quality Control Samples
SOP-5061, Field Decontamination of Equipment
SOP-06.09, Spade and Scoop Method for Collection of Soil Samples
SOP-06.10, Hand Auger and Thin-Wall Tube Sampler
SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials
SOP-06.33, Headspace Vapor Screening with a Photoionization Detector
SOP-5181, Notebook Documentation for Environmental Restoration Technical Activities
WES-EDA-QP-219, Sample Control and Field Documentation
ER-SOP-20069, R0, Soil, Tuff, and Sediment Sampling
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

Investigation-Derived Waste Management

C-1.0 INTRODUCTION

This appendix contains the waste management records for the investigation-derived waste (IDW) generated during the implementation of the Phase I, II, and subsequent sampling and remediation activities for the Upper Los Alamos Canyon Aggregate Area including sites within the former Los Alamos (LA) Inn property at Los Alamos National Laboratory (LANL or the Laboratory).

All IDW generated during the 2016 investigation was managed in accordance with TPMC-SOP-7016, Characterization and Management of Environmental Program Waste, equivalent to EP-DIR-SOP-10021, R1, Characterization and Management of Environmental Programs 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, WCSF amendments, and waste profile forms, are included in this appendix as Attachment C-1 (on CD included with this document).

The selection of waste containers was based on appropriate U.S. Department of Transportation (DOT) requirements, waste types, and estimated volumes of IDW to be generated. Immediately following containerization, each waste container was individually labeled with a unique identification number and with information regarding waste classification, contents, and radioactivity, if applicable.

Wastes were staged in clearly marked, appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements were based on the type of IDW and its classification. Container and storage requirements were detailed in the WCSF and approved before waste was generated.

Investigation activities were conducted in a manner that minimized the generation of waste. Waste minimization was accomplished by implementing the most recent version of the “Los Alamos National Laboratory Hazardous Waste Minimization Report.”

C-2.0 WASTE STREAMS

The IDW streams generated and managed during the investigations of the Upper Los Alamos Canyon Aggregate Area including the former LA Inn property sites are described below and summarized in Table C-2.0-1.

- *Waste #1:* Municipal solid waste (MSW) consists of noncontact trash and debris and empty sample preservation containers. The MSW was determined to be nonhazardous and nonradioactive. It was stored in plastic-lined trash cans and disposed of at the Los Alamos County landfill.
- *Waste #2:* This waste stream includes soil and tuff cuttings from boreholes. All drums were directly sampled and were determined to be nonhazardous low-level waste (LLW). All drill cuttings were disposed of at Technical Area 54 (TA-54) Area G.

- *Waste #3:* Excavated metals, concrete, and asphalt. This waste stream includes materials excavated or removed during the site investigation. Included are an excavated cast-iron pipe from Solid Waste Management Unit (SWMU) 01-001(d1) during the Phase I investigation and concrete and asphalt debris from cutting access holes in pavement. Approximately 6 yd^3 of debris was generated and collected at the point of generation. These wastes were characterized based on AK of processes associated with the debris, from site characterization sampling, or by direct sampling. They were determined to be LLW and were disposed of at TA-54 Area G. The excavated cast-iron pipe was swiped and determined to be nonradioactive. The excavated pipe met release criteria and was recycled through the Laboratory's recycling program.
- *Waste #4:* This waste stream includes spent personal protective equipment (PPE), material used in dry decontamination of sampling equipment (e.g., paper towels), and plastic bags 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 and the methods of generation or from site-characterization sampling. These wastes were managed as nonhazardous or LLW depending on the contaminants expected at the SWMUs or area of concern from which they were generated.
- *Waste #5:* This waste steam includes excavated soil, fill, and tuff. A total of approximately 107 yd^3 of material was generated and containerized during several investigations. The waste was characterized by direct sampling and was determined to be LLW. The waste was disposed of at TA-54 Area G or Energy Solutions, Clive, Utah.

Table C-2.0-1
Summary of IDW Generation and Management

Waste Stream	Waste Type	Volume	Characterization Method	On-Site Management	Disposition
Phase I Investigation					
Municipal solid waste	Nonhazardous/ Nonradioactive	2 yd^3	AK	Plastic bags	County of Los Alamos landfill
Drill cuttings	LLW	10 yd^3	Direct sampling	55-gal. drums	TA-54 Area G
Concrete, gravel, asphalt, debris, and metal pipe	LLW	6 yd^3	AK and direct sampling	Rolloff container, 55-gal. drum	TA-54 Area G; metal pipe recycled by the Laboratory
Contact waste	Green is Clean; LLW	0.3 yd^3	AK and results of site characterization	30-gal. drums	County of Los Alamos landfill or TA-54 Area G
Excavated soil	LLW	10 yd^3	Direct sampling	Rolloff bin	TA-54 Area G
Phase II Investigation					
Contact waste	LLW	<0.25 yd^3	AK and results of site characterization	30-gal. drums	TA-54 Area G
Excavated soil	LLW	8 yd^3	Direct sampling	Rolloff bin	TA-54 Area G
2013 Sampling					
Contact waste	Nonhazardous, Green is Clean	0.75 yd^3	AK and results of site characterization	55-gal. drums, plastic bags	County of Los Alamos landfill
Municipal solid waste	MSW	1.0 yd^3	AK	Plastic bags	County of Los Alamos landfill
2016 Sampling					
Contact waste	LLW	<0.25 yd^3	AK	Rolloff bin	EnergySolutions, Clive, Utah
Municipal solid waste	MSW	1.0 yd3	AK	Plastic bags	County of Los Alamos landfill
2016 Sampling and Remediation					
Excavated soil	LLW	89.35 yd^3	Direct sampling	1.0 yd^3 or 1.77 yd^3 DOT-type IP-1 bags	EnergySolutions, Clive, Utah
Contact waste	LLW	<2 yd^3	AK	Rolloff bin or IP-1 bags	EnergySolutions, Clive, Utah
Municipal solid waste	MSW	~3 yd^3	AK	1-gal. plastic bags	County of Los Alamos landfill

Attachment C-1

Waste Characterization Strategy Forms and Amendments
(on CD included with this document)

Appendix D

Analytical Program

D-1.0 INTRODUCTION

This appendix discusses the analytical methods and data-quality review for samples collected during investigations within the former Los Alamos (LA) Inn property as part of the Upper Los Alamos Canyon Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). Additionally, this appendix summarizes the effects of data-quality issues on the acceptability of the analytical data.

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the Quality Assurance Project Plan Requirements for Sampling and Analysis (LANL 1996, 054609); the Laboratory's 2008 statement of work (SOW) for analytical laboratories (LANL 2008, 109962); and the Laboratory's 2015 "Exhibit D, Scope of Work and Technical Specification for Off-Site Analytical Laboratory Services, Revision 4" (hereafter, the 2015 Exhibit D). 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, 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 2008, 109962; the 2015 Exhibit D). 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/plans-procedures.php, were used for data validation:

- SOP-5161, Routine Validation of Volatile Organic Compound (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-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-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 (COCs) forms are provided in Appendix E. The analytical data, instrument printouts, and data validation reports are provided in Appendix E.

D-2.0 ANALYTICAL DATA ORGANIZATION

Historical data evaluated in this report were collected during Resource Conservation and Recovery Act facility investigations, other corrective actions, and other investigations. All historical investigation samples were submitted to and analyzed by approved off-site laboratories. These data are determined to

be of sufficient quality for decision-making purposes and have been reviewed and revalidated to current QA standards.

D-3.0 INORGANIC CHEMICAL ANALYSES

A total of 162 samples (plus 29 field duplicates) were analyzed for target analyte list (TAL) metals and 135 samples (plus 22 field duplicates) were analyzed for nitrate, perchlorate, and total cyanide. The analytical methods used for inorganic chemicals are listed in Table D-1.0-1.

Tables in the investigation report summarize all samples collected and the analyses requested for the investigation of the sites within the former LA Inn property. All analyses conducted during the investigation are presented in Appendix E (on DVD).

D-3.1 Inorganic Chemical QA/QC Samples

The use of QA/QC samples is designed to produce measures of the reliability of the data. The results of the QA/QC analyses performed on a sample provide confidence about whether the analyte is present and whether the concentration reported is accurate. To assess the accuracy and precision of inorganic chemical analyses, LCSs, preparation blanks, MSs, laboratory duplicate samples, interference check samples (ICSs), internal standards (ISs), and serial dilution samples were analyzed as part of the investigation. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 2008, 109962; the 2015 Exhibit D) 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 should fall within the control limits of 75%–125% (LANL 2008, 109962; the 2015 Exhibit D).

The preparation blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing; it is extracted and analyzed in the same manner as the corresponding environmental samples. Preparation blanks are used to measure bias and potential cross-contamination. All inorganic chemical results should be below the method detection limit (MDL).

MS samples assess the accuracy of inorganic chemical analyses. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS acceptance criterion is 75%–125%, inclusive, for all spiked analytes (LANL 2008, 109962; the 2015 Exhibit D).

Laboratory duplicate samples assess the precision of inorganic chemical analyses. All relative percent differences between the sample and laboratory duplicate should be ±35% for soil (LANL 2008, 109962; the 2015 Exhibit D).

The ICSs assess the accuracy of the analytical laboratory's interelement and background correction factors used for inductively coupled plasma emission spectroscopy. The ICS percent recovery should be within the acceptance range of 80%–120%. The QC acceptance limits are ±20%.

ISs are chemical compounds added to every blank, sample, and standard extract at a known concentration. They are used to compensate for (1) analyte concentration changes that might occur during storage of the extract, and (2) quantitation variations that can occur during analysis. ISs are used as the basis for quantitation of target analytes. The percent recovery for ISs should be within the range of 60%–125%.

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%.

D-3.2 Data Quality Results for Inorganic Chemicals

The majority of the analytical results are 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.

D-3.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples analyzed for inorganic chemicals (Appendix E).

D-3.2.2 Sample Documentation

All samples analyzed for inorganic chemicals were properly documented on SCL/COC forms in the field (Appendix E).

D-3.2.3 Sample Dilutions

Some samples were diluted for inorganic chemical analyses. No qualifiers were applied to any inorganic chemical sample results because of dilutions.

D-3.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for inorganic chemicals.

D-3.2.5 Holding Times

Seven cyanide results were qualified as estimated not detected (UJ) because the extraction/analytical holding time is exceeded by less than 2 times the published method for holding times.

Four cyanide results and one nitrate result were qualified as estimated and biased low (J−) because the extraction/analytical holding time are exceeded by less than 2 times the published method for holding times.

D-3.2.6 Calibration Curves

Two nitrate results were qualified as estimated not detected (UJ) because the analytes were analyzed with an initial calibration curve that exceeded the percent relative standard deviation criteria and/or the associated multipoint calibration correlation coefficient is less than 0.995.

D-3.2.7 ICVs and CCVs

Twenty-six TAL metal results were qualified as estimated (J) because the ICV and/or CCV were recovered outside the method-specific limits.

Three TAL metal results were qualified as estimated not detected (UJ) because the ICV and/or CCV were recovered outside the method-specific limits.

D-3.2.8 Interference Check Sample and/or Serial Dilutions

Three TAL metal results were qualified as estimated (J) because the serial dilution sample relative percent difference was greater than 10% and the sample results were greater than 50 times the MDL.

D-3.2.9 ISs

A total of 167 TAL metal results were qualified as estimated (J) because the IS area count is greater than 125% in relation to the metals initial calibration blank.

Eight TAL metal results were qualified as estimated not detected (UJ) because the IS area count is greater than 125% in relation to the metals initial calibration blank.

Four perchlorate results were qualified as estimated not detected (UJ) because the IS area is greater than 70% but less than 25% of the average obtained from the calibration standards.

One perchlorate result was qualified as estimated (J) because the IS area is greater than 70% but less than 25% of the average obtained from the calibration standards.

D-3.2.10 Laboratory Duplicate Samples

A total of 55 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 concentration, and the duplicate relative percent difference was greater than 35% for soil samples.

D-3.2.11 Blanks

A total of 67 TAL metal results and 10 cyanide results were qualified as not detected (U) because the sample results are less than or equal to 5 times the concentration of the related analytes in the method blank.

A total of 101 TAL metal results and 3 cyanide results were qualified as estimated and biased high (J+) because the analytes were identified in the method blank and were greater than 5 times the concentrations.

A total of 124 TAL metal results and 18 cyanide results were qualified as not detected (U) because the sample results are less than or equal to 5 times the concentration of the related analyte in the initial calibration blank and or continuing calibration blank.

D-3.2.12 MS Samples

A total of 63 TAL metal results were qualified as estimated and biased low (J−) because the associated spike recovery was less than the lower acceptance limit (LAL) of 75% in the associated spike sample.

Seven cyanide results were qualified as estimated not detected (UJ) because the associated spike recovery was less than the LAL of 75% in the associated spike sample.

A total of 69 TAL metal results were qualified as estimated and biased high (J+) because recovery was greater than the upper acceptance limit (UAL) of 125% in the associated spike sample.

One TAL metal result was qualified as estimated not detected (UJ) because recovery was greater than the UAL of 125% in the associated spike sample.

D-3.2.13 LCS Recoveries

Three TAL metal results were qualified as estimated and biased high (J+) because recovery was greater than the UAL of 125%.

D-3.2.14 Detection Limits

A total of 63 TAL metal results, 21 perchlorate results, 36 nitrate results, and 6 total cyanide results were qualified as estimated (J) because the sample result was reported as detected between the practical quantitation limit and the MDL.

D-3.2.15 Rejected Results

Seven chromium results and seven zinc results were qualified as rejected (R) because the associated MS recovery was less than 10%.

The rejected data were not used to determine the nature and extent of contamination or to assess the potential human and ecological risks. However, sufficient data of good quality are available to characterize the site(s) and conduct risk assessments. The results of other qualified data were used as reported and do not affect the usability of the sampling results.

D-4.0 ORGANIC CHEMICAL ANALYSES

A total of 52 samples (plus 14 field duplicates) were analyzed for volatile organic chemicals (VOCs); 121 samples (plus 15 field duplicates) were analyzed for semivolatile organic chemicals (SVOCs); and 100 samples (plus 14 field duplicates) were analyzed for polychlorinated biphenyls (PCBs). All QC procedures were followed as required by the analytical laboratory SOWs (LANL 2008, 109962; the 2015 Exhibit D). The analytical methods used for organic chemicals are listed in Table D-1.0-1.

Tables within the supplemental investigation report summarize all samples collected from within the former LA Inn property and the analyses requested. All organic chemical results are provided in Appendix E (on DVD).

D-4.1 Organic Chemical QA/QC Samples

The use of QA/QC samples is designed to produce measures of the reliability of the data. The results of the QA/QC analyses performed on a sample provide confidence about whether the analyte is present and whether the concentration reported is accurate. Calibration verifications, LCSs, method blanks, MSs, surrogates, and ISs were analyzed to assess the accuracy and precision of organic chemical analyses. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 2008, 109962; the 2015 Exhibit D) and described briefly below.

Calibration verification is the establishment of a quantitative relationship between the response of the analytical procedure and the concentration of the target analyte. There are two aspects of calibration verification: initial and continuing. The initial calibration verifies the accuracy of the calibration curve as well as the individual calibration standards used to perform the calibration. The continuing calibration ensures the initial calibration is still holding and correct as the instrument is used to process samples. The continuing calibration also serves to determine that analyte identification criteria such as retention times and spectral matching are being met.

The LCS is a sample of a known matrix that has been spiked with compounds that are representative of the target analytes, and it serves as a monitor of overall performance on a "controlled" sample. The LCS is the primary demonstration, on a daily basis, of the ability to analyze samples with good qualitative and quantitative accuracy. The LCS recoveries should 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 is normally 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 can occur during analysis. ISs are used as the basis for quantitation of target analytes. The percent recovery for ISs should be within the range of 50%–200%.

D-4.2 Data Quality Results for Organic Chemicals

The majority of the analytical results are 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.

One SVOC result and one VOC result were qualified as not detected (U) because the mass spectra did not meet specifications.

D-4.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples analyzed for organic chemicals (Appendix E).

D-4.2.2 Sample Documentation

All samples analyzed for organic chemicals were properly documented on the SCL in the field (Appendix E).

D-4.2.3 Sample Dilutions

Some samples were diluted for organic chemical analyses. No qualifiers were applied to any organic chemical sample results because of dilutions.

D-4.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for organic chemicals.

D-4.2.5 Holding Times

A total of 223 VOC results were qualified as estimated not detected (UJ) because the extraction holding time was exceeded by less than 2 times the published method for holding times.

D-4.2.6 ICVs and CCVs

One VOC result was qualified as estimated (J) because the affected analyte was analyzed with a relative response factor of less than 0.05 in the initial calibration and/or CCV.

A total of 113 SVOC results and 64 VOC results were qualified as estimated not detected (UJ) because the affected analytes were analyzed with an initial calibration curve that exceeded the percent relative standard deviation criteria and/or the associated multipoint calibration correlation coefficient is less than 0.995.

Four PCB results were qualified as estimated not detected (UJ) because the ICV and/or CCV were recovered outside the method-specific limits.

Two PCB results were qualified as estimated (J) because the multipoint standard was not analyzed within 72 h of the initial analysis.

A total of 181 SVOC results and 193 VOC results were qualified as estimated not detected (UJ) because the ICV and/or CCV were recovered outside the method-specific limits.

A total of three SVOC results were qualified as estimated (J) because the ICV and/or CCV were recovered outside the method-specific limits.

D-4.2.7 Surrogate Recoveries

A total of 116 SVOC results and 133 VOC results were qualified as estimated not detected (UJ) because the surrogate percent recovery is below the LAL but was greater than or equal to 10%.

Two SVOC results were qualified as estimated and biased low (J−) because the surrogate percent recovery is below the LAL but was greater than or equal to 10%.

Two VOC results were qualified as estimated and biased high (J+) because the surrogate percent recovery is above the UAL.

D-4.2.8 IS Responses

A total of 41 SVOC results and 116 VOC results were qualified as estimated not detected (UJ) because the IS area counts were less than 50% but greater than 10%.

D-4.2.9 Method Blanks

A total of 7 SVOC results and 100 VOC results results were qualified as not detected (U) because the associated sample concentration was less than 5 times (10 times for common laboratory contaminants) the concentration of the related analyte in the method blank.

A total of 17 VOC results were qualified as not detected (U) because the sample result is less than or equal to 5 times (10 times for common laboratory contaminants) the concentration of the related analyte in the trip blank, rinsate blank, or equipment blank.

D-4.2.10 MS Samples

Data were not qualified because of MS recoveries.

D-4.2.11 Laboratory Duplicate Samples

Laboratory duplicates collected for organic chemical analyses indicated acceptable precision for all samples.

D-4.2.12 LCS Recoveries

A total of 26 SVOC results and 2 VOC results were qualified as estimated not detected (UJ) because the percent recovery was less than the LAL but greater than 10%.

D-4.2.13 PQLs and MDLs

A total of 16 PCB results, 107 SVOC results, and 29 VOC results were qualified as estimated (J) because the sample result was reported as detected between the practical quantitation limit and the method detection limit.

D-4.2.14 Rejected Data

A total of 13 SVOC results (2,4-dinitrophenol) were qualified as rejected (R) because a percent recovery was less than 10% in the associated LCS.

A total of 85 VOC results (19 acetone, 58 2-butanone, and 8 2-hexanone) were qualified as rejected (R) because the affected analytes were analyzed with a relative response factor of less than 0.05 in the initial calibration and/or CCV.

Four VOC results (acetone) were qualified as rejected (R) because the data validator identified quality deficiencies in the reported data that required qualification.

The rejected data were not used to characterize the nature and extent of contamination or assess the potential human and ecological risks. However, sufficient data of good quality are available to characterize the site(s) and conduct the risk assessments. The results of other qualified data were used as reported and do not affect the usability of the sampling results.

D-5.0 RADIONUCLIDE ANALYSES

A total of 128 samples (plus 14 field duplicates) were analyzed for americium-241; 125 samples (plus 14 field duplicates) were analyzed for gamma-emitting radionuclides, isotopic uranium, strontium-90, and tritium; and 243 samples (plus 27 field duplicates) were analyzed for isotopic plutonium. The analytical methods used for radionuclides are listed in Table D-1.0-1.

Tables in the supplemental investigation report summarize all samples collected from within the former LA Inn property and the analyses requested. All radionuclide results are provided on DVD (Appendix E).

D-5.1 Radionuclide QA/QC Samples

All procedures were followed as required by the analytical services SOWs (LANL 2008, 109962; the 2015 Exhibit D). Some sample results were qualified as not detected (U). This data qualification is related only to detection status, not to the quality of the data.

To assess the accuracy and precision of radionuclide analyses, LCSs, method blanks, MS samples, laboratory duplicate samples, and tracers were analyzed as part of the investigations. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 2008, 109962; the 2015 Exhibit D) 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 percent recovery should fall between the control limits of 80%–120%.

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing; it is analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during analysis. All radionuclide results should be below the minimum detectable activity.

MS samples assess the accuracy of inorganic chemical analyses. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS acceptance criterion is 75%–125%.

Tracers are radioisotopes added to a sample for the purposes of monitoring losses of the target analyte. The tracer is assumed to behave in the same manner as the target analytes. The tracer recoveries should fall between the LAL and UAL.

Laboratory duplicate samples assess the precision of radionuclide analyses. All relative percent differences between the sample and laboratory duplicate should be ±35% for soil (LANL 2008, 109962; the 2015 Exhibit D).

D-5.2 Data Quality Results for Radionuclides

D-5.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples (Appendix E).

D-5.2.2 Sample Documentation

All samples were properly documented on the SCL/COC forms in the field (Appendix E).

D-5.2.3 Sample Dilutions

Some samples were diluted for radionuclide analyses. No qualifiers were applied to any radionuclide sample results because of dilutions.

D-5.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for radionuclides.

D-5.2.5 Holding Times

Holding-time criteria were met for all samples analyzed for radionuclides.

D-5.2.6 Method Blanks

Nine isotopic plutonium results and two isotopic uranium results were qualified as not detected (U) because the associated sample concentration was less than 5 times the concentration of the related analyte in the method blank.

Eight isotopic plutonium results and 38 isotopic uranium results were qualified as estimated (J) because the sample results were greater than 5 times the concentration in the method blank.

D-5.2.7 MS Samples

Twenty-two strontium-90 results were qualified as estimated not detected (UJ) because the MS recovery was less than 10%.

Nine strontium-90 results were qualified as estimated not detected (UJ) because the MS recovery was greater than UAL.

D-5.2.8 Tracer Recoveries

Two americium-241 results and 4 isotopic uranium results were qualified as estimated and biased low (J−) because the tracer recovery was less than the LAL but greater than or equal to 10%.

D-5.2.9 LCS Recoveries

LCS recovery criteria were met for all samples analyzed for radionuclides.

D-5.2.10 Laboratory Duplicate Samples Recoveries

Eight isotopic plutonium results and one isotopic uranium result were qualified as estimated (J) because the associated duplicate sample has a duplicate error ratio or a relative error ratio greater than the analytical laboratory's acceptance limits.

D-5.2.11 Rejected Data

A total of 28 cesium-134 results and 1 cobalt-60 result were qualified as rejected (R) because spectral interferences prevented positive identification of the analytes.

The rejected data were not used to determine the nature and extent of contamination or to assess the potential human and ecological risks. However, sufficient data of good quality are available to characterize the site(s) and conduct the risk assessments. The results of other qualified data were used as reported and do not affect the usability of the sampling results.

D-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 or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System 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 ESH 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), 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 D-1.0-1
Inorganic Chemical, Organic Chemical, and Radionuclide Analytical Methods for Samples Collected within the former LA Inn property

Analytical Method	Analytical Description	Analytical Suite
EPA 300.0	Ion chromatography	Anions (nitrate)
EPA 905.0	Gas proportional counting	Strontium-90
EPA 906.0	Liquid scintillation	Tritium
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, vanadium, and zinc (TAL metals)
EPA SW-846: 9012A	Automated colorimetric/off-line distillation	Total cyanide
EPA SW-846:6850	Liquid chromatography–mass spectrometry/mass spectrometry	Perchlorate
EPA SW-846:7470A	Cold vapor atomic absorption (CVAA)	Mercury
EPA SW-846:7471	CVAA	Mercury
EPA SW-846:7471A	CVAA	Mercury
EPA SW-846: 8082	Gas chromatography	PCBs
EPA SW-846: 8260 and 8260B	Gas chromatography mass spectrometry (GC/MS)	VOCs
EPA SW-846: 8270 and 8270C	GC/MS	SVOCs
Generic: Gamma spectroscopy	Gamma spectroscopy	Cesium-134, cesium-137, cobalt-60, sodium-22
HASL 300	Chemical separation alpha spectrometry	Isotopic uranium, isotopic plutonium, americium-241

Appendix E

Analytical Suites and Results and Analytical Reports
(on DVD included with this document)

Appendix F

Box Plots and Statistical Results

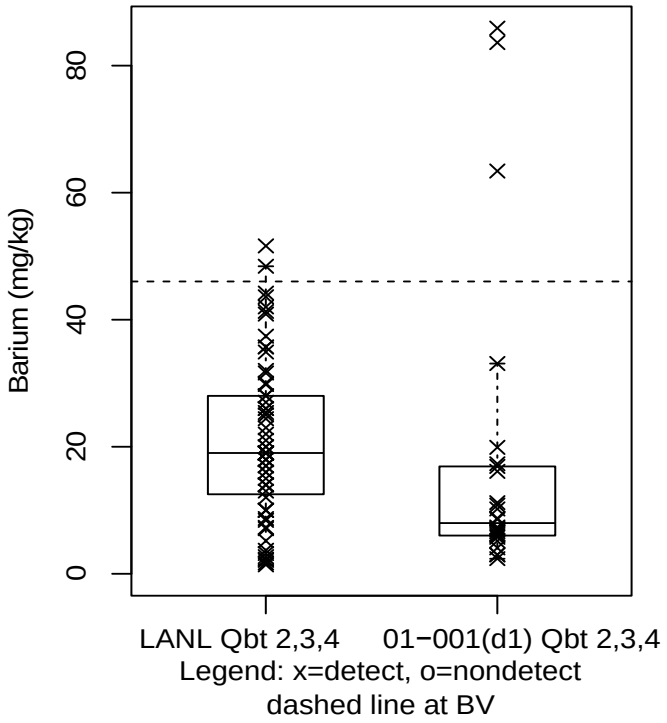

Figure F-1 Box plot of barium in tuff at Solid Waste Management Unit (SWMU) 01-001(d1)

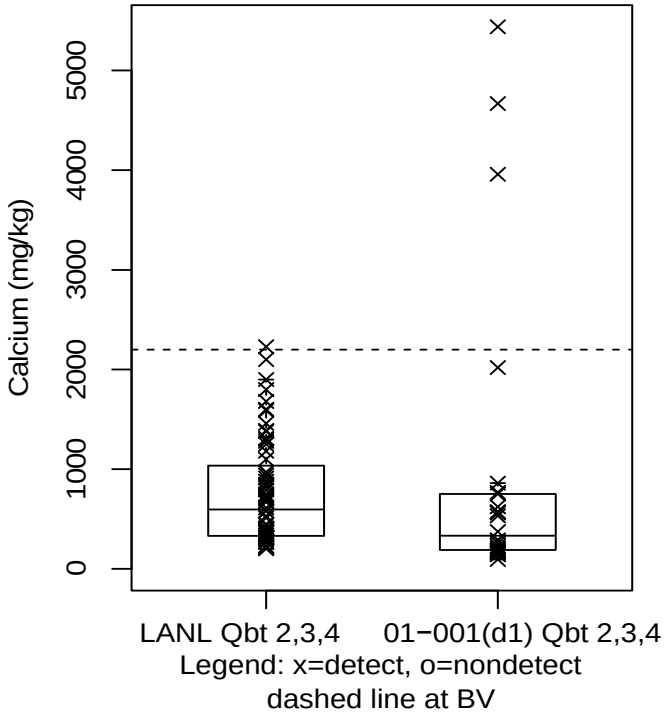

Figure F-2 Box plot of calcium in tuff at SWMU 01-001(d1)

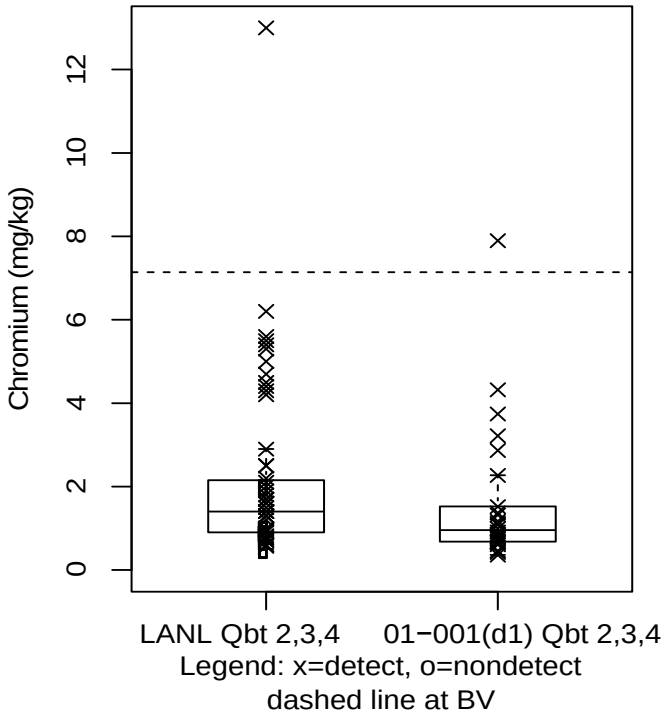

Figure F-3 Box plot of chromium in tuff at SWMU 01-001(d1)

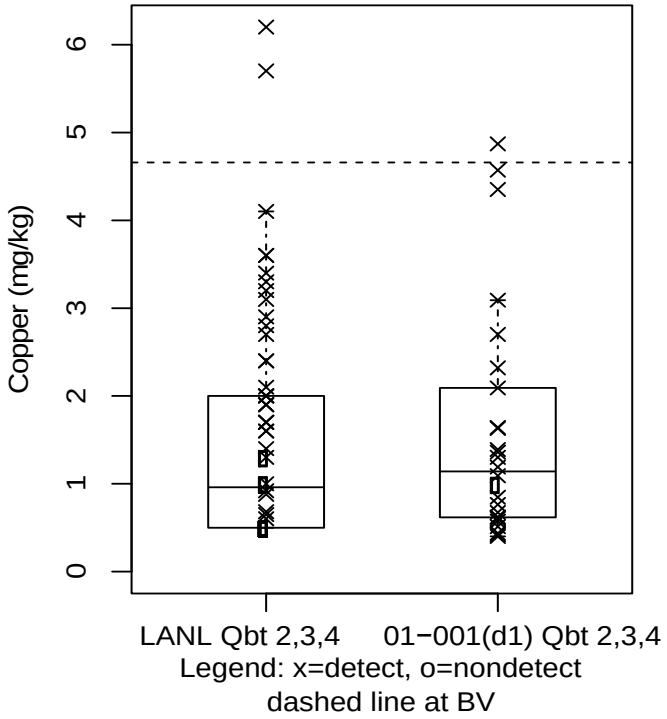

Figure F-4 Box plot of copper in tuff at SWMU 01-001(d1)

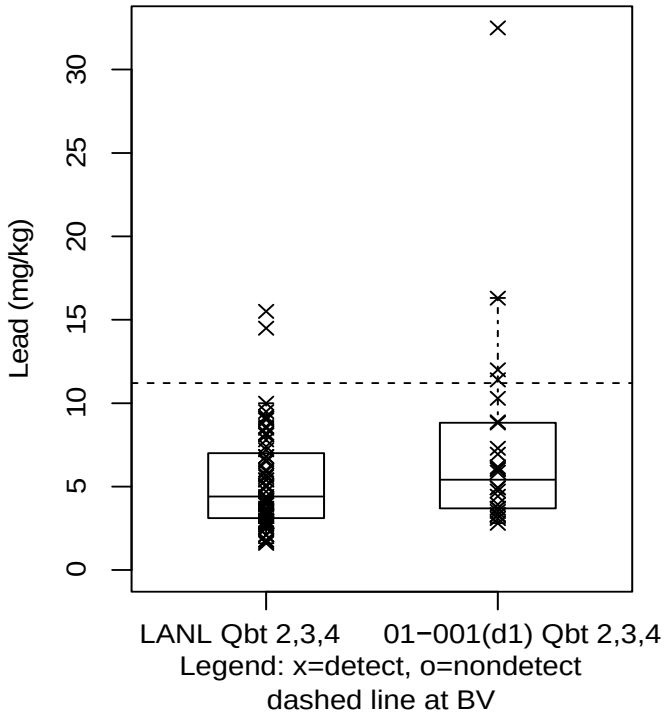

Figure F-5 Box plot of lead in tuff at SWMU 01-001(d1)

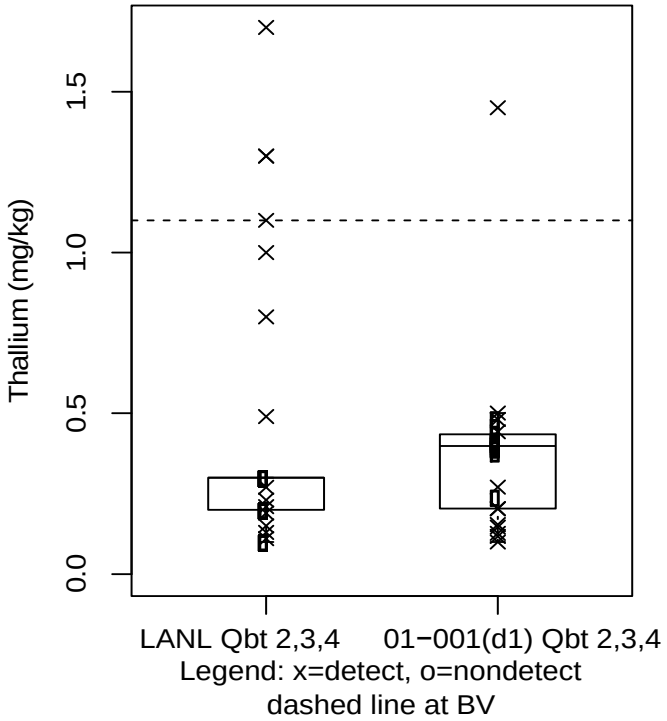

Figure F-6 Box plot of thallium in tuff at SWMU 01-001(d1)

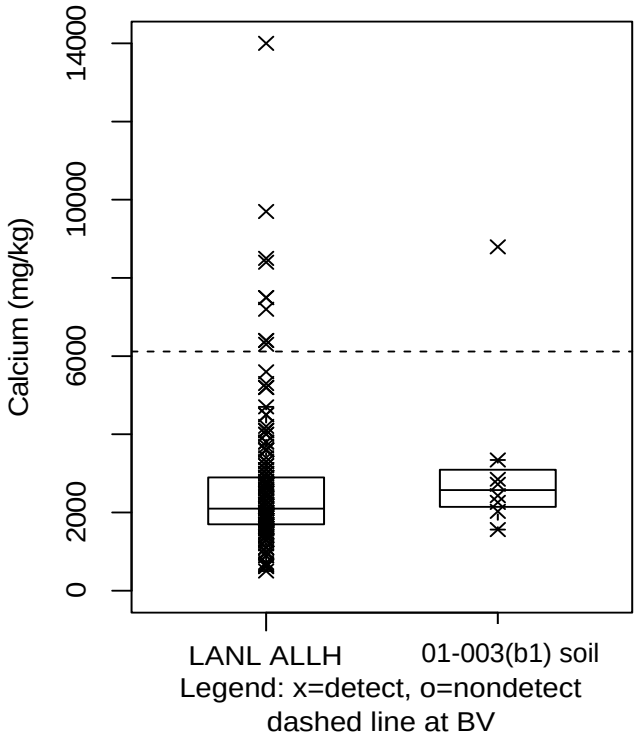

Figure F-7 Box plot of calcium in soil at Area of Concern (AOC) 01-003(b1)

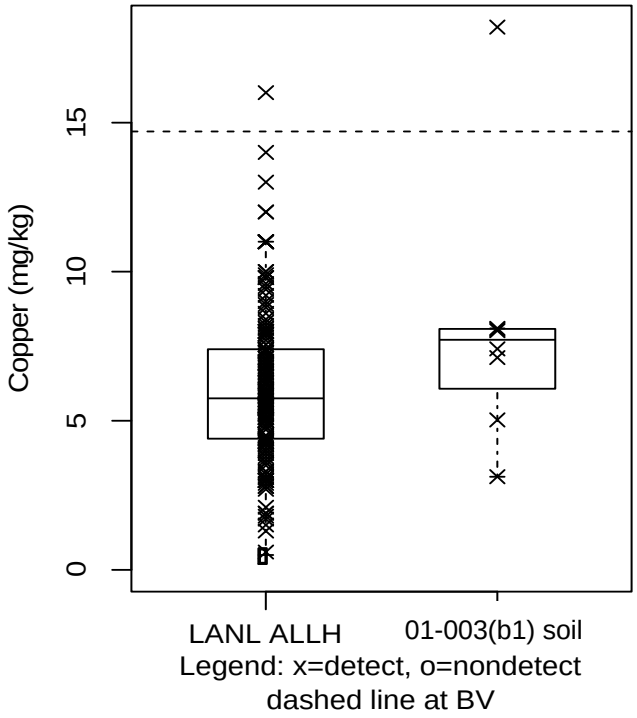

Figure F-8 Box plot of copper in soil at AOC 01-003(b1)

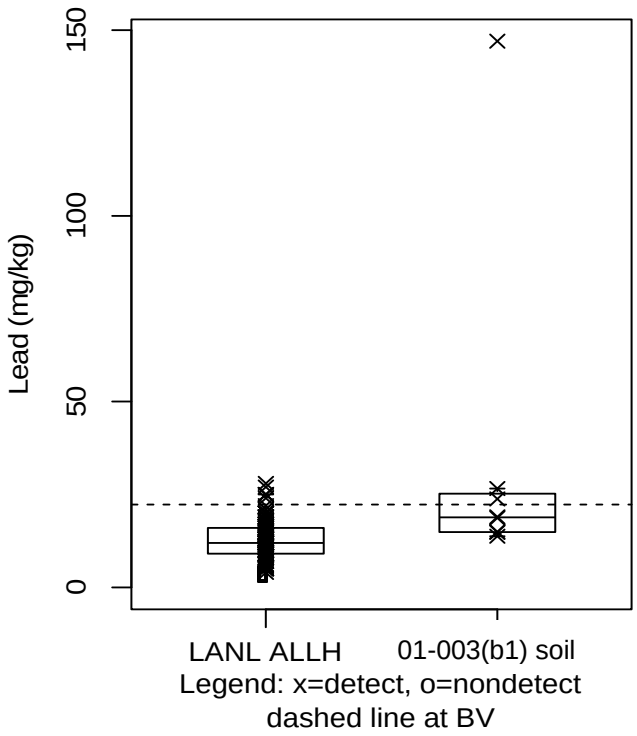

Figure F-9 Box plot of lead in soil at AOC 01-003(b1)

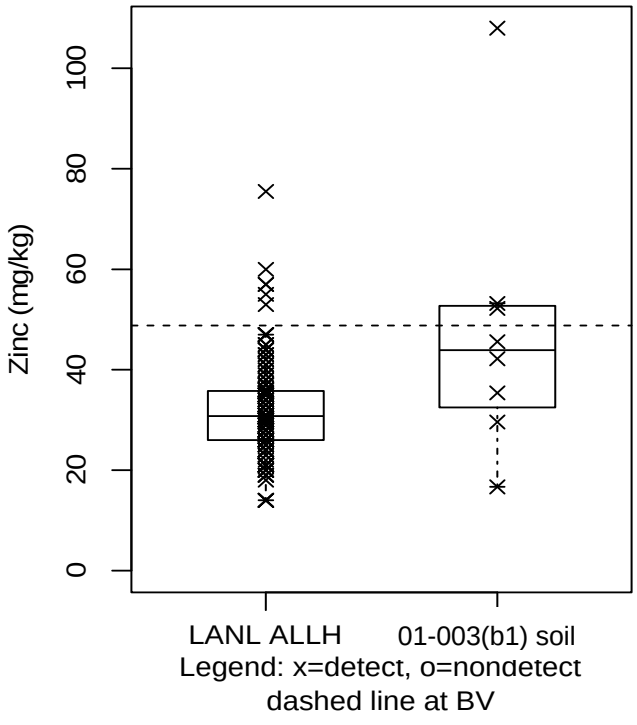

Figure F-10 Box plot of zinc in soil at AOC 01-003(b1)

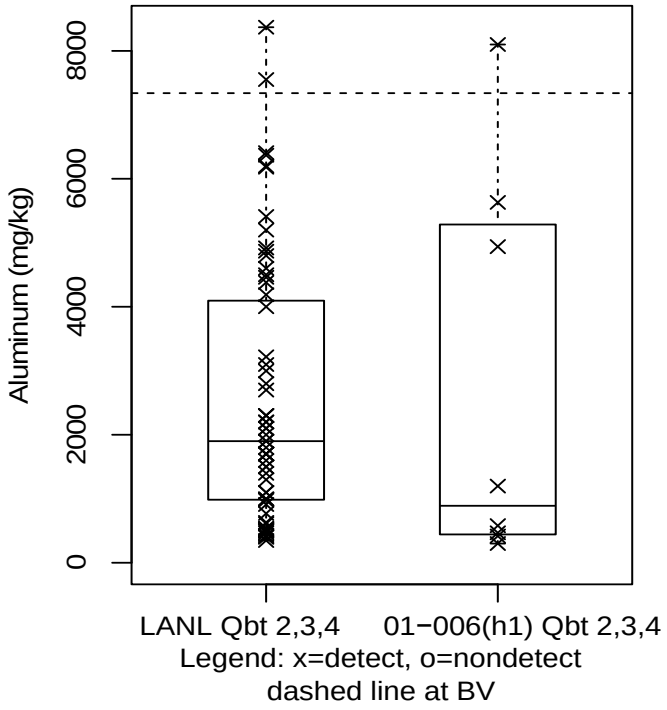

Figure F-11 Box plot of aluminum in tuff at SWMU 01-006(h1)

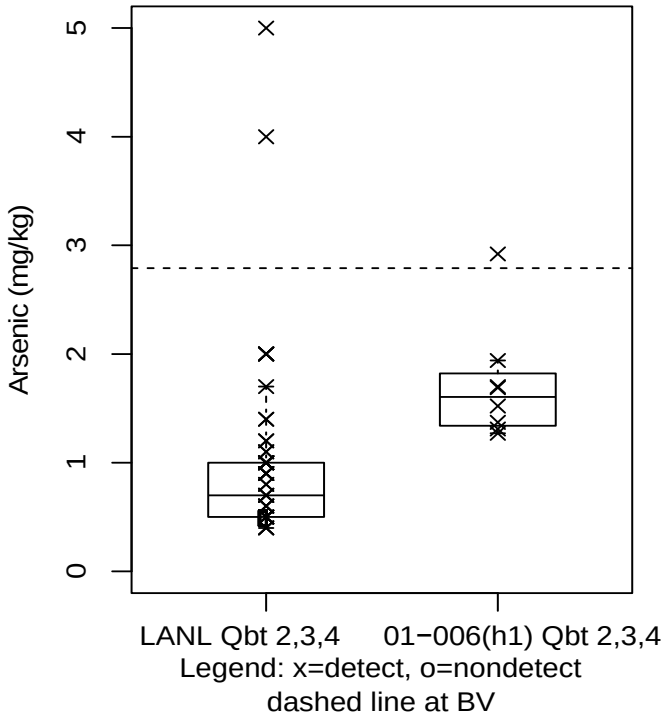

Figure F-12 Box plot of arsenic in tuff at SWMU 01-006(h1)

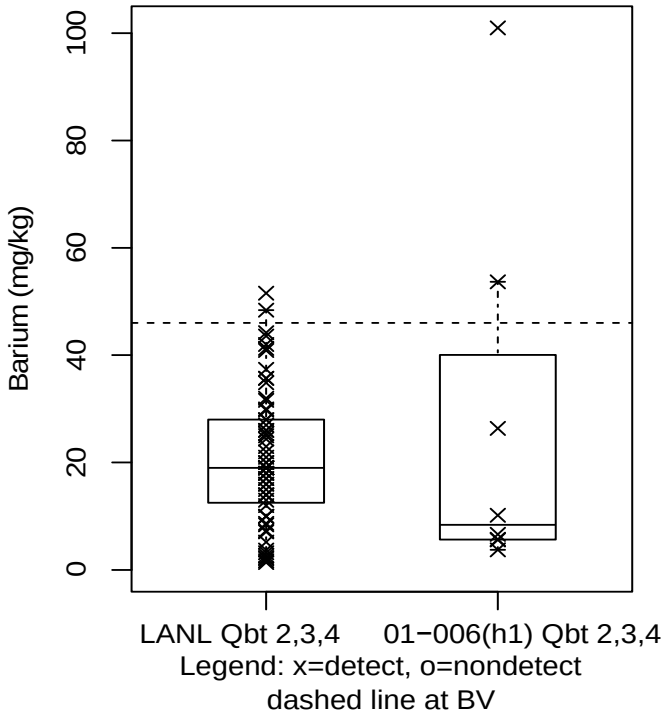

Figure F-13 Box plot of barium in tuff at SWMU 01-006(h1)

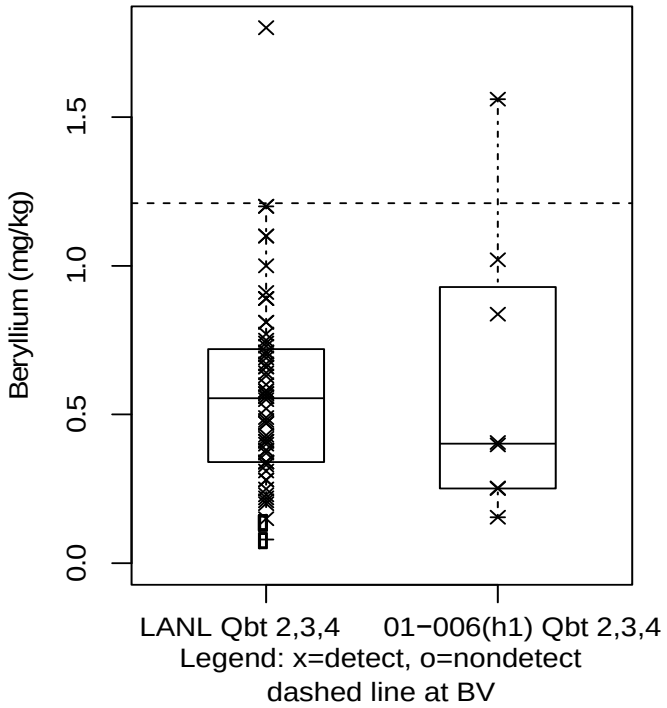

Figure F-14 Box plot of beryllium in tuff at SWMU 01-006(h1)

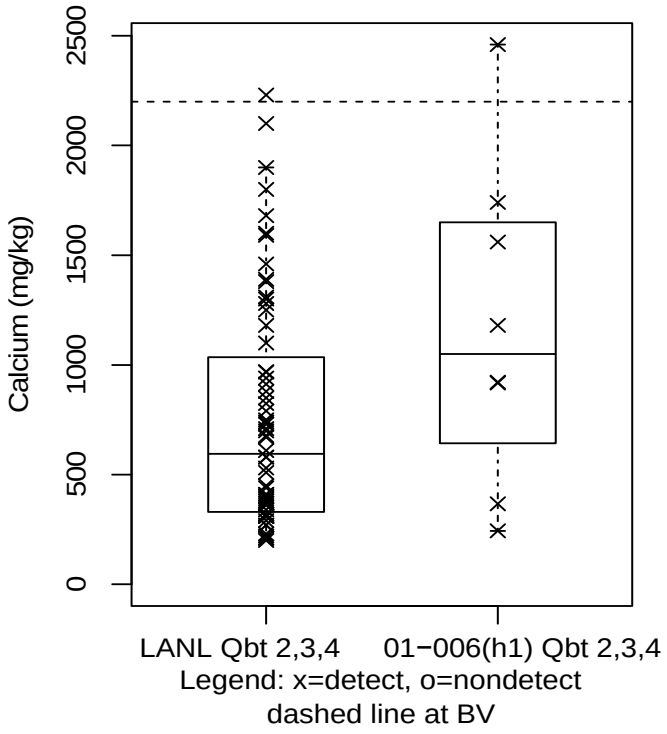

Figure F-15 Box plot of calcium in tuff at SWMU 01-006(h1)

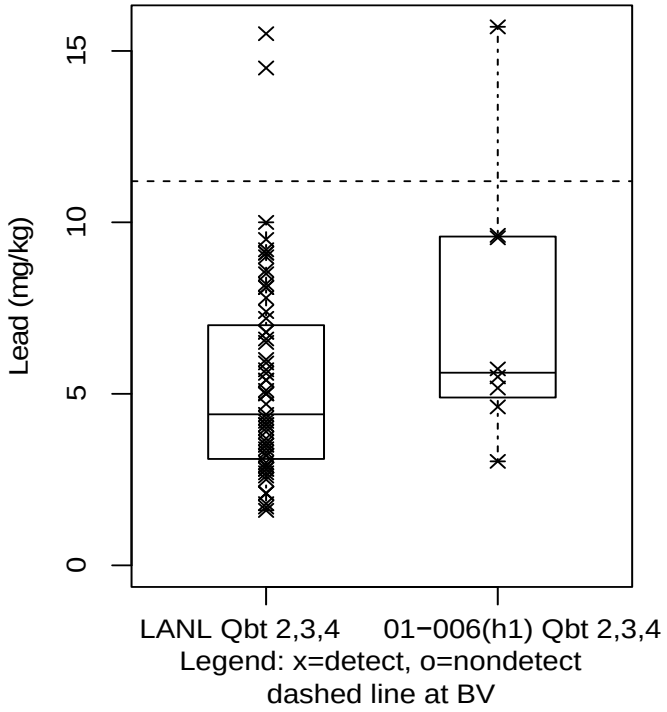

Figure F-16 Box plot of lead in tuff at SWMU 01-006(h1)

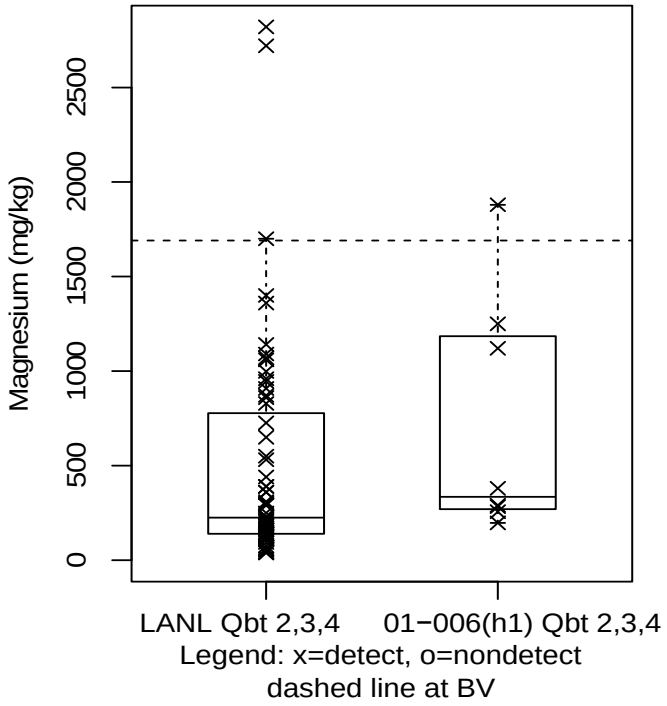

Figure F-17 Box plot of magnesium in tuff at SWMU 01-006(h1)

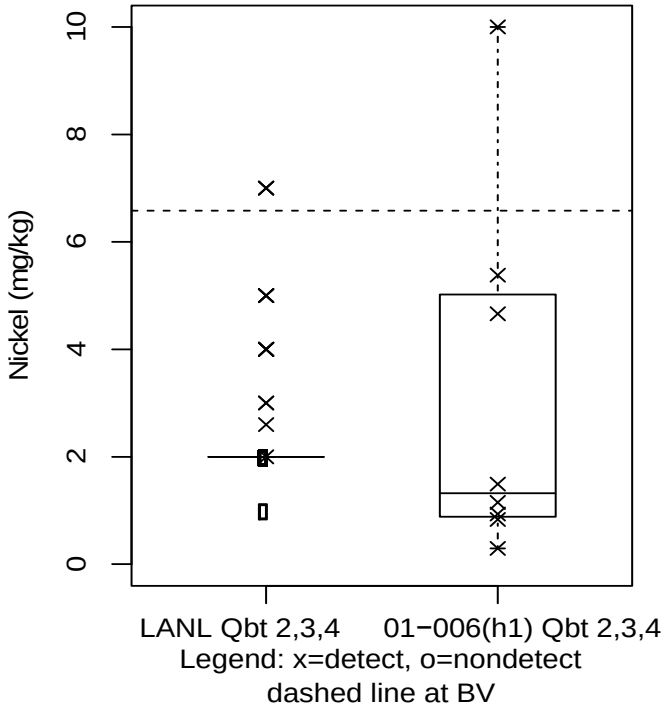

Figure F-18 Box plot of nickel in tuff at SWMU 01-006(h1)

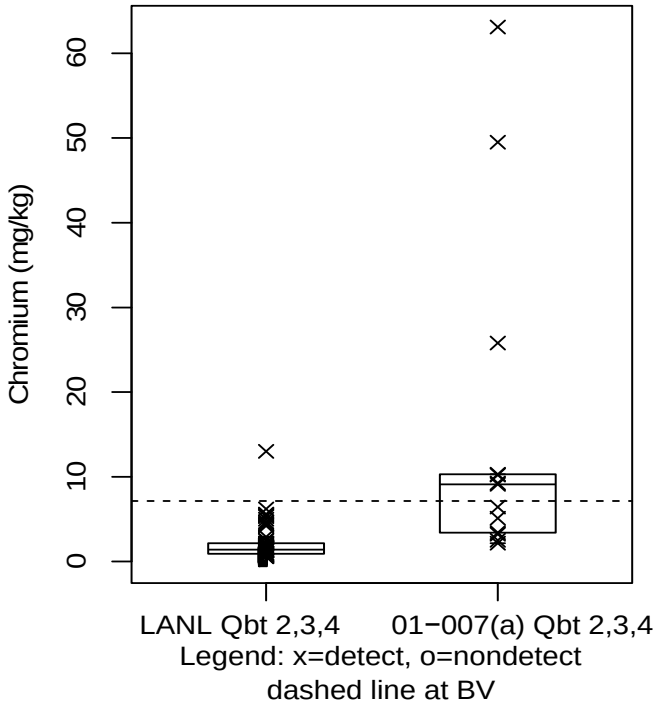

Figure F-19 Box plot of chromium in tuff at SWMU 01-007(a)

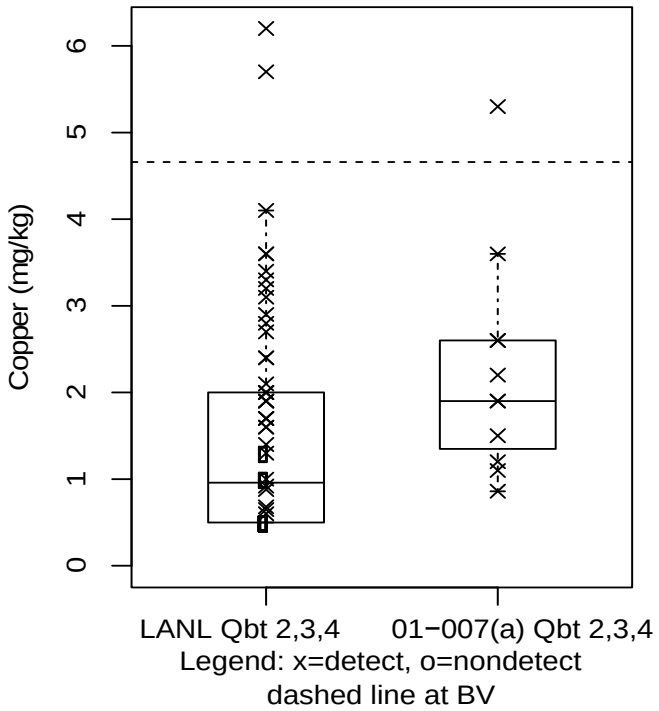

Figure F-20 Box plot of copper in tuff at SWMU 01-007(a)

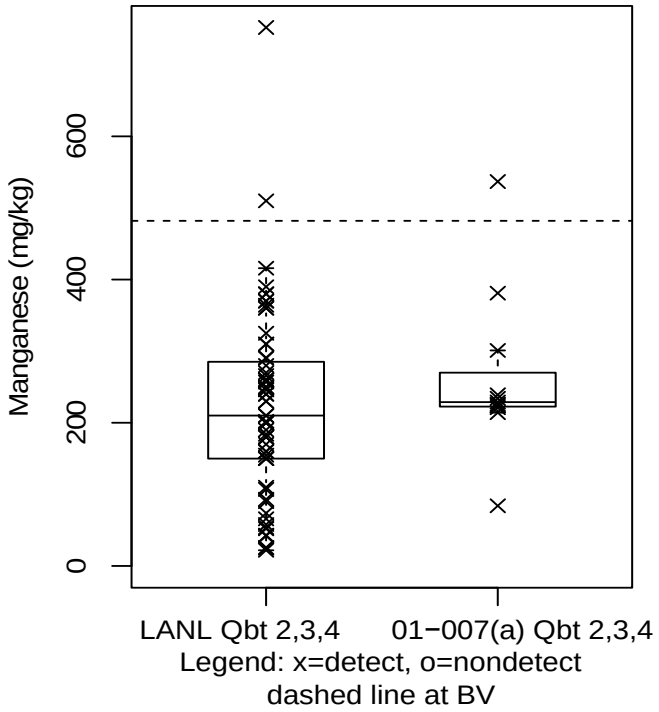

Figure F-21 Box plot of manganese in tuff at SWMU 01-007(a)

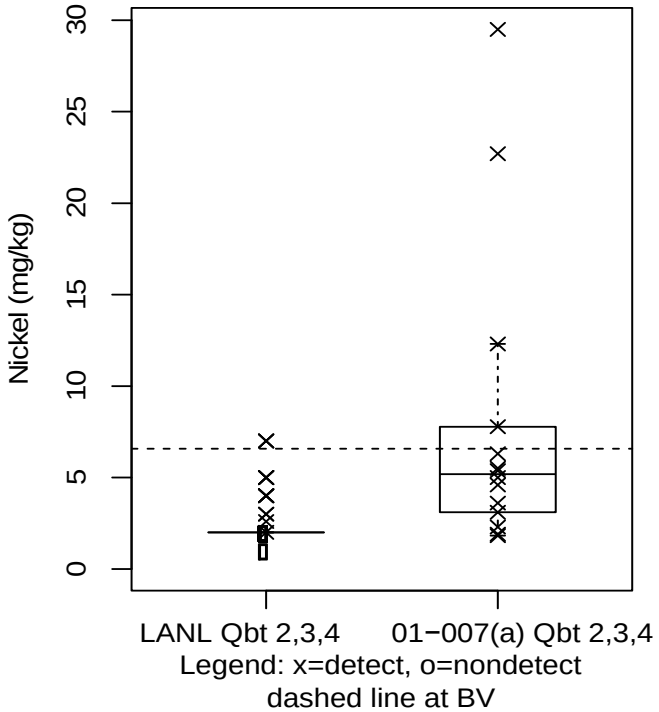

Figure F-22 Box plot of nickel in tuff at SWMU 01-007(a)

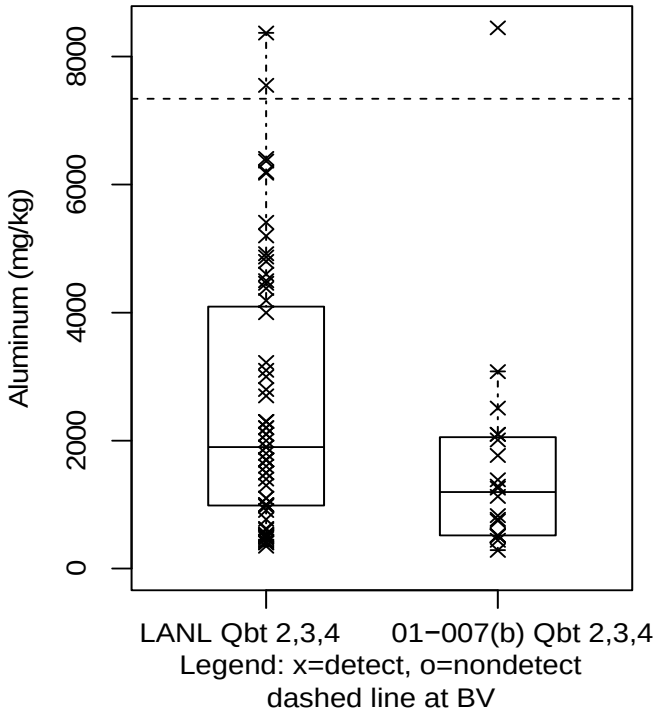

Figure F-23 Box plot of aluminum in tuff at SWMU 01-007(b)

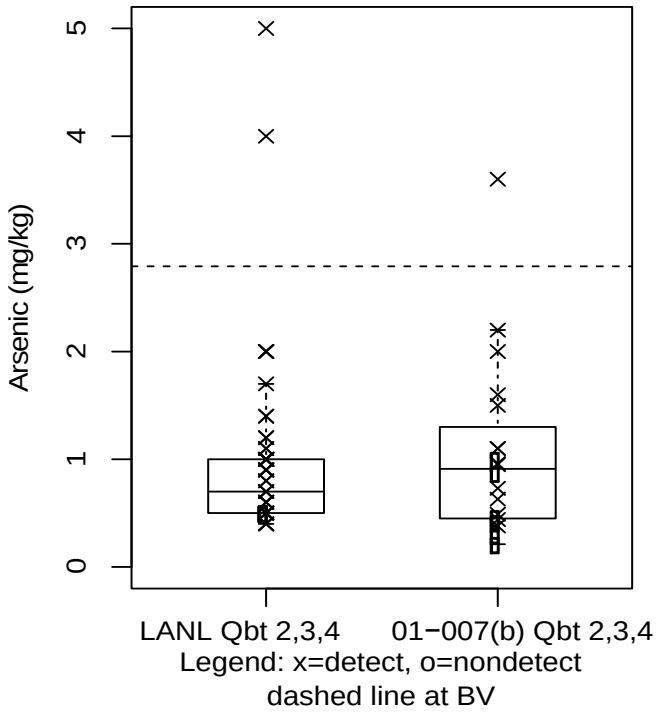

Figure F-24 Box plot of arsenic in tuff at SWMU 01-007(b)

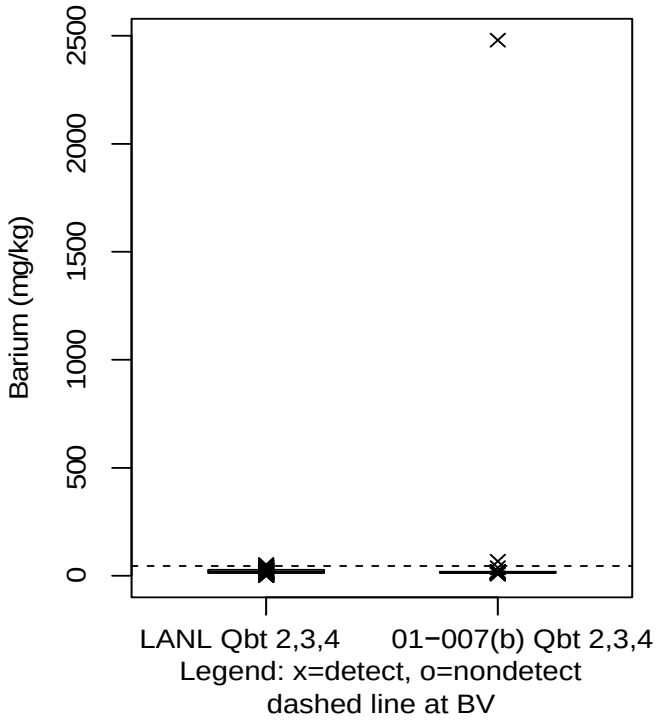

Figure F-25 Box plot of barium in tuff at SWMU 01-007(b)

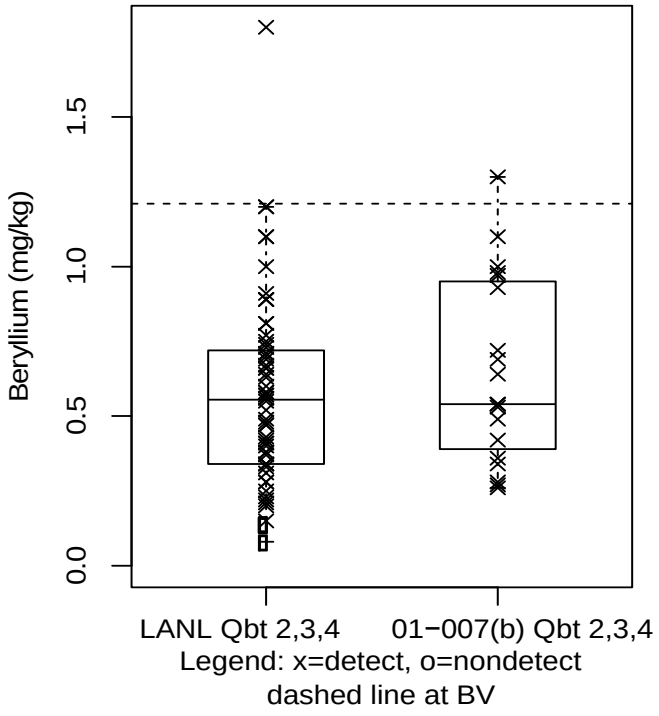

Figure F-26 Box plot of beryllium in tuff at SWMU 01-007(b)

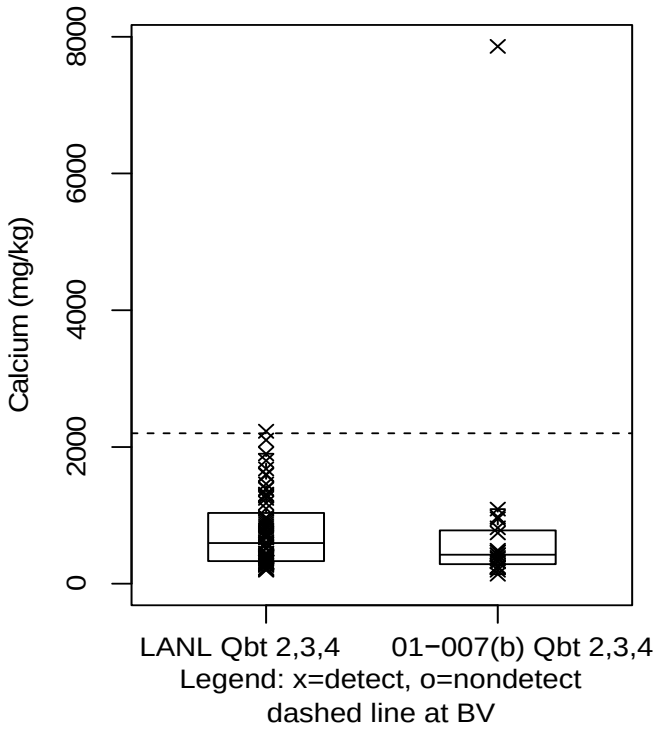

Figure F-27 Box plot of calcium in tuff at SWMU 01-007(b)

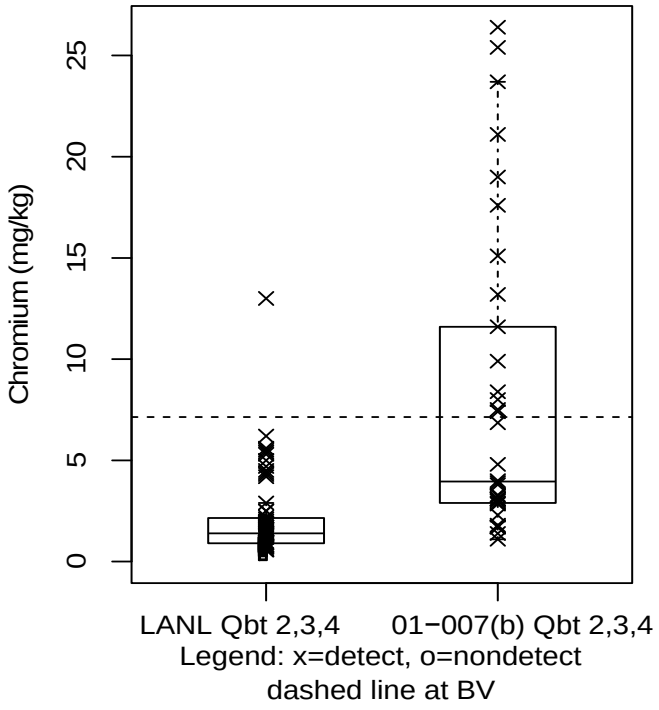

Figure F-28 Box plot of chromium in tuff at SWMU 01-007(b)

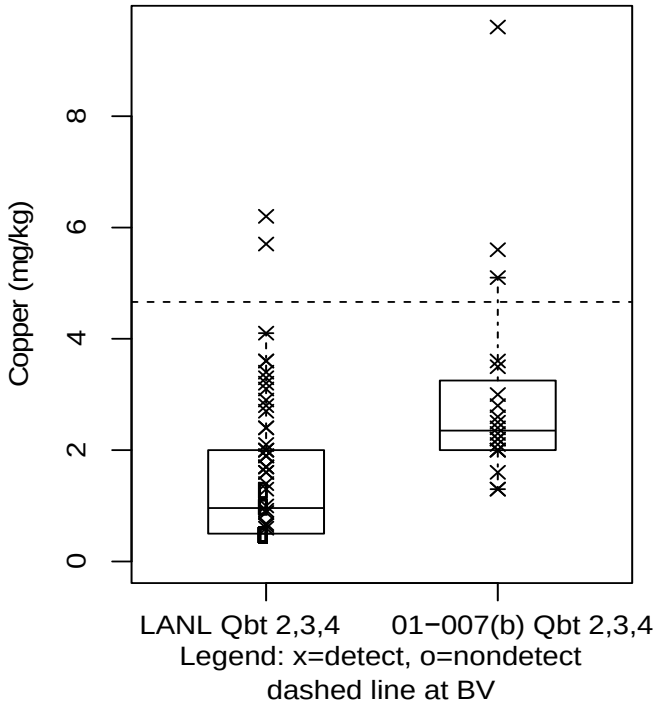

Figure F-29 Box plot of copper in tuff at SWMU 01-007(b)

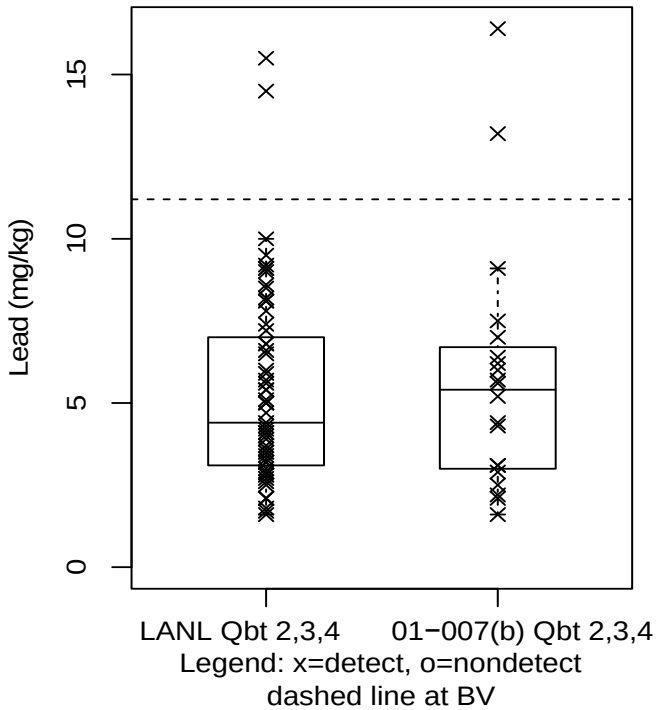

Figure F-30 Box plot of lead in tuff at SWMU 01-007(b)

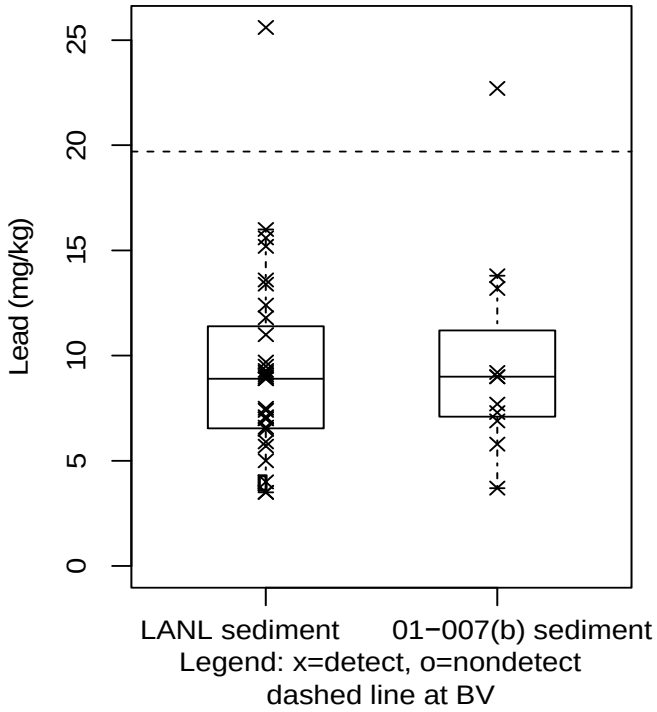

Figure F-31 Box plot of lead in sediment at SWMU 01-007(b)

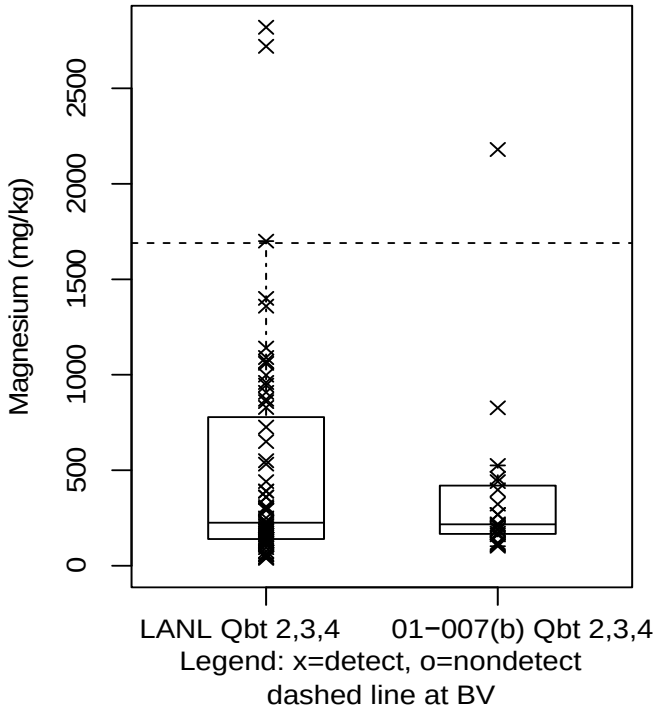

Figure F-32 Box plot of magnesium in tuff at SWMU 01-007(b)

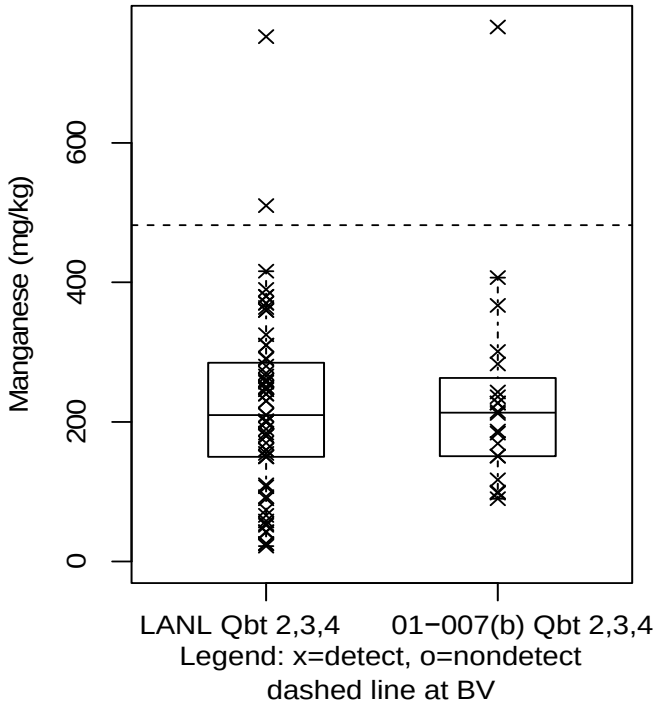

Figure F-33 Box plot of manganese in tuff at SWMU 01-007(b)

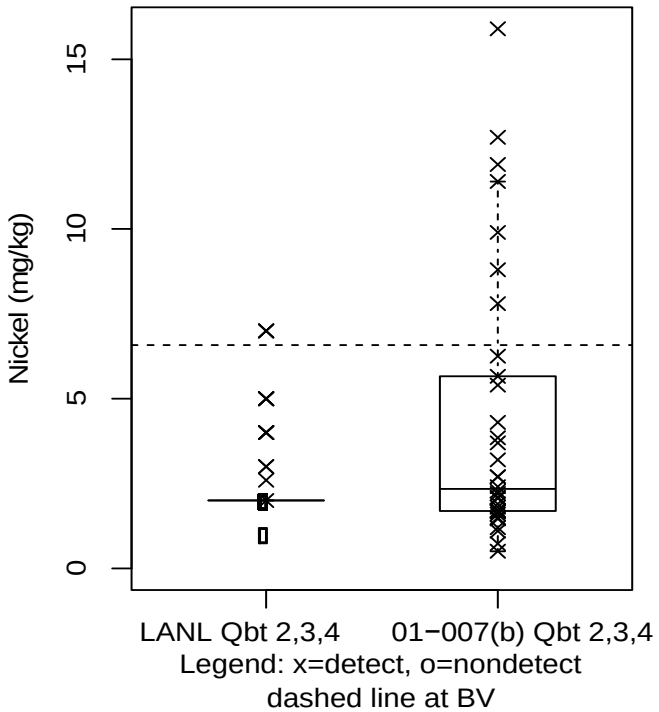

Figure F-34 Box plot of nickel in tuff at SWMU 01-007(b)

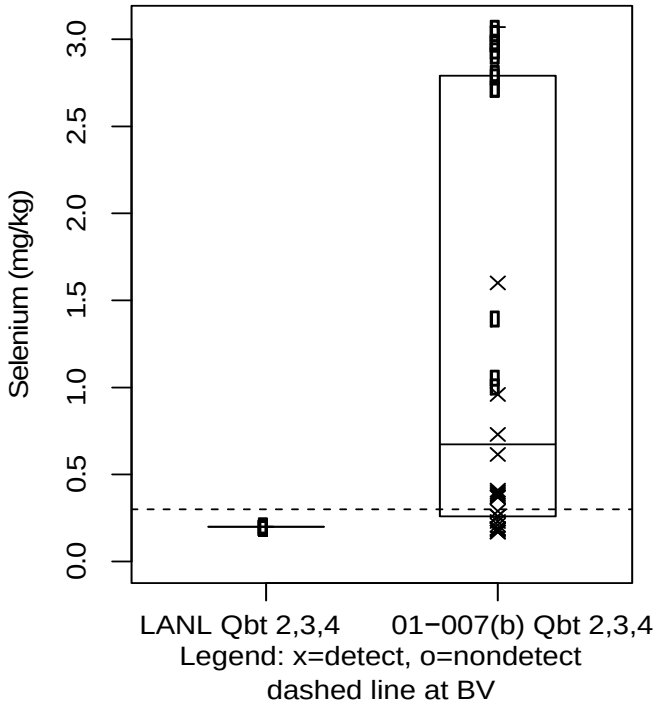

Figure F-35 Box plot of selenium in tuff at SWMU 01-007(b)

Table F-1
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 01-001(d1)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-Value	COPC?
Barium	0.9974	0.8055	n/a*	No
Calcium	0.9891	0.8382	n/a	No
Chromium	0.881	0.6495	n/a	No
Copper	0.09963	0.5861	n/a	No
Lead	0.05314	0.1803	n/a	No
Thallium	n/a	0.7981	1	No

* n/a = Not applicable.

Table F-2
Results of Statistical Tests for Inorganic Chemicals in Soil at AOC 01-003(b1)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-Value	COPC?
Calcium	0.1088	0.48	n/a*	No
Copper	0.04213	0.0604	0.04396	Yes
Lead	0.0006914	0.008565	n/a	Yes
Zinc	0.009522	0.00769	n/a	Yes

* n/a = Not applicable.

Table F-3
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 01-006(h1)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-Value	COPC?
Aluminum	0.7609	0.1864	n/a*	No
Arsenic	0.000226	0.00804	n/a	Yes
Barium	0.7408	0.4968	n/a	No
Beryllium	0.5676	0.2123	n/a	No
Calcium	0.05947	0.1804	n/a	No
Lead	0.04119	0.1864	0.1127	No
Magnesium	0.04028	0.1804	1	No
Nickel	n/a	0.2191	0.1127	No

* n/a = Not applicable.

Table F-4
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 01-007(a)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-Value	COPC?
Chromium	0.000000923	0.0000158	n/a*	Yes
Copper	0.008524	0.6569	1	No
Manganese	0.1663	0.6569	n/a	No
Nickel	n/a	0.0005116	0.0007397	Yes

* n/a = Not applicable.

Table F-5
Results of Statistical Tests for Inorganic Chemicals in Tuff at SWMU 01-007(b)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-Value	COPC?
Aluminum	0.9759	0.9929	n/a*	No
Arsenic	0.5505	0.3751	n/a	No
Barium	0.797	0.8083	n/a	No
Beryllium	0.1604	0.1359	n/a	No
Calcium	0.9204	0.9924	n/a	No
Chromium	0.00000000367	0.0000147	n/a	Yes
Copper	0.0000204	0.1359	0.2381	No
Lead	0.4302	0.8083	n/a	No
Magnesium	0.5647	0.9924	n/a	No
Manganese	0.5251	0.8377	n/a	No
Nickel	n/a	0.01209	0.0004188	Yes
Selenium	n/a	0.02553	0.0000000344	Yes

* n/a = Not applicable.

Table F-6
Results of Statistical Tests for Inorganic Chemicals in Sediment at SWMU 01-007(b)

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-Value	COPC?
Lead	0.4262	0.6881	n/a*	No

* n/a = Not applicable.

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Risk Assessments

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Attachments

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Attachment G-2 Vapor Intrusion Spreadsheets (on CD included with this document)
Attachment G-3 As Low as Reasonably Achievable Analyses for Sites within the Former Los Alamos Inn Property
Attachment G-4 Ecological Scoping Checklists

G-1.0 INTRODUCTION

This appendix presents the results of the human health and ecological risk-screening assessments conducted in support of the investigation at sites within the former Los Alamos (LA) Inn property. The sites evaluated in this investigation report are located on private, Los Alamos County, and U.S. Department of Energy (DOE) property within former Technical Area 01 (TA-01) at Los Alamos National Laboratory (LANL or the Laboratory).

G-2.0 BACKGROUND

G-2.1 Site Descriptions and Operational History

The following information on site descriptions and operational history is for the solid waste management units (SWMUs) and area of concern (AOC) for which potential human health and ecological risks were evaluated as part of the report.

G-2.1.1 SWMU 01-001(d1), Sanitary Waste Line to Septic Tank 138

SWMU 01-001(d2) is a septic tank (septic tank 138) that was constructed of reinforced concrete and installed in 1943. SWMU 01-001(d1) is the sanitary waste line leading to septic tank 138. The septic tank was located southeast of former building Y and served former buildings K, V, and Y. Building K was a chemical stock room that contained a mercury still. Building V housed the original uranium and beryllium machine shop. Dry-grinding of boron was also conducted in V. Building Y housed a physics laboratory that handled tritium, uranium-238, and polonium-210. The former buildings were connected to septic tank 138 by one sanitary waste line [SWMU 01-001(d1)]. The tank and surrounding soil were removed during the Ahlquist radiological survey (Ahlquist et al. 1977, 005710, p. 79). The outfall was located east of former building Y and discharged over the rim of Los Alamos Canyon. This outfall area is known as Hillside 138.

Currently, the location of the waste line is on privately owned and commercially developed land and partially under an asphalt parking lot. Part of the line was under commercial buildings but is now accessible following building removal.

G-2.1.2 SWMU 01-001(s1), Portion of Western Sanitary Waste Line

SWMU 01-001(s) is the western sanitary waste line (WSWL). SWMU 01-001(s1) is the portion of the WSWL located within the former LA Inn property on the mesa top. The buildings that were served by SWMU 01-001(s) housed most of the processing and production operations in the early days of the Laboratory. SWMU 01-001(s) served former buildings A, B; former Boiler House 2; and former buildings C, D, G, M, V, and Sigma.

- Building A housed administrative offices.
- Building B had administrative offices and electronic and metallurgical laboratories. Small amounts of radionuclide foils were stored in a concrete vault in the building (Ahlquist et al. 1977, 005710, p. 128).
- Boiler House 2 supplied steam to Technical Area 01 (TA-01) buildings.

- Building C had a uranium machine shop and other machining (e.g., graphite machining) operations. Before its removal in 1964, building C was found to be free of radioactive contamination, except for the concrete building pad. The contaminated concrete pad was removed to an unspecified material disposal area (MDA).
- Building D was used to process plutonium.
- Building G housed the Sigma Pile, a small pile of graphite and uranium. Leak-testing of radium sources was also performed in building G. In 1959, the building structure was found to be uncontaminated and was removed. The concrete floor was found to be slightly contaminated with radioactivity and, along with drainlines, was taken to an unspecified MDA (Ahlquist et al. 1977, 005710, p. 125).
- Building M was used to process and recover enriched uranium.
- Building V contained offices and a toolmaker's shop. It was the original machine shop for machining uranium and beryllium and for dry-grinding boron at TA-01.
- The Sigma Building was used for machining radionuclides for casting and powder metallurgy.

SWMU 01-001(s) exited from building D, ran parallel to most of the main industrial waste line [SWMU 01-002(a)-00], and passed near the southwest corner of building C. It then proceeded west along the former Finch Street and turned north between buildings T-221 and T-225. This sanitary waste line connected to septic tank 6 [SWMU 00-030(g)] and discharged into Acid Canyon. The portion of the WSWL leading from building C to the east end of the eastern building of the Trinity Village apartments had been removed in the 1960s (Buckland 1973, 058138). The lines beneath the central and western Trinity Village buildings were probably removed before building construction, but the line beneath the eastern building may still be there.

Currently, the area has been developed and the SWMU is under an asphalt parking lot.

G-2.1.3 SWMU 01-002(a1)-00, Portion of an Industrial Waste Line

SWMU 01-002(a)-00 is an industrial waste line located in the southern and western portion of former TA-01. SWMU 01-002(a1)-00 is the portion of the industrial waste line located within the former LA Inn property on the mesa top. From 1943 to 1951, chemical and radioactive process wastes passed through this section of pipe en route to discharge to Acid Canyon [SWMU 01-002(b)-99], a small branch of Pueblo Canyon. SWMU 01-002(a)-00 included the area around former Boiler House 2, former buildings D, H, J-2, M, ML, Q, Sigma, and several properties north of Trinity Drive extending to Canyon Road (near the location of former TA-45). These former buildings were the sources of major process discharges from former TA-01 (Ahlquist et al. 1977, 005710, p. 15).

- Boiler House 2 supplied steam for TA-01.
- Building D was used to process plutonium.
- Building H was used for source preparation of polonium-210.
- Building J-2 was used for radiochemistry work.
- Building M was used to recover enriched uranium-235.
- Building ML was a medical laboratory.
- Building Q was used to calibrate laboratory equipment using radium-226 as a check source.
- Sigma Building was used for machining radionuclides for casting and powder metallurgy.

The industrial waste line consisted of two sections: the main industrial waste line south of Trinity Drive ran from former building D and the western industrial waste line ran from former building J-2 to its junction with the main industrial waste line outside the former TA-01 boundary. From the junction, the line ran north as a single unit to the former TA-45 waste treatment plant.

Currently, the area has been developed and the SWMU is under an asphalt parking lot.

G-2.1.4 AOC 01-003(b1), Surface Disposal Area

AOC 01-003(b1) is part of a former surface disposal site [AOC 01-003(b)] for construction debris reported to be below the north rim of Los Alamos Canyon approximately 450 ft east of Bailey Bridge Canyon (LANL 1990, 007511). Several trips were made to locate the site, but the disposal area was not evident, although several pieces of metal piping were found, a few objects were found scattered over more than an acre on the hillside, and the portable beta/gamma instruments used to screen each object registered only background radiation.

Currently, the AOC is on undeveloped land.

G-2.1.5 SWMU 01-006(b), Drainline and Outfall

SWMU 01-006(b) consists of a drainline and outfall that served former building D, which was used to process plutonium. The drainline exited the southwest side of the building and extended southwest and then south before discharging into Los Alamos Canyon. The types and quantities of fluids handled by this drainline are not known. During the excavation of the areas in and around former buildings D and D-2, all drainlines were removed along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64).

Currently, the area is undeveloped.

G-2.1.6 SWMU 01-006(c), Drainlines and Outfalls

SWMU 01-006(c) consists of possibly four drainlines and two outfalls that served former building D-2. Former building D-2 served as the facility for laundering radioactively contaminated clothing and recyclable equipment for the entire TA from 1943 to 1945. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of former buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). The drainlines exited the southwest side of the former building and discharged directly onto Hillside 137. The two drainlines and outfall at the southeast end of the former building were indicated on engineering drawings but were not located when trenching was conducted in the building D-2 area (Ahlquist et al. 1977, 005710, p. 49). The two drainlines and outfall at the southwest end of the building were encountered during trenching and were removed (Ahlquist et al. 1977, 005710, p. 49).

Currently, the SWMU has been covered with fill material and is undeveloped.

G-2.1.7 SWMU 01-006(h1), Storm Water Drainage System

SWMU 01-006(h) is the storm water drainage system that served the northwest side of former building R and the east side of former building Y. SWMU 01-006(h1) is the portion of the storm water drainage system within the former LA Inn property boundary on the mesa top. Building R housed model, glass, carpentry, and plumbing shops. Building Y housed a physics laboratory that handled tritium, uranium-238, and polonium-210. The outfall was located 25 ft south of former building Y on the north rim of Los Alamos Canyon, immediately west of Hillside 138.

The location of the storm water drainage system is on privately owned and commercially developed land. The SWMU was under commercial buildings but is now accessible following building demolition and removal.

G-2.1.8 SWMU 01-006(n), Storm Water Drainage System

SWMU 01-006(n) is the storm water drainage system that served former building D that was used to process plutonium. It originated near the east corner of the building and extended along the southeast side of the building to an outfall into Los Alamos Canyon. No information on the excavation of this specific drainline can be located, although during the excavation of the buildings D and D-2 areas, all drainlines were removed, along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64).

Currently, the SWMU is under a paved parking lot.

G-2.1.9 SWMU 01-007(a), Suspected Subsurface Soil Radiological Contamination

SWMU 01-007(a) is an area of suspected subsurface soil radiological contamination near former building D, which was used for processing plutonium (Ahlquist et al. 1977, 005710, p. 11).

Currently, the mesa-top portion of the SWMU is under a parking lot, the bench area has been covered with fill and is undeveloped, and the hillside portion is undeveloped.

G-2.1.10 SWMU 01-007(b), Suspected Subsurface Soil Radiological Contamination

SWMU 01-007(b) is the area of suspected subsurface soil radiological contamination associated with the drainlines and outfalls from building D-2 laundry facility (Ahlquist et al. 1977, 005710, p. 11). Building D-2 served as the laundry facility for radioactively contaminated clothing and recyclable equipment for the entire TA from 1943 to 1945 when the laundry facility was moved to TA-21. Drainlines from the laundry facility discharged directly onto Hillside 137 southwest of former building D-2. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of former buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70).

Currently, the portion of the SWMU on the bench has been covered with fill material and is undeveloped, and the hillside portion is undeveloped.

G-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 to human health and the environment for the former LA Inn property sites consisted of all qualified analytical results compiled from both historical sampling activities and the 2016 investigation. Only those data determined to be of decision-level quality following the data-quality assessment (Appendix D) and left in place following remediation are included in the data sets evaluated in this risk appendix. The data are presented in Appendix E (on DVD).

Tables G-2.2-1 to G-2.2-26 summarize the COPCs evaluated for potential risk for each site. Section 5 of the investigation report summarizes the COPC selection process. 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 0.0 to 10.0 ft below ground surface (bgs) for the residential and construction worker scenarios, 0.0 to 5.0 ft bgs for ecological risk, and 0.0 to 1.0 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 detected. Because sampling depths often overlapped during multiple investigations, all

samples with a starting depth less than the lower bound of the interval for each scenario were included in the risk assessments.

G-3.0 CONCEPTUAL SITE MODEL

The primary mechanisms of release are related to historical contaminant sources described in detail in the Upper Los Alamos Canyon Aggregate Area historical investigation report (LANL 2006, 091915) and summarized in the approved investigation work plan (LANL 2006, 091916; NMED 2006, 095460). Releases at sites within the aggregate area may have occurred as a result of surface and subsurface releases and effluent discharges. Previous sampling results indicated contamination from inorganic chemicals, organic chemicals, and radionuclides (LANL 2010, 108528).

G-3.1 Receptors and Exposure Pathways

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. Migration of contamination to groundwater through the vadose zone is unlikely given the depth to groundwater (greater than 1000 ft bgs). Human receptors may be exposed through direct contact with soil or suspended particulates by ingestion, inhalation, dermal contact, and external irradiation pathways. Direct contact exposure pathways from subsurface contamination to human receptors are complete for the resident and construction worker. The beef ingestion pathway is not complete because the sites are less than 2 acres in size and the area encompassing the sites is within the Los Alamos townsite. The exposure pathways are the same as those for surface soil. Sources, exposure pathways, and receptors are presented in the conceptual site model (Figure G-3.1-1).

The sites within the former LA Inn property are in a commercially developed area adjacent to apartments and condominiums and in many cases provide minimal potential habitat for ecological receptors. For unpaved sites or areas of sites, exposure pathways are complete to surface soil and tuff for ecological receptors. Exposure is assessed across the site to a depth of 0.0 to 5.0 ft. Weathering of tuff is the only viable natural process that may result in the exposure of receptors to COPCs in tuff. However, because of the slow rate of weathering expected for tuff, exposure to COPCs in tuff is negligible, although it is included in the assessments. Exposure pathways to subsurface contamination below 5 ft are not complete unless contaminated soil or tuff were excavated and brought to the surface. The potential pathways are root uptake by plants inhalation of 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 G-3.1-1).

G-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 also limited by a lack of hydrostatic pressure as well as the lack of a source for the continued release of contamination. Without sufficient moisture and a source, little or no potential migration of materials through the vadose zone to groundwater occurs.

Contamination at depth is addressed in the discussion of nature and extent presented in the report. Results from the deepest samples collected showed either no detected concentrations of COPCs or low or trace-level concentrations of only a few inorganic, radionuclide, and/or organic COPCs in tuff. The limited extent of contamination is related to the absence of the key factors that facilitate migration, as mentioned above. Given how long the contamination has been present in the subsurface, physical and chemicals properties of the COPCs, and the lack of saturated conditions, the potential for contaminant migration to groundwater is very low.

The New Mexico Environment Department (NMED) guidance (NMED 2015, 600915) 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 in the development of these DAF SSLs include an assumption of uniform contaminant concentrations from the contaminant source to the water table (i.e., it is assumed that migration to groundwater has already occurred). Furthermore, this assumption is inappropriate for cases such as the former LA Inn property where sampling has shown that contamination is vertically bounded near the surface and the distance from the surface to the water table is large. For these reasons, screening of contaminant concentrations in soil against the DAF SSLs was not performed.

The best indication of the potential for future contaminant migration to groundwater is the current vertical distribution of contaminants in the subsurface. All releases from the former LA Inn property sites are historical (i.e., they occurred decades ago). The regional aquifer beneath the aggregate area is greater than 1000 ft bgs. Therefore, for migration of contaminants to occur from shallow soil to the regional aquifer in a meaningful time frame (e.g., 100 to 1000 yr), significant vertical migration should have already occurred. Sampling has shown that this migration has not occurred, indicating a very low potential for future contaminant migration to groundwater.

The relevant release and transport processes of the COPCs are a function of chemical-specific properties that include the relationship between the physical form of the constituents and the nature of the constituent transport processes in the environment. Specific properties include the degree of saturation, the potential for ion exchange or sorption, and the potential for natural bioremediation. The transport of volatile organic compounds (VOCs) occurs primarily in the vapor phase by diffusion or advection in subsurface air.

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 in the vicinity of the original release points.

G-3.2.1 Inorganic Chemicals

In general, and particularly in a semiarid climate such as that found at the sites within the former LA Inn property, 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 G-3.2-1 presents the K_d values for the inorganic COPCs identified at the former LA Inn property sites. Based on this criterion aluminum, antimony, barium, chromium, lead, manganese, mercury, nickel, and zinc have a low potential to mobilize and migrate through soil and the vadose zone. The K_d values for arsenic, copper, cyanide, nitrate, perchlorate, and selenium 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 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 (neutral to slightly alkaline soil pH) present within the former LA Inn property.
- 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 neutral to slightly alkaline, 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.
- Nitrate is highly soluble in water and may migrate with water molecules in saturated soil. As noted above, the subsurface material beneath the former LA Inn property sites has low moisture content, which inhibits the mobility of nitrate as well as most other inorganic chemicals.

- Perchlorate is soluble in water and may migrate with water molecules in saturated soil. As noted above, the subsurface material beneath the former LA Inn property has low moisture content, which would inhibit the mobility of perchlorate as well as most other inorganic chemicals. The extent of perchlorate is defined.
- 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 neutral to slightly alkaline, which indicates that selenium is not likely to migrate.

G-3.2.2 Organic Chemicals

Table G-3.2-2 presents the physical and chemical properties (organic carbon–water partition coefficient [K_{oc}], logarithm to the base 10 octanol/water partition coefficient [log K_{ow}] and solubility) of the organic chemicals detected at the former LA Inn property sites. Physical and chemical properties of organic chemicals are important when evaluating their fate and transport. The following physiochemical property information illustrates some aspects of the fate and transport tendencies of the organic chemicals detected. The information is summarized from Ney (1995, 058210).

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. Acetone, benzene, benzyl alcohol, chloromethane, 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 organic chemicals identified as having water solubilities less than 10 mg/L are acenaphthene; anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; benzo[g,h,i]perylene; benzo[k]fluoranthene; bis[2-ethylhexyl]phthalate; chrysene; dibenzofuran; fluoranthene; fluorene; indeno[1,2,3-cd]pyrene; phenanthrene; and pyrene.

Vapor pressure is a chemical characteristic used to evaluate the tendency of organic chemicals to volatize. Chemicals with vapor pressure greater than 0.01 millimeters of mercury (mm Hg) are likely to volatilize, and therefore, concentrations at the site are reduced over time; vapors of these chemicals are more likely to travel toward the atmosphere and not migrate toward groundwater. Acetone; benzene; benzyl alcohol; tert-butylbenzene; chloromethane; isopropylbenzene; 4-isopropyltoluene; methylene chloride; tetrachloroethene; toluene; trichlorofluoromethane; and 1,2,4-trimethylbenzene have vapor pressures 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. Anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; benzo[g,h,i]perylene; benzo[k]fluoranthene; bis[2-ethylhexyl]phthalate; chrysene; di-n-butylphthalate; fluoranthene; indeno[1,2,3-cd]pyrene; and pyrene have vapor pressures less than 0.00001 mm Hg.

The K_{ow} is an indicator of a chemical's potential to bioaccumulate or bioconcentrate in the fatty tissues of living organisms. The unitless K_{ow} value is an indicator of water solubility, mobility, sorption, and bioaccumulation. The higher the K_{ow} is above 1000, 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 organic chemicals with a K_{ow} greater than 1000 include anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; benzo[g,h,i]perylene; benzo[k]fluoranthene; bis[2-ethylhexyl]phthalate; tert-butylbenzene; chrysene; dibenzofuran; di-n-butylphthalate; fluoranthene; fluorene; indeno[1,2,3-cd]pyrene; 4-isopropyltoluene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; tetrachloroethene; and 1,2,4-trimethylbenzene. 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. Acetone, benzyl alcohol, methylene chloride, and trichlorofluoromethane have a K_{ow} less than 500.

The K_{oc} measures the tendency of a chemical to adsorb to organic carbon in soil. K_{oc} values above 500 L/kg indicate a strong tendency to adsorb to soil, leading to low mobility (NMED 2015, 600915). Acenaphthene; acenaphthylene; anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; benzo[g,h,i]perylene; benzo[k]fluoranthene; bis[2-ethylhexyl]phthalate; tert-butylbenzene; chrysene; dibenzofuran; di-n-butylphthalate; 4,6-dinitro-2-methylphenol; fluoranthene; fluorene; indeno[1,2,3-cd]pyrene; 4-isopropyltoluene; 2-methylnaphthalene; naphthalene; phenanthrene; pyrene; and 1,2,4-trimethylbenzene have K_{oc} values above 500 L/kg, indicating a very low potential to migrate toward groundwater. The organic chemicals with K_{oc} values less than 500 L/kg are acetone; benzene; benzyl alcohol; chloromethane; methylene chloride; tetrachloroethene; toluene; and trichlorofluoromethane;.

Anthracene; Aroclor-1242; Aroclor-1254; Aroclor-1260; benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; benzo[g,h,i]perylene; benzo[k]fluoranthene; bis[2-ethylhexyl]phthalate; chrysene; dibenzofuran; di-n-butylphthalate; fluoranthene; fluorene; indeno[1,2,3-cd]pyrene; phenanthrene; and pyrene are the least mobile and the most likely to bioaccumulate. The more soluble and volatile organic chemicals acetone; benzene; chloromethane; methylene chloride; tetrachloroethene; toluene; and trichlorofluoromethane are more mobile but are also more likely to travel toward the atmosphere and not migrate toward groundwater. Because the organic chemicals were detected at low concentrations and extent is defined, they are not likely to migrate to groundwater.

G-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 G-3.2-3 presents physical and chemical properties of the radionuclide COPCs identified for the former LA Inn property sites. Based on K_d values, americium-241, cesium-134, cesium-137, plutonium-238, and plutonium-239/240 have a very low potential to migrate towards groundwater at the sites within the former LA Inn property. The K_d values for tritium, uranium-234, uranium-235/236, and uranium-238 are less than 40 and indicate a potential to migrate towards groundwater.

- 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.
- Tritium's initial behavior in the environment is determined by the source. If it is released as a gas or vapor to the atmosphere, substantial dispersion can be expected, and the rapidity of deposition is dependent on climatic factors. If tritium is released in liquid form, it is diluted in surface water and is subject to physical dispersion, percolation, and evaporation (Whicker and Schultz 1982, 058209, p. 147). Tritium concentrations in the subsurface are low (generally <1 pCi/g), indicating there is not a significant source of tritium. Because tritium migrates in association with moisture, the low moisture content of the subsurface limits the potential for tritium to migrate to groundwater.

G-3.3 Exposure Point Concentration Calculations

The exposure point concentrations (EPCs) represent upper bound concentrations of COPCs. For comparison to risk screening levels, the upper confidence 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 (or the maximum detection limit) of the COPC was used as the EPC. Calculation of UCLs of the mean concentrations was done using the U.S. Environmental Protection Agency (EPA) ProUCL 5.1.002 program (EPA 2015, 601724), which is based on EPA guidance (EPA 2002, 085640). The ProUCL program calculates 95%, 97.5%, and 99% UCLs and recommends a distribution and 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 UCL for the recommended calculation method was used as the EPC, and the 95% UCL was selected as the representative UCL. 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. 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 G-2.2-1 to G-2.2-26. Input and output data files for ProUCL calculations are provided on CD as Attachment G-1.

G-4.0 HUMAN HEALTH RISK-SCREENING ASSESSMENTS

The human health risk-screening assessments were conducted for all sites within the former LA Inn property. The sites were screened for the industrial scenario using data from 0.0 to 1.0 ft bgs, and the construction worker and residential scenarios using data from 0.0 to 10.0 ft bgs. The human health risk-screening assessments compare either the EPC of each COPC with SSLs for chemicals and screening action levels (SALs) for radionuclides.

G-4.1 SSLs

Human health risk-screening assessments were conducted using the SSLs obtained from NMED guidance (NMED 2015, 600915) or the May 2016 EPA regional tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables). The SSL 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 1×10^{-5}. EPA regional screening levels are not available for construction workers; therefore, when regional screening levels were used for a COPC, the construction worker SSLs were calculated using toxicity values from EPA's May 2016 regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and exposure parameters from NMED guidance (NMED 2015, 600915). 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 G-4.1-1.

Radionuclide SALs are used for comparison with radionuclide COPC EPCs and were derived using the residual radioactive (RESRAD) model, Version 7.0 (LANL 2015, 600929). The SALs are based on a 25-mrem/yr dose as authorized by DOE Order 458.1. Exposure parameters used to calculate the SALs are presented in Tables G-4.1-2 and G-4.1-3.

G-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 sum of the cancer risks were compared with the NMED target cancer risk level of 1×10^{-5} (NMED 2015, 600915). 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 2015, 600915). The radionuclide EPCs were divided by the SALs and multiplied by 25 mrem/yr. The sum of the doses were compared the DOE target level of 25 mrem/yr as authorized by DOE Order 458.1. The results of the human health screening evaluations are presented in Tables G-4.2-1 to G-4.2-71.

G-4.2.1 SWMU 01-001(d1)

The surface of SWMU 01-001(d1) is covered by asphalt as it is part of a parking lot for the adjacent buildings or was sampled at depths greater than 0.0 to 1.0 ft bgs. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest sample collected.

The results of the risk-screening assessments for the industrial scenario are presented in Table G-4.2-1. No carcinogenic COPCs were identified in the shallowest sample. The industrial HI is 0.004, which is below the NMED target HI of 1 (NMED 2015, 600915). No radionuclides COPCs were identified in the shallowest sample.

The results of the risk-screening assessments for the construction worker scenario are presented in Tables G-4.2-2 and G-4.2-3. No carcinogenic COPCs were identified in the 0.0- to 10.0-ft depth interval. The construction worker HI is 0.02, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-4 and G-4.2-5. No carcinogenic COPCs were identified in the 0.0- to 10.0-ft depth interval. The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the

residential scenario is 0.3 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.2.2 SWMU 01-001(s1)

The surface of SWMU 01-001(s1) is covered by asphalt as it is part of a parking lot for the adjacent buildings. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest samples collected beneath the asphalt.

The results of the risk-screening assessment for the industrial scenario are presented in Tables G-4.2-6, G-4.2-7, and G-4.2-8. The total excess cancer risk for the industrial scenario is 4×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.03, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.00001 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the construction worker scenario are presented in Tables G-4.2-9 and G-4.2-10. No carcinogenic COPCs were identified for the construction worker scenario. The construction worker HI is 0.3, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.06 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-11, G-4.2-12, and G-4.2-13. The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.2.3 SWMU 01-002(a1)-00

The surface of SWMU 01-002(a1)-00 is either covered by asphalt as part of a parking lot for the adjacent buildings or was sampled at depths greater than 0.0 to 1.0 ft bgs. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest sample collected.

The results of the risk-screening assessment for the industrial scenario are presented in Tables G-4.2-14 and G-4.2-15. No carcinogenic COPCs were identified in the shallowest sample. The industrial HI is 0.01, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.03 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessment for the construction worker scenario are presented in Tables G-4.2-16 and G-4.2-17. No carcinogenic COPCs were identified for the construction worker scenario. The construction worker HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.06 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-18, G-4.2-19, and G-4.2-20. The total excess cancer risk for the residential scenario is 1×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.2.4 AOC 01-003(b1)

The results of the risk-screening assessment for the industrial scenario are presented in Tables G-4.2-21, G-4.2-22, and G-4.2-23. The total excess cancer risk for the industrial scenario is 8×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.0004, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.02 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the construction worker scenario are presented in Tables G-4.2-24, G-4.2-25, and G-4.2-26. The total excess cancer risk for the construction worker is 2×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-27, G-4.2-28, and G-4.2-29. The total excess cancer risk for the residential scenario is 3×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.3, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 4 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.2.5 SWMU 01-006(b)

The results of the risk-screening assessment for the industrial scenario are presented in Tables G-4.2-30 and G-4.2-31. The total excess cancer risk for the industrial scenario is 6×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). No noncarcinogenic COPCs were identified in the 0.0- to 1.0-ft depth interval. The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the construction worker scenario are presented in Tables G-4.2-32, G-4.2-33, and G-4.2-34. The total excess cancer risk for the construction worker scenario is 4×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-35, G-4.2-36, and G-4.2-37. The total excess cancer risk for the residential scenario is 1×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 4 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.2.6 SWMU 01-006(c)

The results of the risk-screening assessment for the industrial scenario are presented in Tables G-4.2-38 and G-4.2-39. No carcinogenic COPCs were identified in the 0.0- to 1.0-ft depth interval. The industrial HI is 0.09, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.01 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessment for the construction worker scenario are presented in Tables G-4.2-40 and G-4.2-41. No carcinogenic COPCs were identified for the construction worker scenario. The construction worker HI is 0.4, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.09 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-42, G-4.2-43 and G-4.2-44. The total excess cancer risk for the residential scenario is 3×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.2.7 SWMU 01-006(h1)

All samples collected at SWMU 01-006(h1) were from below the 0.0- to 10.0-ft depth interval. Therefore, no complete exposure pathways to a receptor exist for the industrial, construction worker, and residential scenarios.

G-4.2.8 SWMU 01-006(n)

The results of the risk-screening assessment for the industrial scenario are presented in Tables G-4.2-45, G-4.2-46, and G-4.2-47. The total excess cancer risk for the industrial scenario is 5×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.0003, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the construction worker scenario are presented in Tables G-4.2-48, G-4.2-49, and G-4.2-50. The total excess cancer risk for the construction worker scenario is 2×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.7 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-51, G-4.2-52, and G-4.2-53. The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.2.9 SWMU 01-007(a)

The results of the risk-screening assessment for the industrial scenario are presented in Tables G-4.2-54, G-4.2-55, and G-4.2-56. The total excess cancer risk for the industrial scenario is 5×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.003, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the construction worker scenario are presented in Tables G-4.2-57, G-4.2-58, and G-4.2-59. The total excess cancer risk for the construction worker scenario is 3×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 1, which is equivalent to the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-60, G-4.2-61, and G-4.2-62. The total excess cancer risk for the residential scenario is 5×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 3 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.2.10 SWMU 01-007(b)

The results of the risk-screening assessments for the industrial scenario are presented in Tables G-4.2-63, G-4.2-64, and G-4.2-65. The total excess cancer risk for the industrial scenario is 4×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.00005, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the construction worker scenario are presented in Tables G-4.2-66, G-4.2-67 and G-4.2-68. The total excess cancer risk for the construction worker is 6×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.7 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessments for the residential scenario are presented in Tables G-4.2-69, G-4.2-70, and G-4.2-71. The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.006, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1.

G-4.3 Evaluation of Vapor Intrusion Pathway

NMED guidance (NMED 2015, 600915) requires an evaluation of the vapor intrusion pathway. The evaluation can be qualitative for a potentially complete pathway if the following criteria are met:

- VOCs are minimally detected,
- concentrations are below NMED's vapor intrusion screening levels for soil-gas and/or groundwater,
- there is no suspected source(s) for VOCs, and
- concentrations are decreasing with depth (for soil).

Because only bulk soil data are available for the SWMUs and AOC within the former LA Inn property, the vapor intrusion screening levels are not applicable for the evaluation. Residential soil screening values were calculated 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). The advanced soil model was used to calculate risk-based soil concentrations for VOCs. The maximum detected concentration of each VOC COPC was compared with the risk-based concentration generated by the model for each site as a line of evidence that the VOCs do not impact the soil or the potential risk. The model inputs and risk-based concentrations generated are provided in Attachment G-2 on CD. HQs and HIs were calculated for noncarcinogenic COPCs and total excess cancer risks for carcinogenic COPCs. The NMED target risk level of 1×10^{-5} and NMED target HI of 1 were applied.

No VOCs were detected at SWMU 01-006(h1). Therefore, the vapor intrusion pathway was not evaluated for this site.

SWMU 01-006(c) is located on the mesa edge and is not suitable for placement of a structure. The vapor intrusion pathway was not evaluated at this site. Only portions of SWMUs 01-006(b), 01-007(a), and 01-007(b) are located on the mesa top with the remainder not suitable for placing a structure because they are on the mesa edge or on the canyon slope. Therefore, only the sections of the sites on the mesa top are evaluated for the vapor intrusion pathway.

The vapor intrusion pathway was evaluated as part of the residential scenario for the sites within the former LA Inn property.

G-4.3.1 SWMU 01-001(d1)

SWMU 01-001(d) was a septic tank installed in 1943 and located southeast of former building Y and served former buildings K, V, and Y. Building K was a chemical stock room that contained a mercury still. Building V housed the original uranium and beryllium machine shop. Dry-grinding of boron was also conducted in V. Building Y housed a physics laboratory that handled tritium, uranium-238, and polonium-210. The former buildings were connected to septic tank 138 by a sanitary waste line [SWMU 01-001(d1)]. The tank and surrounding soil were removed during the Ahlquist radiological survey (Ahlquist et al. 1977, 005710, p. 79). The outfall was located east of former building Y and discharged over the rim of Los Alamos Canyon. This outfall area is known as Hillside 138. Therefore, based on the operational history of the former buildings, the cessation of operations over 70 yr ago, and the removal of the buildings and the waste line, the SWMU is not a source of VOCs.

One VOC (methylene chloride) was detected in one sample. The concentration was not at a significant level (less than 0.003 mg/kg), was below the estimated quantitation limit (EQL), and decreased with depth. The screening of the bulk soil data using the Johnson and Ettinger model as presented below indicates the soil has not been impacted. The vapor intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2015, 600915), but no additional evaluation is necessary.

The result of the residential vapor intrusion screening assessment is presented in Tables G-4.3-1. The HI is approximately 0.00001, which is less than the NMED target HI of 1 (NMED 2015, 600915). The result does not change the HI presented in section G-4.2.

G-4.3.2 SWMU 01-001(s1)

SWMU 01-001(s) was the WSWL. SWMU 01-001(s1) is the portion of the WSWL located within the former LA Inn property on the mesa top. The buildings that were served by SWMU 01-001(s) housed most of the processing and production operations in the early days of the Laboratory. SWMU 01-001(s) served former buildings A, B; former Boiler House 2; and former buildings C, D, G, M, V, and Sigma.

- Building A housed administrative offices.
- Building B had administrative offices and electronic and metallurgical laboratories. Small amounts of radionuclide foils were stored in a concrete vault in the building (Ahlquist et al. 1977, 005710, p. 128).
- Boiler House 2 supplied steam to TA-01 buildings.
- Building C had a uranium machine shop and other machining (e.g., graphite machining) operations. Before its removal in 1964, building C was found to be free of radioactive contamination, except for the concrete building pad. The contaminated concrete pad was removed to an unspecified MDA.
- Building D was used to process plutonium.
- Building G housed the Sigma Pile, a small pile of graphite and uranium. Leak-testing of radium sources was also performed in building G. In 1959, the building structure was found to be uncontaminated and was removed. The concrete floor was found to be slightly contaminated with radioactivity and, along with drainlines, was taken to an unspecified MDA (Ahlquist et al. 1977, 005710, p. 125).
- Building M was used to process and recover enriched uranium.
- Building V contained offices and a toolmaker's shop. It was the original machine shop for machining uranium and beryllium and for dry-grinding boron at TA-01.
- The Sigma Building was used for machining radionuclides for casting and powder metallurgy.

Therefore, based on the operational histories of the buildings and the removal of the buildings and waste line over 40 yr ago, the SWMU is not a source of VOCs.

One VOC (methylene chloride) was detected in four samples. Concentrations were not at significant levels (less than 0.004 mg/kg), were below the EQLs, and decreased or did not change substantially with depth. The screening of the bulk soil data using the Johnson and Ettinger model as presented below indicates the soil has not been impacted. The vapor intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2015, 600915), but no additional evaluation is necessary.

The result of the residential vapor intrusion screening assessment is presented in Tables G-4.3-2. The HI is approximately 0.00006, which is less than the NMED target HI of 1 (NMED 2015, 600915). The result does not change the HI presented in section G-4.2.

G-4.3.3 SWMU 01-002(a1)-00

SWMU 01-002(a)-00 is an industrial waste line formerly located in the southern and western portion of former TA-01. SWMU 01-002(a1)-00 is the portion of the industrial waste line located within the former LA Inn property on the mesa top. From 1943 to 1951, chemical and radioactive process wastes passed through this section of pipe en route to discharge to Acid Canyon [SWMU 01-002(b)-00], a small branch of Pueblo Canyon. SWMU 01-002(a)-00 includes the area around former Boiler House 2, former buildings D, H, J-2, M, ML, Q, Sigma, and several properties north of Trinity Drive extending to Canyon

Road (near the location of former TA-45). These former buildings were the sources of major process discharges from former TA-01 (Ahlquist et al. 1977, 005710, p. 15).

- Boiler House 2 supplied steam for TA-01.
- Building D was used to process plutonium.
- Building H was used for source preparation of polonium-210.
- Building J-2 was used for radiochemistry work.
- Building M was used to recover enriched uranium-235.
- Building ML was a medical laboratory.
- Building Q was used to calibrate laboratory equipment using radium-226 as a check source.
- Sigma Building was used for machining radionuclides for casting and powder metallurgy.

Therefore, based on the operational histories of the buildings and the removal of the buildings and waste line over 40 yr ago, the SWMU is not a source of VOCs.

Four VOCs (benzene, tert-butylbenzene, isopropylbenzene, and methylene chloride) were detected in one or three samples. Concentrations were not at significant levels (0.0002 mg/kg or less for benzene, tert-butylbenzene, and isopropylbenzene and less than 0.007 mg/kg for methylene chloride). Concentrations of benzene, tert-butylbenzene, isopropylbenzene, and two of three of methylene chloride were below the EQLs. The screening of the bulk soil data using the Johnson and Ettinger model as presented below indicates the soil has not been impacted. The vapor intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2015, 600915), but no additional evaluation is necessary.

The results of the residential vapor intrusion screening assessments are presented in Tables G-4.3-3 and G-4.3-4. The total excess cancer risk is approximately 2×10^{-9}, which is less than the NMED target cancer risk level of 1×10^{-5} (NMED 2015, 600915). The HI is approximately 0.00005, which is less than the NMED target HI of 1 (NMED 2015, 600915). The results do not change the residential cancer risk and HI presented in section G-4.2.

G-4.3.4 AOC 01-003(b1)

AOC 01-003(b1) is part of a former surface disposal site [AOC 01-003(b)] for construction debris reported to be below the north rim of Los Alamos Canyon approximately 450 ft east of Bailey Bridge Canyon (LANL 1990, 007511). Therefore, based on the operational history, the AOC is not a source of VOCs.

One VOC (acetone) was detected in one sample. The concentration was not at a significant level (approximately 0.002 mg/kg), was below the EQL, and decreased with depth. The screening of the bulk soil data using the Johnson and Ettinger model as presented below indicates the soil has not been impacted. The vapor intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2015, 600915), but no additional evaluation is necessary.

The result of the residential vapor intrusion screening assessment is presented in Table G-4.3-5. The HI is approximately 0.0000002, which is less than the NMED target HI of 1 (NMED 2015, 600915). The result does not change the residential HI presented in section G-4.2.

G-4.3.5 SWMU 01-006(b)

SWMU 01-006(b) consists of the former building D drainline and outfall that discharged to Los Alamos Canyon. Before its removal, building D was used to process plutonium. The types and quantities of liquids handled by the drainline are not known. During the 1974–1976 excavation of the building D area, all drainlines were removed along with the areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). Therefore, based on the operational history of the tank and the removal of the buildings and lines over 40 yr ago, the SWMU is not a source of VOCs.

One VOC (methylene chloride) was detected in one sample. The concentration was not at a significant level (less than 0.007 mg/kg) and decreased with depth. The screening of the bulk soil data using the Johnson and Ettinger model presented below indicates the soil has not been impacted. The vapor intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2015, 600915), but no additional evaluation is necessary.

The result of the residential vapor intrusion screening assessment is presented in Table G-4.3-6. The HI is approximately 0.0003, which is less than the NMED target HI of 1 (NMED 2015, 600915). The result does not change the residential HI presented in section G-4.2.

G-4.3.6 SWMU 01-006(n)

SWMU 01-006(n) is the storm water drainage system that served former building D that was used to process plutonium. It originated near the east corner of the building and extended along the southeast side of the building to an outfall into Los Alamos Canyon. No information on the excavation of this specific drainline can be located, although during the excavation of the buildings D and D-2 areas, all drainlines were removed, along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). Therefore, based on the operational history of former building D, the cessation of discharges to the outfall over 40 yr ago, and the removal of the drainline and outfall over 40 yr ago, the SWMU is not a source of VOCs.

Two VOCs (methylene chloride and trichlorofluoromethane) were detected in four samples and one sample, respectively. The concentrations were not at significant levels (less than 0.008 mg/kg for methylene chloride and less than 0.002 mg/kg for trichlorofluoromethane). The trichlorofluoromethane concentrations decreased with depth and methylene chloride concentrations decreased with depth at two of three locations. The screening of the bulk soil data using the Johnson and Ettinger model as presented below indicates the soil has not been impacted. The vapor intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2015, 600915), but no additional evaluation is necessary.

The result of the residential vapor intrusion screening assessment is presented in Table G-4.3-7. The HI is approximately 0.00004, which is less than the NMED target HI of 1 (NMED 2015, 600915). The result does not change the residential HI presented in section G-4.2.

G-4.3.7 SWMU 01-007(a)

SWMU 01-007(a) is an area of suspected subsurface soil radiological contamination near former building D, which was used for processing plutonium (Ahlquist et al. 1977, 005710, p. 11). During the Ahlquist radiological survey, contaminated soil was excavated in the areas of former buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). Therefore, based on the operational history, the cessation of operations over 70 yr ago, and the removal of the building and contaminated soil 40 yr ago, the SWMU is not a source of VOCs.

Seven VOCs (acetone, benzene, tert-butylbenzene, isopropylbenzene, 4-isopropyltoluene, tetrachloroethene, and trichlorofluoromethane) were detected in one or two samples and one VOC (methylene chloride) was detected in six samples. Concentrations decreased with depth, did not change substantially with depth, and/or were below the EQLs. Concentrations were not at significant levels (less than 0.008 mg/kg for acetone; 0.0002 mg/kg for benzene; less than 0.0002 mg/kg for tert-butylbenzene, isopropylbenzene, and tetrachloroethene; less than 0.005 mg/kg for 4-isopropyltoluene; less than 0.009 mg/kg for methylene chloride; and less than 0.002 mg/kg for trichlorofluoromethane). The screening of the bulk soil data using the Johnson and Ettinger model presented below indicates the soil has not been impacted. The vapor intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2015, 600915), but no additional evaluation is necessary.

The results of the residential vapor intrusion screening assessments are presented in Tables G-4.3-8 and G-4.3-9. The total excess cancer risk is approximately 2×10^{-9}, which is less than the NMED target cancer risk level of 1×10^{-5} (NMED 2015, 600915). The HI is approximately 0.001, which is less than the NMED target HI of 1 (NMED 2015, 600915). The results do not change the HI and cancer risk presented in section G-4.2.

G-4.3.8 SWMU 01-007(b)

SWMU 01-007(b) is an area of suspected subsurface soil radiological contamination associated with the drainlines and outfalls from building D-2 laundry facility (Ahlquist et al. 1977, 005710, p. 11). Building D-2 served as the laundry facility for radioactively contaminated clothing and recyclable equipment for the entire technical area from 1943 to 1945 when the laundry facility was moved to TA-21. Drain lines from the laundry facility discharged directly onto Hillside 137 southwest of former building D-2. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of former buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). Therefore, based on the operational history of the former building, the cessation of operations over 70 yr ago, and the removal of the building and contaminated soil 40 yr ago, the SWMU is not a source of VOCs.

Five VOCs (chloromethane; isopropylbenzene; 4-isopropyltoluene; trichlorofluoromethane; and 1,2,4-trimethylbenzene) were detected in one sample each and two VOCs (methylene chloride and toluene) were detected in two samples each. Concentrations were not at significant levels (0.0004 mg/kg or less for chloromethane; isopropylbenzene; 4-isopropyltoluene; toluene; trichlorofluoromethane; and 1,2,4-trimethylbenzene, and less than 0.001 mg/kg for methylene chloride). Concentrations decreased with depth or were below the EQLs in the deeper sample. The vapor intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2015, 600915), but no additional evaluation is necessary.

The results of the residential vapor intrusion screening assessments are presented in Tables G-4.3-10 and G-4.3-11. The total excess cancer risk is approximately 2×10^{-9}, which is less than the NMED target cancer risk level of 1×10^{-5} (NMED 2015, 600915). The HI is approximately 0.0002, which is less than the NMED target HI of 1 (NMED 2015, 600915). The results do not change the HI and cancer risk presented in section G-4.2.

G-4.4 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-evaluation process. Each or all of these uncertainties may affect the evaluation results.

G-4.4.1 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) that may be encountered during sampling because such data are not included in the background data set. Some inorganic chemicals and radionuclides may also have been retained as COPCs that are not site-related. 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 the inorganic and organic chemicals may include errors in sampling, laboratory analysis, and data analysis. However, because concentrations used in the risk-screening evaluations are less than estimated detection or quantitation limits, data evaluation uncertainties are expected to have little effect on the risk-screening results.

G-4.4.2 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 industrial and construction worker SSLs. For the sites evaluated, individuals might not be on-site at present or in the future for that frequency and duration. The industrial assumptions for the SSLs are that the potentially exposed individual is outside on-site for 8 h/d, 225 d/yr, and 25 yr (NMED 2015, 600915), while the construction worker SSLs are based on exposure of 8 h/d, 250 d/yr, and 1 yr (NMED 2015, 600915). The residential SSLs are based on exposure of 24 h/d, 350 d/yr, and 30 yr (NMED 2015, 600915). As a result, the industrial, construction worker, and residential scenarios evaluated at these sites likely overestimate the exposure and risk.

The actual versus hypothetical scenario exposures at the sites is appropriate given that the sites evaluated no longer exist and are not continually occupied. The levels of exposure similar to those defined by the scenarios are unlikely for any of the sites because receptors are present (if at all) for very short periods. Actual activity patterns for potential receptors within the aggregate area are not known, but given the generic industrial and construction worker exposure assumptions (potentially exposed individual is outside on-site for 8 h/d, for 225 d/yr or 250 d/yr) and the absence of regular daily operations requiring workers to be present at any of the evaluated sites, exposure and risk are almost certainly overestimated by the generic scenarios. Although some sites are located close together, no actual or foreseeable activities could result in exposure intensity commensurate with the exposure time, frequency, and duration represented by the scenarios.

Activity at sites is infrequent at best and more likely nonexistent. The sites evaluated consist of waste lines, a surface disposal area, drainlines and outfalls, storm drainage systems, and areas of potential soil contamination. Workers are not continuously present at the sites. No activity probably occurs unless the grounds need maintenance or debris needs to be cleaned up, which are short-term, infrequent activities.

The sites are either in unoccupied areas or next to buildings where no activity occurs. The waste lines, drainlines, and storm drainage systems have been removed. The most common activities, if there are any, might be site landscaping/groundskeeping (mowing grass, cutting weeds, repairing parking lots) and walking to and between buildings. None of these activities would result in the type of exposure time, frequency, and duration set forth in calculating industrial and construction SSLs, even if the activity brought a receptor in contact with more than one site. Therefore, the calculated risks are overestimated and exposure to multiple sites would not increase risk, hazard, and dose estimates.

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 2015, 600915). When several upper-bound values (such as are found in NMED 2015, 600915) 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.

G-4.4.3 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 2015, 600915). Uncertainties were identified in five areas with respect to the toxicity values: (1) extrapolation from other animals to humans, (2) interindividual variability in the human population, (3) the derivation of RfDs and SFs, (4) the chemical form of the COPC, and (5) the use of surrogate chemicals.

G-4.4.3.1 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.

G-4.4.3.2 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.

G-4.4.3.3 Derivation of RfDs and SFs

The RfDs and SFs 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.

G-4.4.3.4 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.

G-4.4.3.5 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 benzo(g,h,i)perylene and 4-isopropyltoluene based on structural similarity or because it is derived from the parent compound (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 minimal.

G-4.4.4 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.

G-4.4.5 As Low As Reasonably Achievable Analysis

The calculated total radiation dose(s) for the residential scenario at the sites within the former LA Inn property where there is public access ranged from approximately 0.2 mrem/yr to approximately 4 mrem/yr. SWMUs 01-006(b) and 01-007(a), and AOC 01-003(b1) had residential total doses 0.8 mrem/yr, 0.3 mrem/yr, and 1.4 mrem/yr, respectively, above 3 mrem/yr. The “as low as reasonably achievable” ALARA analysis for the three sites indicated the cost of cleanup at each site is greater than the benefit derived from dose reduction (Attachment G-3). As a result, the radiation exposures to the public at SWMUs 01-006(b) and 01-007(a) and AOC 01-003(b1) are ALARA and further soil removal is not warranted. The radiation exposures to the public at the other sites evaluated within the Los Alamos Inn property are less than 3 mrem/yr and are ALARA per the Laboratory’s ALARA program description (PD410, “Los Alamos National Laboratory Environmental ALARA Program,” p. 7, effective date September 8, 2008).

G-4.5 Interpretation of Human Health Risk-Screening Results

G-4.5.1 SWMU 01-001(d1)

Industrial Scenario

The surface of SWMU 01-001(d1) is covered by asphalt as it is part of a parking lot for the adjacent buildings or was sampled at depths greater than 0.0 to 1.0 ft bgs. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest sample collected.

No carcinogenic COPCs were identified in the shallowest sample. The industrial HI is 0.004, which is below the NMED target HI of 1 (NMED 2015, 600915). No radionuclides COPCs were identified in the shallowest sample.

Construction Worker Scenario

No carcinogenic COPCs were identified in the 0.0- to 10.0-ft depth interval. The construction worker HI is 0.02, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 2×10^{-8}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

No carcinogenic COPCs were identified in the 0.0- to 10.0-ft depth interval. The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.3 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 3×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

G-4.5.2 SWMU 01-001(s1)

Industrial Scenario

The surface of SWMU 01-001(s1) is covered by asphalt as it is part of a parking lot for the adjacent buildings. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest samples collected beneath the asphalt.

The total excess cancer risk for the industrial scenario is 4×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.03, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.00001 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 8×10^{-10}, based on conversion from dose using RESRAD Version 7.0.

Construction Worker Scenario

No carcinogenic COPCs were identified for the construction worker scenario. The construction worker HI is 0.3, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.06 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 3×10^{-8}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 2×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

G-4.5.3 SWMU 01-002(a1)-00

Industrial Scenario

The surface of SWMU 01-002(a1)-00 is either covered by asphalt as part of a parking lot for the adjacent buildings or was sampled at depths greater than 0.0 to 1.0 ft bgs. As a result, no surface samples were collected. The industrial scenario was evaluated using the shallowest sample collected.

No carcinogenic COPCs were identified in the shallowest sample. The industrial HI is 0.01, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.03 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 5×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Construction Worker Scenario

No carcinogenic COPCs were identified for the construction worker scenario. The construction worker HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.06 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 3×10^{-8}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

The total excess cancer risk for the residential scenario is 1×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 2×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

G-4.5.4 AOC 01-003(b1)

Industrial Scenario

The total excess cancer risk for the industrial scenario is 8×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.0004, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.02 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 1×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Construction Worker Scenario

The total excess cancer risk for the construction worker is 2×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 3×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

The total excess cancer risk for the residential scenario is 3×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.3, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 4 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 5×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

G-4.5.5 SWMU 01-006(b)

Industrial Scenario

The total excess cancer risk for the industrial scenario is 6×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). No noncarcinogenic COPCs were identified in the 0.0- to 1.0-ft depth interval. The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 9×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Construction Worker Scenario

The total excess cancer risk for the construction worker scenario is 4×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 2×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

The total excess cancer risk for the residential scenario is 1×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 4 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 3×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

G-4.5.6 SWMU 01-006(c)

Industrial Scenario

No carcinogenic COPCs were identified in the 0.0- to 1.0-ft depth interval. The industrial HI is 0.09, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.01 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 5×10^{-8}, based on conversion from dose using RESRAD Version 7.0.

Construction Worker Scenario

No carcinogenic COPCs were identified for the construction worker scenario. The construction worker HI is 0.4, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.09 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 1×10^{-8}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

The total excess cancer risk for the residential scenario is 3×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 2×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

G-4.5.7 SWMU 01-006(h1)

All samples collected at SWMU 01-006(h1) were from below the 0.0- to 10.0-ft depth interval. Therefore, there are no complete exposure pathways to a receptor for the industrial, construction worker, and residential scenarios.

G-4.5.8 SWMU 01-006(n)

Industrial Scenario

The total excess cancer risk for the industrial scenario is 5×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.0003, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 1×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

Construction Worker Scenario

The total excess cancer risk for the construction worker scenario is 2×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.7 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 1×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.07, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 2×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

G-4.5.9 SWMU 01-007(a)

Industrial Scenario

The total excess cancer risk for the industrial scenario is 5×10^{-8}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.003, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 1×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

Construction Worker Scenario

The total excess cancer risk for the construction worker scenario is 3×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is approximately 1, which is equivalent to the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 1 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 2×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

The total excess cancer risk for the residential scenario is 5×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.2, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 3 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 3×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

G-4.5.10 SWMU 01-007(b)

Industrial Scenario

The total excess cancer risk for the industrial scenario is 4×10^{-7}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The industrial HI is 0.00005, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the industrial scenario is 0.2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 7×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Construction Worker Scenario

The total excess cancer risk for the construction worker is 6×10^{-9}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The construction worker HI is 0.1, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the construction worker scenario is 0.7 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the construction worker scenario is equivalent to a total risk of 1×10^{-7}, based on conversion from dose using RESRAD Version 7.0.

Residential Scenario

The total excess cancer risk for the residential scenario is 2×10^{-6}, which is below the NMED target risk level of 1×10^{-5} (NMED 2015, 600915). The residential HI is 0.006, which is below the NMED target HI of 1 (NMED 2015, 600915). The total dose for the residential scenario is 2 mrem/yr, which is below the DOE target dose limit of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 2×10^{-6}, based on conversion from dose using RESRAD Version 7.0.

G-5.0 ECOLOGICAL RISK-SCREENING ASSESSMENTS

The approach for conducting ecological risk screening assessments is described in the “Screening Level Ecological Risk Assessment Methods, Revision 4” (LANL 2015, 600982). 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.

G-5.1 Scoping Evaluation

The scoping evaluation establishes the breadth and focus of the screening assessment. The ecological scoping checklists for the four sites evaluated within this aggregate area are useful tools for organizing existing ecological information (Attachment G-4). 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 that 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 depth of the regional aquifer (greater than 1000 ft bgs) and the semiarid climate limit transport to groundwater. The potential exposure pathways for terrestrial receptors in soil and tuff are root uptake, inhalation, soil ingestion, dermal contact, external irradiation, and food-web transport

(Figure G-3.1-1). The weathering of tuff is the only viable natural process that may result in the exposure of receptors to contaminants in tuff. Because of the slow rate of weathering expected for tuff, exposure in tuff is negligible, although it is included in the assessment. Plant exposure in tuff is largely limited to fractures near the surface, which does not produce sufficient biomass to support an herbivore population. Consequently, the contaminants in tuff are not available to receptors.

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 (LANL 2015, 600982). 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, Version 3.3 (LANL 2015, 600921).

G-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 selected to represent each functional group. The receptor species were selected 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.

G-5.3 Screening Evaluation

The ecological risk-screening assessments identify chemicals of potential ecological concern (COPECs) based on the comparison of EPCs. The ESLs for all COPCs and receptors evaluated were obtained from the ECORISK Database, Version 3.3 (LANL 2015, 600921) and are presented in Table G-5.3-1.

The risk-screening assessments involve the calculation of HQs for all COPECs and all screening receptors (LANL 2015, 600982). 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 to 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 that 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.

G-5.3.1 SWMU 01-001(d1)

The results of the minimum ESL comparisons are presented in Table G-5.3-2. Antimony, copper, mercury, selenium, and di-n-butylphthalate HQs greater than 0.3 and are retained as COPECs.

Table G-5.3-3 presents the HQs and HIs for each receptor/COPEC at SWMU 01-001(d1). The HI analysis indicates the kestrel (both feeding guilds), robin (all feeding guilds), deer mouse, shrew, earthworm, and plant have HIs greater than 1, the cottontail has an HI equivalent to 1, and the red fox has an HI less than 1. The COPECs and receptors are discussed in the uncertainty analysis.

G-5.3.2 SWMU 01-001(s1)

The surface of SWMU 01-001(s1) is covered by asphalt as it is part of a parking lot for the adjacent buildings. Therefore, there is currently little or no exposure of ecological receptors to COPCs at this SWMU. The results of the minimum ESL comparisons are presented in Table G-5.3-4. Chromium, cyanide, lead, nickel, and selenium have HQs greater than 0.3 and are retained as COPECs.

Table G-5.3-5 presents the HQs and HIs for each receptor/COPEC at SWMU 01-001(s1). The HI analysis indicates the kestrel (intermediate carnivore), robin (all feeding guilds), and shrew have HIs greater than 1, the deer mouse and kestrel (top carnivore) have HIs equivalent to 1, and the red fox, cottontail, earthworm, and plant have HIs less than 1. The COPECs and receptors are discussed in the uncertainty section.

G-5.3.3 SWMU 01-002(a1)-00

The surface of SWMU 01-002(a1)-00 is either covered by asphalt as it is part of a parking lot for the adjacent buildings or was sampled at depths greater than 0.0 to 5.0 ft bgs. As a result, there is currently little or no exposure of ecological receptors to COPCs at this SWMU. The results of the minimum ESL comparisons are presented in Table G-5.3-6. Chromium, cyanide, and selenium have HQs greater than 0.3 and are retained as COPECs.

Table G-5.3-7 presents the HQs and HIs for each receptor/COPEC at SWMU 01-002(a1)-00. The HI analysis indicates the kestrel (intermediate carnivore) and the robin (all feeding guilds) have HIs greater than 1, the kestrel (top carnivore) has an HI equivalent to 1, and the other receptors have HIs less than 1. The COPECs and receptors are discussed in the uncertainty analysis.

G-5.3.4 AOC 01-003(b1)

The results of the minimum ESL comparisons are presented in Table G-5.3-8. Copper, lead, mercury, zinc, and Aroclor-1254 have HQs greater than 0.3 and are retained as COPECs.

Perchlorate does not have ESLs for any receptor. As a result, perchlorate is retained as a COPEC and discussed in the uncertainty section.

Table G-5.3-9 presents the HQs and HIs for each receptor/COPEC at AOC 01-003(b1). The HI analysis indicates the kestrel (intermediate carnivore), robin (all feeding guilds), deer mouse, shrew, and earthworm have HIs greater than 1, the kestrel (top carnivore) and plant have HIs equivalent to 1, and the red fox and cottontail have HIs less than 1. The COPECs and receptors are discussed in the uncertainty section.

G-5.3.5 SWMU 01-006(b)

The results of the minimum ESL comparisons are presented in Table G-5.3-10. Cyanide, lead, nickel, selenium, and Aroclor-1254 have HQs greater than 0.3 and are retained as COPECs.

Table G-5.3-11 presents the HQs and HIs for each receptor/COPEC at SWMU 01-006(b). The HI analysis indicates the kestrel (intermediate carnivore), robin (all feeding guilds), and shrew have HIs greater than 1, the kestrel (top carnivore), deer mouse, and plant have HIs equivalent to 1, and red fox, cottontail, and earthworm have HIs less than 1. The COPECs and receptors are discussed in the uncertainty section.

G-5.3.6 SWMU 01-006(c)

The results of the minimum ESL comparisons are presented in Table G-5.3-12. Barium, chromium, lead, nickel, selenium, and zinc have HQs greater than 0.3 and are retained as COPECs.

Perchlorate does not have ESLs for any receptor. As a result, perchlorate is retained as a COPEC and is discussed in the uncertainty section.

Table G-5.3-13 presents the HQs and HIs for each receptor/COPEC at SWMU 01-006(c). The HI analysis indicates all receptors have HIs greater than 1, except for the red fox and kestrel (top carnivore), which have HIs less than 1. The COPECs and receptors are discussed in the uncertainty section.

G-5.3.7 SWMU 01-006(h1)

All samples collected at SWMU 01-006(h1) were from below the 0.0- to 5.0-ft depth interval. Therefore, no complete exposure pathways to ecological receptors exist.

G-5.3.8 SWMU 01-006(n)

The results of the minimum ESL comparisons are presented in Table G-5.3-14. Lead, mercury, selenium, Aroclor-1260, and bis(2-ethylhexyl)phthalate have HQs greater than 0.3 and are retained as COPECs.

Nitrate and perchlorate do not have ESLs for any receptor. As a result, nitrate and perchlorate are retained as COPECs and are discussed in the uncertainty section.

Table G-5.3-15 presents the HQs and HIs for each receptor/COPEC at SWMU 01-006(n). The HI analysis indicates the kestrel (both feeding guilds), robin (all feeding guilds), deer mouse, shrew, and earthworm have HIs greater than 1, the plant has an HI equivalent to 1, and the red fox and cottontail have HIs less than 1.

G-5.3.9 SWMU 01-007(a)

The results of the minimum ESL comparisons are presented in Table G-5.3-16. Beryllium, chromium, mercury, nickel, selenium, zinc, and bis(2-ethylhexyl)phthalate have HQs greater than 0.3 and are retained as COPECs.

Potential ecological risks associated with aluminum are based on soil pH. Aluminum is retained as a COPEC 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 average soil pH is neutral to slightly alkaline.

Isopropyltoluene[4-] does not have ESLs for any receptor. As a result, 4-isopropyltoluene is retained as a COPEC and is discussed in the uncertainty section.

Table G-5.3-17 presents the HQs and HIs for each receptor/COPEC at SWMU 01-007(a). The HI analysis indicates all receptors have HIs greater than 1, except for the red fox, kestrel (top carnivore), and cottontail, which have HIs less than 1. The COPECs and receptors are discussed in the uncertainty section.

G-5.3.10 SWMU 01-007(b)

The results of the minimum ESL comparisons are presented in Table G-5.3-18. Chromium, nickel, selenium, bis(2-ethylhexyl)phthalate, and di-n-butylphthalate have HQs greater than 0.3 and are retained as COPECs.

Isopropyltoluene[4-], perchlorate, and 1,2,4-trimethylbenzene do not have ESLs for any receptor. As a result, 4-isopropyltoluene, perchlorate, and 1,2,4-trimethylbenzene are retained as COPECs and are discussed in the uncertainty section.

Table G-5.3-19 presents the HQs and HIs for each receptor/COPEC at SWMU 01-007(b). The HI analysis indicates the robin (omnivore and insectivore) and shrew have HIs greater than 1, kestrel (intermediate carnivore) has an HI equivalent to 1, and the other receptors have HIs less than 1. The COPECs and receptors are discussed in the uncertainty section.

G-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.

G-5.4.1 Chemical Form

The assumptions used in the ESL derivations are conservative and not necessarily representative of actual conditions. These assumptions include maximum chemical bioavailability, maximum receptor ingestion rates, minimum body weight, and additive effects of multiple COPECs. These factors tend to result in conservative ESL estimates, which may lead to an overestimation of the potential risk. The assumption of additive effects for multiple COPECs may result in an over- or underestimation of the potential risk to receptors.

The chemical form of the individual COPCs was not determined as part of the investigation. Toxicological data are typically based on the most toxic and bioavailable chemical species, which are not typically found in the environment. Inorganic, radionuclide, and organic 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 2015, 600982), and the values are biased toward overestimating the potential risk to receptors.

G-5.4.2 Exposure Assumptions

The EPCs used in the HQ calculations are the 95% UCLs, maximum detected concentrations, or maximum detection limits to a depth of 0.0 to 5.0 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 are likely to overestimate potential ecological exposure and risk.

G-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.

G-5.4.4 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. The kestrel (top carnivore) is used as the surrogate receptor for the Mexican spotted owl. The site areas range from 0.0001 ha to 0.48 ha, and the HR for the Mexican spotted owl is 366 ha. Therefore, the AUFs for the Mexican spotted owl range from 0.00000027 to 0.0013. Application of the AUFs for the Mexican spotted owl to the HQs for the kestrel (top carnivore) results in adjusted HIs ranging from 0.00000005 to 0.0007. Therefore, no potential exists for adverse impacts to the Mexican spotted owl.

G-5.4.5 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 HR and its dispersal distance (Bowman et al. 2002, 073475). Bowman et al. (2002, 073475) estimate that the median dispersal distance for mammals is 7 times the linear dimension of the HR (i.e., the square root of the HR area). If only the dispersal distances for the mammals with HRs within the range of the screening receptors are used, the median dispersal distance becomes 3.6 times the square root of the HR ($R^2 = 0.91$) (Bowman et al. 2002, 073475). If it is assumed that the receptors can disperse over the same distance in any direction, the population area is circular and the dispersal distance is the radius of the circle. Therefore, the population area for each receptor can be derived by $\pi(3.6\sqrt{HR})^2$ or approximately 40HR.

The home ranges for the kestrel, robin, deer mouse, shrew, cottontail, and red fox were determined using the data in EPA's wildlife exposure factors handbook (EPA 1993, 059384). The HRs were either for specific environments or averages of different environments presented in the respective exposure parameter/population dynamic tables (EPA 1993, 059384). Laboratory guidance (2015, 600982, Table 3.3-1) presents how the EPA data were used to derive the HRs for each receptor. The HRs were used to calculate the population areas for each receptor as described above.

SWMU 01-001(d1)

The area of SWMU 01-001(d1) is approximately 0.033 ha. The population area use factors (PAUFs) are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-1). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for SWMU 01-001(d1) are less than 1 for all receptors (Table G-5.4-2). The plant had an unadjusted HI of 2, and the earthworm had an unadjusted HI of 28 (Table G-5.4-2).

SWMU 01-001(s1)

The area of SWMU 01-001(s1) is approximately 0.016 ha. The PAUFs are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-3). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for SWMU 01-001(s1) are less than 1 for all receptors (Table G-5.4-4). The earthworm and plant have unadjusted HIs less than 1 (Table G-5.4-4).

SWMU 01-002(a1)-00

The area of SWMU 01-002(a1)-00 is approximately 0.082 ha. The PAUFs are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-5). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for SWMU 01-002(a1)-00 are less than 1 for all receptors (Table G-5.4-6). The earthworm and plant have unadjusted HIs less than 1 (Table G-5.4-6).

AOC 01-003(b1)

The area of AOC 01-003(b1) is approximately 0.0028 ha. The PAUFs are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-7). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for AOC 01-003(b1) are less than 1 for all receptors (Table G-5.4-8). The plant had an unadjusted HI of approximately 1, and the earthworm had an unadjusted HI of 6 (Table G-5.4-8).

SWMU 01-006(b)

The area of SWMU 01-006(b) is approximately 0.015 ha. The PAUFs are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-9). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for SWMU 01-006(b) are less than 1 for all receptors (Table G-5.4-10). The plant had an unadjusted HI of approximately 1, and the earthworm had an unadjusted HI of 0.2 (Table G-5.4-10).

SWMU 01-006(c)

The area of SWMU 01-006(c) is approximately 0.0001 ha. The PAUFs are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-11). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for SWMU 01-006(c) are less than 1 for all receptors (Table G-5.4-12). The plant had an unadjusted HI of 8, and the earthworm had an unadjusted HI of 2 (Table G-5.4-12).

SWMU 01-006(n)

The area of SWMU 01-006(n) is approximately 0.026 ha. The PAUFs are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-13). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for SWMU 01-006(n) are less than 1 for all receptors (Table G-5.4-14). The plant had an unadjusted HI of approximately 1 and the earthworm had an unadjusted HI of 11 (Table G-5.4-14).

SWMU 01-007(a)

The area of SWMU 01-007(a) is approximately 0.48 ha. The PAUFs are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-15). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for SWMU 01-007(a) are less than 1 for all receptors, except the robin (insectivore), which has an adjusted HI of approximately 1 (Table G-5.4-16). The plant had an unadjusted HI of 2, and the earthworm had an unadjusted HI of 3 (Table G-5.4-16).

SWMU 01-007(b)

The area of SWMU 01-007(b) is approximately 0.46 ha. The PAUFs are estimated by dividing the site area by the population area of each receptor population (Table G-5.4-17). The HQs and HIs are recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs.

The adjusted HIs for SWMU 01-007(b) are less than 1 for all receptors (Table G-5.4-18). The earthworm and plant had unadjusted HIs less than 1 (Table G-5.4-18).

G-5.4.6 LOAEL Analysis

Several sites have adjusted or unadjusted HIs equivalent to or greater than 1 for one or more receptors. To address these HIs and reduce the associated uncertainty, a LOAEL analysis was conducted using ESLs calculated based on a LOAEL rather than a NOAEL. The LOAEL-based ESLs were calculated based on toxicity information in the ECORISK Database, Version 3.3 (LANL 2015, 600921) and are presented in Table G-5.4-19. The analysis addresses some of the uncertainties and conservativeness of the ESLs used in the initial screening assessments. The HI analyses were conducted using the LOAEL-based ESLs. The HQs and HIs calculated for this subset of receptors and COPECs were also adjusted using the PAUFs, if the wildlife receptor HIs were equivalent to or exceeded 1 using the LOAEL-based ESLs.

G-5.4.7 Site Discussions

SWMU 01-001(d1)

The unadjusted HIs for SWMU 01-001(d1) is greater than 1 for the earthworm and plant (Table G-5.4-2). The primary COPEC for the earthworm is mercury and for the plant is selenium. The HI analysis using LOAEL-based ESLs resulted in an HI of 3 for the earthworm and approximately 0.4 for the plant (Table G-5.4-20).

The LOAEL-based earthworm HI is from mercury. The EPC is the maximum detected concentration (1.4 mg/kg), which is the only concentration above BV in the 0.0 to 5.0 ft bgs depth interval (other mercury concentrations from 0.0 to 5.0 ft are 1% to 5% of the maximum), and decreased by orders of magnitude with depth. The median of the data set is 0.0629 mg/kg, which results in a HQ using the LOAEL-based ESL of approximately 0.1. Therefore, the potential ecological risk to the earthworm is overestimated.

SWMU 01-001(d1) is a small site with an area of approximately 0.033 ha. The limited area of contamination indicates the soil invertebrate community as a whole is not impacted. The area is also heavily developed and provides little or no quality habitat.

AOC 01-003(b1)

The unadjusted HIs for AOC 01-003(b1) are greater than or equivalent to 1 for the earthworm and plant (Table G-5.4-8). The primary COPECs for the earthworm are mercury and zinc and for the plant are lead and zinc. The HI analysis using LOAEL-based ESLs resulted in HIs of 0.6 for the earthworm and 0.3 for the plant (Table G-5.4-21).

SWMU 01-006(b)

The unadjusted HI for SWMU 01-006(b) is approximately 1 for the plant (Table G-5.4-10). The primary COPEC for the plant is selenium. The HI analysis using LOAEL-based ESL resulted in an HI of 0.2 for the plant (Table G-5.4-22).

SWMU 01-006(c)

The unadjusted HIs for SWMU 01-006(c) are greater than 1 for the earthworm and plant (Table G-5.4-12). The primary COPECs are barium, lead, nickel, selenium, and zinc for one or both receptors. The HI analysis using LOAEL-based ESLs resulted in an HI of 0.2 for the earthworm and 2 for the plant (Table G-5.4-23).

The LOAEL-based plant HI is primarily from barium and selenium. The barium EPC is the maximum detected concentration (172 mg/kg), which was in a soil sample, and below the soil BV (295 mg/kg) (i.e., 172 mg/kg is a background concentration). The other detected concentration (82.1 mg/kg), which was in a Qbt 3 sample and above the Qbt 2,3,4 BV, is approximately one-half the maximum and less than the soil BV. This concentration results in a LOAEL-based HQ of 0.3. Selenium was not detected in either sample so the EPC is the maximum detection limit (2.6 mg/kg); the other detection limit was 0.53 mg/kg and results in a LOAEL-based HQ of 0.2. The use of detection limits as EPCs overestimates the potential risk to the plant.

In addition, SWMU 01-006(c) is a small site with an area of approximately 0.0001 ha. The limited area of contamination indicates the plant community as a whole is not impacted. Field observations made during the site visit found the site to be physically disturbed with scattered weeds and grasses (Attachment G-4). Therefore, the HI does not indicate potential risk to the plants.

SWMU 01-006(n)

The unadjusted HIs for SWMU 01-006(n) are greater than or equivalent to 1 for the earthworm and plant (Table G-5.4-14). The primary COPEC for the earthworm is mercury and the primary COPECs for the plant are lead and selenium. The HI analysis using LOAEL-based ESLs resulted in HIs of approximately 1 for the earthworm and 0.3 for the plant (Table G-5.4-24).

The LOAEL-based earthworm HI is from mercury. The mercury EPC (0.555 mg/kg) is the maximum detected concentration from 0.0 to 5.0 ft and overestimates the risk to the earthworm. The other mercury concentrations reported in this depth interval were either below the BV of 0.1 mg/kg or approximately 20% to 25% of the maximum. The median concentration of mercury is 0.121 mg/kg, which results in an HQ based on the LOAEL-based ESL of 0.2.

In addition, SWMU 01-006(n) is a small site with an area of approximately 0.026 ha. The limited area of mercury contamination indicates the soil invertebrate community as a whole is not impacted.

SWMU 01-007(a)

The adjusted HI for SWMU 01-007(a) is approximately 1 for the robin (insectivore) and the unadjusted HIs are greater than 1 for the earthworm and plant (Table G-5.4-16). The primary COPECs are bis(2-ethylhexyl)phthalate for the robin (insectivore), mercury and zinc for the earthworm, and beryllium and selenium for the plant. The HI analysis using LOAEL-based ESL resulted in HIs of 3 for the robin (insectivore), 0.3 for the earthworm, and 0.2 for the plant (Table G-5.4-25). The adjusted HI analysis using LOAEL-based ESL resulted in an HI of 0.1 for the robin (insectivore) (Table G-5.4-26).

G-5.4.8 COPECs without ESLs

Several COPECs do not have ESLs for any receptor in Version 3.3 of the ECORISK Database (LANL 2015, 600921). 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, U.S. Department of Agriculture Integrated Pesticide Management Database, American Bird Conservancy Pesticide Toxicity Database, and Oak Ridge National Laboratory Risk Assessment Information System. Although the COPECs listed did not have any relevant toxicity data in the online databases listed above, a search of the literature continues in an effort to determine if any relevant toxicity information exists.

In the absence of a chemical-specific ESL, COPEC concentrations can be compared with 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. In these cases, comparisons with residential human health SSLs are presented as part of a qualitative assessment. The comparison of COPEC concentrations with residential human health SSLs is a viable alternative for several reasons. Animal studies are used to infer effects on humans and is 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). The COPECs without ESLs are discussed below.

No ESLs are available for 4-isopropyltoluene; nitrate; perchlorate; and 1,2,4-trimethylbenzene. For nitrate and perchlorate, no surrogate or other toxicity information are available. For the other COPECs, surrogates are used based on structural similarity to evaluate the potential toxicity.

Isopropyltoluene[4-] was detected in one sample each at SWMUs 01-007(a) and 01-007(b) from 0.0 to 5.0 ft at concentrations of 0.0041 mg/kg and 0.00019 mg/kg, respectively. The minimum ESL for toluene (23 mg/kg for the montane shrew) was used to screen 4-isopropyltoluene and resulted in a maximum HQ of 0.0002. Because the HQ is less than 0.3, 4-isopropyltoluene is not retained as a COPEC.

Nitrate was detected in one sample at SWMU 01-006(n) from 0.0 to 5.0 ft at an elevated concentration of 26 mg/kg. Nitrate is naturally occurring and all other nitrate concentrations likely reflect naturally occurring concentrations. The NMED residential SSL for nitrate is 125,000 mg/kg, indicating that potential toxicity is very low. Because of the potential low toxicity and the low frequency of detection above naturally occurring concentrations, nitrate is not retained as a COPEC.

Perchlorate was detected in one or three samples at four sites from 0.0 to 5.0 ft at concentrations ranging from 0.00111 mg/kg to 0.016 mg/kg. The NMED residential SSL for perchlorate is 54.5 mg/kg, indicating that potential toxicity is low. Because of the potential low toxicity and the low frequency of detection, perchlorate is not retained as a COPEC.

Trimethylbenzene[1,2,4-] was detected in one sample at SWMU 01-007(b) from 0.0 to 5.0 ft at a concentration of 0.0004 mg/kg. The minimum ESL for benzene (24 mg/kg for the deer mouse) was used to screen 1,2,4-trimethylbenzene and resulted in a maximum HQ of 0.00002. Because the HQ is less than 0.3, 1,2,4-trimethylbenzene is not retained as a COPEC.

G-5.5 Interpretation of Ecological Risk-Screening Results

G-5.5.1 Receptor Lines of Evidence

Based on the ecological risk-screening assessments, several COPECs (including COPECs without ESLs) were identified at the former LA Inn property sites. Receptors were evaluated using several lines of evidence: minimum ESL comparisons, HI analyses, potential effects to populations (individuals for T&E species), and LOAEL analyses.

Kestrel (Top Carnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the kestrel (top carnivore), are less than 0.3.
- The HI analyses indicated that the HIs for the kestrel (top carnivore) are less than 1 at three sites.
- The HIs were adjusted by the PAUFs, which is the ratio of the site area to the kestrel's population area. The adjusted HIs are less than 1 for the kestrel (top carnivore) for all of the sites.
- The kestrel (top carnivore) is a surrogate for the Mexican spotted owl. The HI was adjusted by the AUF, which is the ratio of the site area to the individual HR. The adjusted HIs are less than 1 for all sites.

These lines of evidence support the conclusion that no potential ecological risk to the kestrel (top carnivore) or the Mexican spotted owl exists at the former LA Inn property sites.

Kestrel (Intermediate Carnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the kestrel (intermediate carnivore), are less than 0.3.
- The HI analyses indicated that the HI for the kestrel (intermediate carnivore) is equivalent to 1 at SWMU 01-007(b). The remaining sites have HIs greater than 1.

- The HIs were adjusted by the PAUFs, which is the ratio of the site area to the kestrel's population area. The adjusted HIs are less than 1 for the kestrel (intermediate carnivore) for all sites.

These lines of evidence support the conclusion that no potential ecological risk to the kestrel (intermediate carnivore) exists at the former LA Inn property sites.

Robin (All Feeding Guilds)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the robin, were less than 0.3.
- The HI analyses indicated the HIs are less than for the robin (herbivore) but greater than 1 for the robin (omnivore and insectivore) at SWMU 01-007(b). The remaining sites have HIs greater than 1 for the robin (all feeding guilds).
- The HIs were adjusted by the PAUFs, which is the ratio of the site area to the robin's population area. The adjusted HIs are less than 1 for the robin (all feeding guilds) at the majority of sites. The adjusted HI is greater than 1 for the robin (insectivore) at SWMU 01-007(a).
- A LOAEL analysis was conducted at SWMU 01-007(a). The adjusted LOAEL HI is less than 1 for the robin (insectivore).

These lines of evidence support the conclusion that no potential ecological risk to the robin (all feeding guilds) exists at the former LA Inn property sites.

Deer Mouse (Omnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the deer mouse, were less than 0.3.
- The HI analyses indicated the HIs were less than 1 for the deer mouse at SWMUs 01-002(a1)-00 and 01-007(b) and equivalent to 1 at SWMUs 01-001(s1) and 01-006(b). The HIs at the other sites are greater than 1.
- The HIs 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 at all sites.

These lines of evidence support the conclusion that no potential ecological risk to the deer mouse exists at the former LA Inn property sites.

Montane Shrew (Insectivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the shrew, are less than 0.3.
- The HI analyses indicated the HIs were less than 1 for the shrew at SWMU 01-002(a1)-00. The HIs at the other sites are greater than 1.
- The HIs were adjusted by the PAUFs, which is the ratio of the site area to the shrew's population area. The adjusted HIs are less than 1 for the shrew at all sites.

These lines of evidence support the conclusion that no potential ecological risk to the montane shrew exists at the former LA Inn property sites.

Desert Cottontail (Herbivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the cottontail, are less than 0.3.
- The HI analyses indicated that the HIs for the cottontail are less 1 than at 7 sites, equivalent to 1 at SWMU 01-001(d1), and greater than 1 at SWMU 01-006(c).
- The HIs were adjusted by the PAUFs, which is the ratio of the site area to the cottontail's population area. The adjusted HIs are less than 1 for the cottontail for all sites.

These lines of evidence support the conclusion that no potential ecological risk to the cottontail exists at the former LA Inn property sites.

Red Fox (Carnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the red fox, are less than 0.3.
- The HI analyses indicated that the HIs for the red fox are less than 1 at all sites.

These lines of evidence support the conclusion that no potential ecological risk to the red fox exists at the former LA Inn property sites.

Earthworm (Invertebrate)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the earthworm, were less than 0.3.
- The HI analyses indicated that the HIs for the earthworm are less than 1 at SWMUs 01-001(s1), 01-002(a1)-00, 01-006(b), and 01-007(b) and are greater than 1 at the other sites.
- A LOAEL analysis was conducted for the sites with HIs greater than 1. The unadjusted LOAEL HIs are less than 1 at SWMUs 01-006(c) and 01-007(a) and AOC 01-003(b1). The unadjusted LOAEL HI is equivalent to 1 at SWMU 01-006(n) and greater than 1 at SWMU 01-001(d1).
- Further evaluation of the data found the potential risks to the earthworm are overestimated at these two sites.
- Field observations made during the site visit and field activities found no indication of adverse impacts on the plant community. Because the plant community does not appear to be affected by COPECs, the earthworm population is also probably not affected. In addition, the sites are small and the limited areas of contamination do not affect the soil invertebrate community as a whole. .

These lines of evidence support the conclusion that no potential ecological risk to the earthworm exists at the former LA Inn property sites.

Plant

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the plant, are less than 0.3.
- The HI analyses indicated that the HIs for the plant are less than 1 at SWMUs 01-001(s1), 01-002(a1)-00, and 01-007(b) and equivalent to 1 at SWMUs 01-006(b) and 01-006(n) and AOC 01-003(b1). The HIs at the other sites are greater than 1.

- A LOAEL analysis was conducted for the sites with HIs greater than or equivalent to 1. The unadjusted LOAEL HIs are less than 1 at SWMUs 01-006(b), 01-006(n), and 01-007(a) and AOC 01-003(b1), equivalent to 1 at SWMU 01-001(d1), and greater than 1 at SWMU 01-006(c).
- Further evaluation of the data found the potential risks to the plant are overestimated at these sites.
- 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. In addition, the sites are small and the limited areas of contamination do not affect the plant community as a whole.

These lines of evidence support the conclusion that no potential ecological risk to the plant exists at the former LA Inn property sites.

G-5.5.2 COPECs with No ESLs

The COPECs with no ESLs were not evaluated for each receptor. If a surrogate chemical could be identified, the minimum ESL was used to screen the COPEC. If a residential SSL was available, it was used to estimate potential toxicity. All COPECs were eliminated based on these comparisons.

The analysis of COPECs with no ESLs supports the conclusion that there are no potential ecological risks to any receptor at the former LA Inn property sites.

G-5.5.3 Summary

Based on evaluations of the minimum ESL, HI analysis, potential effects to populations (individuals for T&E species), and LOAEL analyses, no potential ecological risk to the kestrel, robin, deer mouse, desert cottontail, shrew, red fox, earthworm, and plant exists at the sites evaluated within the former LA Inn property.

G-6.0 CONCLUSIONS AND RECOMMENDATIONS

G-6.1 Human Health

The risk-screening assessment results indicated no potential unacceptable risks or doses from COPCs exist for the industrial, construction worker, and residential scenarios at the 10 sites located within the former LA Inn property. The total excess cancer risks are below the NMED target risk level of 1×10^{-5}, the HIs are below or equivalent to the NMED target HI of 1, and the doses are below the DOE target dose limit of 25 mrem/yr. In addition, risk-screening assessments were not conducted for SWMU 01-006(h1) because no samples were collected within the 0.0- to 10.0-ft depth interval relevant for exposure to receptors.

The equivalent total risks for radionuclides were estimated based on conversion from dose using RESRAD Version 7.0. The equivalent total risks from radionuclides ranged from 8×10^{-10} to 1×10^{-6} for the industrial scenario, from 2×10^{-8} to 3×10^{-7} for the construction worker scenario, and from 3×10^{-7} to 5×10^{-6} for the residential scenario.

The Laboratory's ALARA program description (PD410, "Los Alamos National Laboratory Environmental ALARA Program," p. 7, effective date September 8, 2008) states that "quantitative ALARA evaluations are not necessary for Laboratory activities that have a potential for annual public exposure less than a 3-mrem TEDE [total effective dose equivalent] individual dose…." The calculated total radiation dose(s)

for the residential scenario at the publicly accessible sites within the former LA Inn property ranged from approximately 0.2 mrem/yr to approximately 4 mrem/yr. Three sites [SWMUs 01-006(b) and 01-007(a), and AOC 01-003(b1)] had residential total doses 0.8 mrem/yr, 0.3 mrem/yr, and 1.4 mrem/yr, respectively, above 3 mrem/yr. The ALARA analysis for the three sites indicated the cost of cleanup at each site is greater than the benefit derived from dose reduction (Attachment G-3). The radiation exposures to the public at the other sites evaluated within the former LA Inn property are less than 3 mrem/yr and are therefore ALARA. As a result, the radiation exposures to the public at these sites are ALARA, and further soil removal is not warranted.

G-6.2 Ecology

No potential ecological risks were found for any receptor at the 10 sites located within the former LA Inn property based on minimum ESL comparisons, HI analyses, potential effects to populations (individuals for T&E species), and LOAEL analyses. These lines of evidence, discussed above for each receptor, and the analysis of COPECs with no ESLs support the conclusion that no potential ecological risks exist at the sites evaluated within the former LA Inn property. In addition, a risk-screening assessment was not conducted for SWMU 01-006(h1) because no samples were collected within the 0.0- to 5.0-ft depth interval relevant for exposure to ecological receptors. Therefore, no potential risks to ecological receptors from COPCs exist at this site.

G-7.0 REFERENCES

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Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the ESH 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 to 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 to 10 ft or 1 to 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 screen; major or minor pathway.

O = Not evaluated in risk screen; no pathway.

Figure G-3.1-1 Conceptual site model for human and ecological receptors

Table G-2.2-1
EPCs at SWMU 01-001(d1) for Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Mercury	1	1	1.4	1.4	n/a*	1.4	Maximum detected concentration
Selenium	1	1	1.05(J)	1.05(J)	n/a	1.05	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-2
EPCs at SWMU 01-001(d1) for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	4	0	0.34(U)	1.19(U)	n/a*	1.19(U)	Maximum detection limit
Copper	4	4	0.617(J)	17.9	n/a	17.9	Maximum detected concentration
Mercury	4	4	0.0154	1.4	n/a	1.4	Maximum detected concentration
Selenium	4	3	0.52(U)	1.05(J)	n/a	1.05	Maximum detected concentration
Organic Chemicals (mg/kg)							
Di-n-butylphthalate	4	1	0.058(J)	0.399(U)	n/a	0.058	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-239/240	4	1	-0.0152(U)	0.97	n/a	0.97	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-3
EPCs at SWMU 01-001(d1) 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)							
Antimony	8	0	0.34(U)	1.19(U)	n/a*	1.19(U)	Maximum detection limit
Copper	8	8	0.513(J)	17.9	Nonparametric	12.28	95% Chebyshev (Mean, Sd)
Mercury	8	8	0.00778(J)	1.4	Lognormal	0.678	95% Chebyshev (MVUE)
Selenium	8	7	0.52(U)	1.51	Normal	1.17	95% KM (t)
Organic Chemicals (mg/kg)							
Di-n-butylphthalate	8	1	0.058(J)	0.407(U)	n/a	0.058	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-239/240	8	1	-0.0152(U)	0.97	n/a	0.97	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-4
EPCs at SWMU 01-001(s1) for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Chromium (Total)	2	2	6.6(J-)	20.4(J-)	n/a*	20.4	Maximum detected concentration
Cyanide (Total)	2	1	0.14(U)	0.84	n/a	0.84	Maximum detected concentration
Lead	2	2	4.2	15.7	n/a	15.7	Maximum detected concentration
Nickel	2	2	5	10.7	n/a	10.7	Maximum detected concentration
Selenium	2	1	0.26(J)	0.61(U)	n/a	0.26	Maximum detected concentration
Organic Chemicals (mg/kg)							
Methylene chloride	2	2	0.0016(J)	0.0033(J)	n/a	0.0033	Maximum detected concentration
Radionuclides (pCi/g)							
Tritium	2	1	0.09(U)	0.94	n/a	0.94	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-5
EPCs at SWMU 01-001(s1) for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Chromium (Total)	4	4	6.6(J-)	20.4(J-)	n/a*	20.4	Maximum detected concentration
Cyanide (Total)	4	2	0.14(U)	0.84	n/a	0.84	Maximum detected concentration
Lead	4	4	4.2	15.7	n/a	15.7	Maximum detected concentration
Nickel	4	4	5	10.7	n/a	10.7	Maximum detected concentration
Selenium	4	2	0.24(J)	0.61(U)	n/a	0.26	Maximum detected concentration
Organic Chemicals (mg/kg)							
Butylbenzylphthalate	4	1	0.09(J)	0.41(U)	n/a	0.09	Maximum detected concentration
Methylene chloride	4	4	0.0016(J)	0.0033(J)	n/a	0.0033	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-238	4	1	-0.0095(U)	0.117	n/a	0.117	Maximum detected concentration
Plutonium-239/240	4	1	0.009(U)	0.122	n/a	0.122	Maximum detected concentration
Tritium	4	1	0.09(U)	0.94	n/a	0.94	Maximum detected concentration
Uranium-235/236	4	1	0.029(U)	0.167	n/a	0.167	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-6
EPCs at SWMU 01-001(s1) 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)							
Chromium (Total)	6	6	1.54	20.4(J-)	n/a*	20.4	Maximum detected concentration
Cyanide (Total)	6	2	0.14(U)	0.84	n/a	0.84	Maximum detected concentration
Lead	6	6	4.2	15.7	n/a	15.7	Maximum detected concentration
Nickel	6	6	2.15	10.7	n/a	10.7	Maximum detected concentration
Selenium	6	4	0.24(J)	0.873(J)	n/a	0.873	Maximum detected concentration
Organic Chemicals (mg/kg)							
Butylbenzylphthalate	6	1	0.09(J)	0.41(U)	n/a	0.09	Maximum detected concentration
Methylene chloride	6	4	0.00549(U)	0.0033(J)	n/a	0.0033	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-238	6	1	-0.0095(U)	0.117	n/a	0.117	Maximum detected concentration
Plutonium-239/240	6	2	0.009(U)	0.122	n/a	0.122	Maximum detected concentration
Tritium	6	1	-0.749(U)	1.11(U)	n/a	0.94	Maximum detected concentration
Uranium-235/236	6	1	0.0728(U)	0.167	n/a	0.167	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-7
EPCs at SWMU 01-002(a1)-00 for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Cyanide (Total)	1	1	0.83(J)	0.83(J)	n/a*	0.83	Maximum detected concentration
Organic Chemicals (mg/kg)							
Methylene chloride	1	1	0.0026(J)	0.0026(J)	n/a	0.0026	Maximum detected concentration
Radionuclides (pCi/g)							
Uranium-235/236	1	1	0.167	0.167	n/a	0.167	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-8
EPCs at SWMU 01-002(a1)-00 for the Construction Worker and Residential Scenarios and for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Chromium (Total)	2	2	6.6(J-)	13.7(J-)	n/a*	13.7	Maximum detected concentration
Cyanide (Total)	2	1	0.14(U)	0.83	n/a	0.83	Maximum detected concentration
Selenium	2	1	0.26(J)	0.61(U)	n/a	0.26	Maximum detected concentration
Organic Chemicals (mg/kg)							
Methylene chloride	2	2	0.0024(J)	0.0026(J)	n/a	0.0026	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-238	2	1	-0.01(U)	0.117	n/a	0.117	Maximum detected concentration
Plutonium-239/240	2	1	0.022(U)	0.122	n/a	0.122	Maximum detected concentration
Uranium-235/236	2	1	0.101(U)	0.167	n/a	0.167	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-9
EPCs at AOC 01-003(b1) for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Copper	2	2	8.02	18.2	n/a*	18.2	Maximum detected concentration
Perchlorate	2	1	0.00168(J)	0.00208(U)	n/a	0.00168	Maximum detected concentration
Organic Chemicals (mg/kg)							
Aroclor-1260	2	2	0.00673	0.00703	n/a	0.00703	Maximum detected concentration
Benzo(a)anthracene	2	2	0.0145(J)	0.0196(J)	n/a	0.0196	Maximum detected concentration
Benzo(a)pyrene	2	2	0.0152(J)	0.0179(J)	n/a	0.0179	Maximum detected concentration
Benzo(b)fluoranthene	2	2	0.0195(J)	0.0298(J)	n/a	0.0298	Maximum detected concentration
Benzo(g,h,i)perylene	2	2	0.0113(J)	0.0179(J)	n/a	0.0179	Maximum detected concentration
Benzo(k)fluoranthene	2	1	0.0133(J)	0.0354(U)	n/a	0.0133	Maximum detected concentration
Chrysene	2	2	0.012(J)	0.0165(J)	n/a	0.0165	Maximum detected concentration
Fluoranthene	2	2	0.0223(J)	0.0238(J)	n/a	0.0238	Maximum detected concentration
Pyrene	2	2	0.0145(J)	0.0182(J)	n/a	0.0182	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	2	1	0.0282(U)	0.0291(J)	n/a	0.0291	Maximum detected concentration
Plutonium-239/240	2	2	1.11	1.15	n/a	1.15	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-10
EPCs at AOC 01-003(b1) for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Copper	8	8	3.12	18.2(J)	Approximate Gamma	13	95% Adjusted Gamma
Lead	8	8	13.8	147	Nonparametric	105	95% Chebyshev(Mean, Sd)
Mercury	8	8	0.0136	0.378	Nonparametric	0.266	95% Chebyshev(Mean, Sd)
Zinc	8	8	16.7	108	Normal	66.1	95% Student's-t
Organic Chemicals (mg/kg)							
Acetone	8	1	0.00206(J)	0.00572(U)	n/a[a]	0.00206	Maximum detected concentration
Aroclor-1254	8	1	0.00353(U)	0.0296	n/a	0.0296	Maximum detected concentration
Aroclor-1260	8	8	0.00257(J)	0.0236	Gamma	0.0203	95% Adjusted Gamma
Benzo(a)anthracene	8	6	0.0136(J)	0.146(U)	Approximate Normal	0.0271	95% KM (t)
Benzo(a)pyrene	8	6	0.0136(J)	0.146(U)	Gamma	0.0306	95% Gamma-adjusted KM
Benzo(b)fluoranthene	8	7	0.0158(J)	0.049	Normal	0.0366	95% KM (t)
Benzo(g,h,i)perylene	8	4	0.0113(J)	0.146(U)	n/a	0.0236	Maximum detected concentration
Benzo(k)fluoranthene	8	2	0.0133(J)	0.146(U)	n/a	0.0185	Maximum detected concentration
Chrysene	8	5	0.012(J)	0.146(U)	Gamma	0.0318	95% Gamma-adjusted KM
Fluoranthene	8	7	0.0168(J)	0.0657	Normal	0.0438	95% KM (t)
Indeno(1,2,3-cd)pyrene	8	1	0.0218(J)	0.146(U)	n/a	0.0218	Maximum detected concentration
Phenanthrene	8	2	0.0133(J)	0.146(U)	n/a	0.0381	Maximum detected concentration
Pyrene	8	6	0.0145(J)	0.146(U)	Lognormal	0.0408	95% KM (t)
Radionuclides (pCi/g)							
Americium-241	8	5	0.00889(U)	0.384	n/a	0.384[b]	Maximum detected concentration
Cesium-137	8	1	0.0169(U)	0.121	n/a	0.121	Maximum detected concentration
Plutonium-239/240	9	9	1.11	21.5	Lognormal	16.9	95% Chebyshev(Mean, Sd)

Note: Data qualifiers are defined in Appendix A.
[a] n/a = Not applicable.
[b] Maximum detected activity used because the 95% UCL exceeded the maximum activity.

Table G-2.2-11
EPCs at AOC 01-003(b1) 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)							
Copper	8	8	3.12	18.2(J)	Approximate Gamma	13	95% Adjusted Gamma
Lead	8	8	13.8	147	Nonparametric	105	95% Chebyshev(Mean, Sd)
Mercury	8	8	0.0136	0.378	Nonparametric	0.266	95% Chebyshev(Mean, Sd)
Perchlorate	8	3	0.00111(J)	0.00226(U)	n/a[a]	0.00168	Maximum detected concentration
Zinc	8	8	16.7	108	Normal	66.1	95% Student's-t
Organic Chemicals (mg/kg)							
Acetone	8	1	0.00206(J)	0.00572(U)	n/a	0.00206	Maximum detected concentration
Aroclor-1254	8	1	0.00353(U)	0.0296	n/a	0.0296	Maximum detected concentration
Aroclor-1260	8	8	0.00257(J)	0.0236	Gamma	0.0203	95% Adjusted Gamma
Benzo(a)anthracene	8	6	0.0136(J)	0.146(U)	Approximate Normal	0.0271	95% KM (t)
Benzo(a)pyrene	8	6	0.0136(J)	0.146(U)	Gamma	0.0306	95% Gamma-adjusted KM
Benzo(b)fluoranthene	8	7	0.0158(J)	0.049	Normal	0.0366	95% KM (t)
Benzo(g,h,i)perylene	8	4	0.0113(J)	0.146(U)	n/a	0.0236	Maximum detected concentration
Benzo(k)fluoranthene	8	2	0.0133(J)	0.146(U)	n/a	0.0185	Maximum detected concentration
Chrysene	8	5	0.012(J)	0.146(U)	Gamma	0.0318	95% Gamma-adjusted KM
Fluoranthene	8	7	0.0168(J)	0.0657	Normal	0.0438	95% KM (t)
Indeno(1,2,3-cd)pyrene	8	1	0.0218(J)	0.146(U)	n/a	0.0218	Maximum detected concentration
Phenanthrene	8	2	0.0133(J)	0.146(U)	n/a	0.0381	Maximum detected concentration
Pyrene	8	6	0.0145(J)	0.146(U)	Lognormal	0.0408	95% KM (t)
Radionuclides (pCi/g)							
Americium-241	8	5	0.00889(U)	0.384	n/a	0.384[b]	Maximum detected concentration
Cesium-137	8	1	0.0169(U)	0.121	n/a	0.121	Maximum detected concentration
Plutonium-239/240	11	11	0.159	21.5	Lognormal	12.8	95% Chebyshev(Mean, Sd)

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] Maximum detected activity used because the 95% UCL exceeded the maximum activity.

Table G-2.2-12
EPCs at SWMU 01-006(b) for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Organic Chemicals (mg/kg)							
Aroclor-1254	1	1	0.037(J)	0.037(J)	n/a*	0.037	Maximum detected concentration
Aroclor-1260	1	1	0.033(J)	0.033(J)	n/a	0.033	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	4	3	0.00438(U)	0.116	n/a	0.116	Maximum detected concentration
Plutonium-238	17	5	-0.0082(U)	0.34(U)	Normal	0.0174	95% KM (t)
Plutonium-239/240	17	17	0.413	24.4	Gamma	8.81	95% Adjusted Gamma

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-13
EPCs at SWMU 01-006(b) for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Cyanide (Total)	2	1	0.12(U)	0.62	n/a[a]	0.62	Maximum detected concentration
Lead	2	2	18.5	21.2	n/a	21.2	Maximum detected concentration
Nickel	2	2	4.9(J)	8.4(J)	n/a	8.4	Maximum detected concentration
Selenium	2	0	0.51(U)	0.51(U)	n/a	0.51(U)	Maximum detection limit
Organic Chemicals (mg/kg)							
Aroclor-1254	2	1	0.034(U)	0.037(J)	n/a	0.037	Maximum detected concentration
Aroclor-1260	2	2	0.0062(J)	0.033(J)	n/a	0.033	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	9	3	0.00438(U)	0.132(U)	n/a	0.116	Maximum detected concentration
Plutonium-238	35	6	-3.98E-10	0.34(U)	n/a	0.0684[b]	Maximum detected concentration
Plutonium-239/240	35	34	0.00861(U)	24.4	Gamma	5.48	95% Adjusted Gamma

Note: Data qualifiers are defined in Appendix A.
[a] n/a = Not applicable.
[b] Because the recommended 95% UCL was a negative value, the maximum detected activity is used as the EPC.

Table G-2.2-14
EPCs at SWMU 01-006(b) 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)							
Cyanide (Total)	2	1	0.12(U)	0.62	n/a[a]	0.62	Maximum detected concentration
Lead	2	2	18.5	21.2	n/a	21.2	Maximum detected concentration
Nickel	2	2	4.9(J)	8.4(J)	n/a	8.4	Maximum detected concentration
Selenium	2	0	0.51(U)	0.51(U)	n/a	0.51(U)	Maximum detection limit
Organic Chemicals (mg/kg)							
Aroclor-1254	2	1	0.034(U)	0.037(J)	n/a	0.037	Maximum detected concentration
Aroclor-1260	2	2	0.0062(J)	0.033(J)	n/a	0.033	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	15	3	-0.00402(U)	0.116	n/a	0.116	Maximum detected concentration
Plutonium-238	70	8	-3.98E-10	0.34(U)	n/a	0.0684[b]	Maximum detected concentration
Plutonium-239/240	70	66	0.00237(U)	24.4	Lognormal	11.7	95% H-UCL

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] Because the recommended 95% UCL was a negative value, the maximum detected activity is used as the EPC.

Table G-2.2-15
EPCs at SWMU 01-006(c) for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Lead	1	1	67.9	67.9	n/a*	67.9	Maximum detected concentration
Selenium	1	0	2.6(U)	2.6(U)	n/a	2.6(U)	Maximum detection limit
Zinc	1	1	76.7	76.7	n/a	76.7	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-239/240	1	1	0.492	0.492	n/a	0.492	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

* n/a = Not applicable.

Table G-2.2-16
EPCs at SWMU 01-006(c) for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Barium	2	2	82.1	172	n/a*	172	Maximum detected concentration
Chromium (Total)	2	2	1.6(J)	29.2	n/a	29.2	Maximum detected concentration
Lead	2	2	10.7(J-)	67.9(J-)	n/a	67.9	Maximum detected concentration
Nickel	2	2	7.6	15.8	n/a	15.8	Maximum detected concentration
Perchlorate	2	1	0.0025(J)	0.0025(J)	n/a	0.0025	Maximum detected concentration
Selenium	2	0	0.53(U)	2.6(U)	n/a	2.6(U)	Maximum detection limit
Zinc	2	2	21.8	76.7	n/a	76.7	Maximum detected concentration
Organic Chemicals (mg/kg)							
Dibenzofuran	2	1	0.14(J)	0.34(U)	n/a	0.14	Maximum detected concentration
Methylene chloride	2	1	0.00088(J)	0.0052(U)	n/a	0.00088	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-239/240	2	2	0.492	0.679	n/a	0.679	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

* n/a = Not applicable.

Table G-2.2-17
EPCs at SWMU 01-006(c) 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)							
Barium	2	2	82.1	172	n/a*	172	Maximum detected concentration
Chromium (Total)	4	4	1.6(J)	29.2	n/a	29.2	Maximum detected concentration
Lead	2	2	10.7(J-)	67.9(J-)	n/a	67.9	Maximum detected concentration
Nickel	4	4	2.13	15.8	n/a	15.8	Maximum detected concentration
Perchlorate	2	1	0.0025(J)	0.0025(J)	n/a	0.0025	Maximum detected concentration
Selenium	2	0	0.53(U)	2.6(U)	n/a	2.6(U)	Maximum detection limit
Zinc	2	2	21.8	76.7	n/a	76.7	Maximum detected concentration
Organic Chemicals (mg/kg)							
Dibenzofuran	4	1	0.14(J)	0.359(U)	n/a	0.14	Maximum detected concentration
Methylene chloride	4	1	0.00088(J)	0.0054(U)	n/a	0.00088	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-239/240	4	4	0.0632	0.679	n/a	0.679	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

* n/a = Not applicable.

Table G-2.2-18
EPCs at SWMU 01-006(n) for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Mercury	4	3	0.042(U)	0.124	n/a*	0.124	Maximum detected concentration
Nitrate	4	4	0.13(J)	26(J-)	n/a	26	Maximum detected concentration
Organic Chemicals (mg/kg)							
Aroclor-1260	4	2	0.015(J)	0.52	n/a	0.52	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	4	1	0.35(U)	0.67	n/a	0.67	Maximum detected concentration
Methylene chloride	4	2	0.0013(U)	0.0079	n/a	0.0079	Maximum detected concentration
Trichlorofluoromethane	4	1	0.0012(J)	0.011(U)	n/a	0.0012	Maximum detected concentration
Radionuclides (pCi/g)							
Cesium-134	4	1	-0.0005(U)	0.052	n/a	0.052	Maximum detected concentration
Plutonium-239/240	6	4	0.002(U)	7.98	n/a	7.98	Maximum detected concentration
Tritium	4	1	0.15(U)	0.62	n/a	0.62	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-19
EPCs at SWMU 01-006(n) for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Lead	7	7	2.6	44.1	n/a*	44.1	Maximum detected concentration
Mercury	7	5	0.042(U)	0.555	n/a	0.555	Maximum detected concentration
Selenium	7	0	0.51(U)	0.56(U)	n/a	0.56(U)	Maximum detected concentration
Organic Chemicals (mg/kg)							
Aroclor-1260	7	5	0.013(J)	0.52	n/a	0.52	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	7	1	0.34(U)	0.67	n/a	0.67	Maximum detected concentration
Methylene chloride	7	3	0.00095(U)	0.0079	n/a	0.0079	Maximum detected concentration
Trichlorofluoromethane	7	1	0.0012(J)	0.011(U)	n/a	0.0012	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	7	1	-0.008(U)	0.264	n/a	0.264	Maximum detected concentration
Cesium-134	7	1	-0.0005(U)	0.052	n/a	0.052	Maximum detected concentration
Plutonium-239/240	11	9	0.002(U)	8.22	Gamma	6.24	95% KM Adjusted Gamma
Tritium	7	1	-0.06(U)	0.62	n/a	0.62	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

* n/a = Not applicable.

Table G-2.2-20
EPCs at SWMU 01-006(n) 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)							
Chromium (Total)	7	7	3.9(J-)	18.9(J-)	n/a*	18.9	Maximum detected concentration
Lead	10	10	2	44.1	Normal	19.4	95% Student's-t
Mercury	10	6	0.0146(U)	0.555	Gamma	0.33	95% KM Adjusted Gamma
Nickel	10	10	3.5	10.1	Normal	6.91	95% Student's-t
Nitrate	10	9	0.085(J)	26(J-)	Approximate Lognormal	14.2	95% KM Chebyshev
Perchlorate	10	3	0.0027(J)	0.016	n/a	0.016	Maximum detected concentration
Selenium	10	2	0.21(J)	0.56(U)	n/a	0.42	Maximum detected concentration
Organic Chemicals (mg/kg)							
Aroclor-1260	10	6	0.011(J)	0.52	Normal	0.19	95% KM (t)
Bis(2-ethylhexyl)phthalate	10	1	0.33(U)	0.67	n/a	0.67	Maximum detected concentration
Methylene chloride	10	4	0.00095(U)	0.0079	n/a	0.0079	Maximum detected concentration
Trichlorofluoromethane	10	1	0.0012(J)	0.011(U)	n/a	0.0012	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	10	1	-0.008(U)	0.264	n/a	0.264	Maximum detected concentration
Cesium-137	10	1	-0.0005(U)	0.052	n/a	0.052	Maximum detected concentration
Plutonium-239/240	14	12	0.002(U)	8.22	Gamma	4.72	95% KM Adjusted Gamma
Tritium	10	1	-0.06(U)	0.62	n/a	0.62	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-21
EPCs at SWMU 01-007(a) for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Beryllium	5	5	0.5(J)	1.9(J)	n/a*	1.9	Maximum detected concentration
Mercury	5	1	0.015(U)	0.11	n/a	0.11	Maximum detected concentration
Nickel	5	5	1.2(J)	39.5(J)	n/a	39.5	Maximum detected concentration
Selenium	5	3	0.18(J)	0.55(U)	n/a	0.31	Maximum detected concentration
Zinc	4	4	31.5(J)	69.1(J)	n/a	69.1	Maximum detected concentration
Organic Chemicals (mg/kg)							
Acetone	1	1	0.0044(J)	0.0044(J)	n/a	0.0044	Maximum detected concentration
Aroclor-1260	5	2	0.017(J)	0.055	n/a	0.055	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	6	3	0.14(J)	1.2	n/a	1.2	Maximum detected concentration
Isopropyltoluene[4-]	5	1	0.0041(J)	0.0055(U)	n/a	0.0041	Maximum detected concentration
Tetrachloroethene	5	1	0.00011(J)	0.0055(U)	n/a	0.00011	Maximum detected concentration
Trichlorofluoromethane	5	1	0.0012(J+)	0.011(U)	n/a	0.0012	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	5	4	0.005(U)	0.187	n/a	0.187	Maximum detected concentration
Plutonium-238	15	2	0(U)	0.0876(U)	n/a	0.053	Maximum detected concentration
Plutonium-239/240	15	15	0.522	22.3	Normal	10	95% Student's-t

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-22
EPCs at SWMU 01-007(a) for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	14	1	0.068(U)	0.6(U)	n/a*	0.1	Maximum detected concentration
Arsenic	14	4	0.54(J)	2(U)	n/a	1.9	Maximum detected concentration
Beryllium	14	14	0.4	3(J)	Gamma	1.46	95% Adjusted Gamma
Chromium (Total)	16	16	1.33	49.5(J)	Approximate Gamma	15.9	95% Adjusted Gamma
Mercury	14	2	0.0123(U)	0.11	n/a	0.11	Maximum detected concentration
Nickel	18	18	0.993	39.5(J)	Lognormal	12.8	95% Chebyshev (MVUE)
Selenium	14	10	0.18(J)	0.6(U)	Normal	0.33	95% KM (t)
Zinc	12	12	16.6	69.1(J)	Normal	43.2	95% Student's-t
Organic Chemicals (mg/kg)							
Acetone	3	1	0.0044(J)	0.022(U)	n/a	0.0044	Maximum detected concentration
Aroclor-1260	14	2	0.017(J)	0.055	n/a	0.055	Maximum detected concentration
Benzyl alcohol	14	1	0.036(J-)	0.39(U)	n/a	0.036	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	20	7	0.14(J)	1.7	Normal	0.675	95% KM (t)
Tetrachloroethene	14	1	0.00011(J)	0.006(U)	n/a	0.00011	Maximum detected concentration
Trichlorofluoromethane	14	2	0.0012(J)	0.012(U)	n/a	0.0012	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	14	4	-0.0084(U)	0.187	n/a	0.187	Maximum detected concentration
Plutonium-238	36	4	-0.031(U)	0.112	n/a	0.112	Maximum detected concentration
Plutonium-239/240	36	34	0.0308(U)	25.6	Nonparametric	11.1	95% KM Chebyshev

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-23
EPCs at SWMU 01-007(a) 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	18	18	627	9080	Normal	4685	95% Student's-t
Antimony	18	2	0.068(U)	0.97(U)	n/a*	0.97	Maximum detected concentration
Arsenic	18	8	0.54(J)	3.2	Normal	1.45	95% KM (t)
Beryllium	18	18	0.4	3(J)	Approximate Gamma	1.22	95% Adjusted Gamma
Calcium	18	18	234	8030	Lognormal	2713	95% Chebyshev (MVUE)
Chromium (Total)	26	25	0.582(J)	49.5(J)	Gamma	14.2	95% Gamma-adjusted KM
Lead	18	18	2.7	63.6(J+)	Gamma	20.1	95% Adjusted Gamma
Manganese	18	18	118(J)	537	Normal	309.3	95% Student's-t
Mercury	18	6	0.0123(U)	2.12	Gamma	0.826	95% Gamma-adjusted KM
Nickel	28	28	0.585	39.5(J)	Approximate Gamma	8.68	95% Adjusted Gamma
Perchlorate	18	1	0.005(J)	0.0082(J)	n/a	0.0082	Maximum detected concentration
Selenium	18	10	0.18(J)	0.6(U)	Normal	0.329	95% KM (t)
Zinc	16	16	16.6	69.1(J)	Approximate Gamma	43	95% Adjusted Gamma
Organic Chemicals (mg/kg)							
Acetone	7	1	0.0044(J)	0.023(U)	n/a	0.0044	Maximum detected concentration
Aroclor-1260	18	5	0.0068(J)	0.055	Normal	0.0226	95% KM (t)
Benzyl alcohol	18	1	0.036(J-)	0.39(U)	n/a	0.036	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	29	7	0.14(J)	1.7	Normal	0.515	95% KM (t)
Di-n-butylphthalate	18	1	0.065(J)	0.39(U)	n/a	0.065	Maximum detected concentration
Isopropyltoluene[4-]	18	1	0.0041(J)	0.006(U)	n/a	0.0041	Maximum detected concentration
Methylene chloride	18	3	0.001(U)	0.0065	n/a	0.0065	Maximum detected concentration
Tetrachloroethene	18	1	0.00011(J)	0.006(U)	n/a	0.0018	Maximum detected concentration
Trichlorofluoromethane	18	2	0.0012(J)	0.012(U)	n/a	0.0012	Maximum detected concentration

Table G-2.2-23 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Radionuclides (pCi/g)							
Americium-241	18	5	-0.012(U)	0.189	Normal	0.0705	95% KM (t)
Plutonium-238	40	4	-0.031(U)	0.112	n/a	0.112	Maximum detected concentration
Plutonium-239/240	40	38	0.0308(U)	25.6	Nonparametric	10.4	95% KM Chebyshev
Tritium	18	2	-0.2	2.08	n/a	2.08	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-24
EPCs at SWMU 01-007(b) for the Industrial Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Chromium (Total)	13	13	1.33	41.1	Lognormal	18.9	95% Chebyshev (MVUE)
Selenium	13	10	0.2(J)	3.04(U)	Normal	0.319	95% KM (t)
Organic Chemicals (mg/kg)							
Bis(2-ethylhexyl)phthalate	12	1	0.054(J)	0.37(U)	n/a*	0.054	Maximum detected concentration
Methylene chloride	12	1	0.00094(J+)	0.0093(U)	n/a	0.00094	Maximum detected concentration
Toluene	12	2	0.00037(J)	0.0055(U)	n/a	0.00039	Maximum detected concentration
Trimethylbenzene[1,2,4-]	12	1	0.00024(U)	0.0055(U)	n/a	0.0004	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	12	2	-0.007(U)	0.24	n/a	0.24	Maximum detected concentration
Plutonium-239/240	13	11	0.043(U)	20.1	Normal	7.46	95% KM (t)

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-2.2-25
EPCs at SWMU 01-007(b) for Ecological Risk

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Chromium (Total)	33	33	1.33	41.1	Nonparametric	14.2	95% Chebyshev(Mean, Sd)
Nickel	33	33	0.0504	12.7	Nonparametric	5.59	95% Chebyshev(Mean, Sd)
Selenium	33	24	0.17(J)	3.07(U)	Approximate Gamma	0.385	95% KM Adjusted Gamma
Organic Chemicals (mg/kg)							
Aroclor-1260	26	2	0.024(J)	0.037(U)	n/a*	0.035	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	30	2	0.054(J)	0.37(U)	n/a	0.055	Maximum detected concentration
Di-n-butylphthalate	26	1	0.036(J)	0.37(U)	n/a	0.036	Maximum detected concentration
Methylene chloride	26	2	0.00073(J)	0.0093(U)	n/a	0.00094	Maximum detected concentration
Toluene	26	2	0.00037(J)	0.0055(U)	n/a	0.00039	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	26	3	-0.031(U)	0.24	n/a	0.24	Maximum detected concentration
Plutonium-238	30	1	-0.0135(U)	0.057(U)	n/a	0.0367	Maximum detected concentration
Plutonium-239/240	30	23	0.0049(U)	20.1	Normal	5.87	95% KM (t)

Note: Data qualifiers are defined in Appendix A.

* n/a = Not applicable.

Table G-2.2-26
EPCs at SWMU 01-007(b) 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)							
Chromium (Total)	41	41	1.33	41.1	Nonparametric	14.2	95% Chebyshev(Mean, Sd)
Nickel	41	41	0.504	15.9	Nonparametric	6.34	95% Chebyshev(Mean, Sd)
Perchlorate	27	1	0.005(U)	0.0077	n/a*	0.0077	Maximum detected concentration
Selenium	41	26	0.17(J)	3.07(U)	Nonparametric	0.628	95% KM Chebyshev
Organic Chemicals (mg/kg)							
Aroclor-1260	28	3	0.024(J)	0.049	n/a	0.049	Maximum detected concentration
Bis(2-ethylhexyl)phthalate	36	3	0.054(J)	0.47	n/a	0.47	Maximum detected concentration
Di-n-butylphthalate	28	1	0.036(J)	0.37(U)	n/a	0.036	Maximum detected concentration
Isopropylbenzene	28	1	0.00012(J)	0.0055(U)	n/a	0.00012	Maximum detected concentration
Isopropyltoluene[4-]	28	1	0.00019(J)	0.0055(U)	n/a	0.00019	Maximum detected concentration
Methylene chloride	28	2	0.00073(J)	0.0093(U)	n/a	0.00094	Maximum detected concentration
Toluene	28	2	0.00037(J)	0.0055(U)	n/a	0.00039	Maximum detected concentration
Trichlorofluoromethane	28	1	0.00024(J)	0.012(U)	n/a	0.00024	Maximum detected concentration
Trimethylbenzene[1,2,4-]	28	1	0.00019(U)	0.0055(U)	n/a	0.0004	Maximum detected concentration
Radionuclides (pCi/g)							
Americium-241	28	3	-0.031(U)	0.24	n/a	0.24	Maximum detected concentration
Plutonium-238	34	1	-0.014(U)	0.372(U)	n/a	0.0367	Maximum detected concentration
Plutonium-239/240	34	25	-0.0117(U)	20.1	Normal	5.68	95% KM (t)

Note: Data qualifiers are defined in Appendix A.
* n/a = Not applicable.

Table G-3.2-1
Physical and Chemical Properties of Inorganic COPCs
for the Former Los Alamos Inn Property Sites

COPC	K_d[a] (cm^3/g)	Water Solubility[a]
Aluminum	1500	Insoluble
Antimony	45	Insoluble
Arsenic	29	Insoluble
Barium	41	Insoluble
Chromium (Total)	850	Insoluble
Copper	35	Insoluble
Cyanide (Total)	9.9	Soluble
Lead	900	Insoluble
Manganese	65	Insoluble
Mercury	52	Insoluble
Nickel	65	Insoluble
Nitrate	na[b]	Soluble
Perchlorate	na	Soluble
Selenium	5	Insoluble
Zinc	62	Insoluble

[a] Information from http://rais.ornl.gov/cgG-bin/tox/TOX_select?select=nrad.

[b] na = Not available.

Table G-3.2-2
Physical and Chemical Properties of Organic Chemicals
for the Former Los Alamos Inn Property Sites

Analyte	Water Solubility* (mg/L)	Organic Carbon Coefficient K_{oc}* (L/kg)	Log Octanol-Water Partition Coefficient K_{ow}*	Vapor Pressure* (mm Hg at 25ºC)
Acenaphthene	3.90E+00	5.03E+03	3.92E+00	2.15E-03
Acenaphthylene	1.61E+01	5.03E+03	3.94E+00	6.68E-03
Acetone	1.00E+06	1.98E+00	-2.40E-01	2.32E+02
Anthracene	4.34E-02	1.64E+04	4.45E+00	6.53E-06
Aroclor-1242	2.77E-01	7.81E+04	6.29E+00	8.63E-05
Aroclor-1254	4.30E-02	1.35E+05	6.50E+00	6.53E-06
Aroclor-1260	1.44E-02	3.50E+05	7.55E+00	1.30E-07
Benzo(a)anthracene	9.43E-03	1.77E+05	5.76E+00	2.10E-07
Benzo(a)pyrene	1.62E-03	5.87E+05	6.13E+00	5.49E-09
Benzo(b)fluoranthene	1.50E-03	5.99E+05	5.78E+00	5.00E-07
Benzo(g,h,i)perylene	2.60E-04	1.95E+06	6.63E+00	1.00E-10
Benzo(k)fluoranthene	8.00E-04	5.87E+05	6.11E+00	9.65E-10
Benzene	1.79E+03	1.46E+02	2.13E+00	9.48E+01
Benzyl alcohol	4.29E+04	2.15E-01	1.10+00	9.40E-02
Bis(2-ethylhexyl)phthalate	2.70E-01	1.20E+05	7.60E+00	1.42E-07
Butylbenzene[tert-]	2.95E+01	1.00E+03	4.11E+00	2.20E+00
Butylbenzylphthalate	2.69E+00	7.16E+03	4.73E+00	8.25E-06
Chloromethane	5.32E+03	1.32E+01	9.10E-01	4.30E+03
Chrysene	2.00E-03	1.81E+05	5.81E+00	6.23E-09
Dibenzofuran	3.10E+00	9.16E+03	4.12E+00	2.48E-03
Dinitro-2-methylphenol[4,6-]	1.98E+02	7.54E+02	2.13E+00	1.20E-04
Di-n-butylphthalate	1.12E+01	1.16E+03	4.50E+00	2.01E-05
Fluoranthene	2.60E-01	5.55E+04	5.16E+00	9.22E-06
Fluorene	1.69E+00	9.16E+03	4.18E+00	6.00E-04
Indeno(1,2,3-cd)pyrene	2.20E-05	3.47E+06	6.70E+00	1.25E-10
Isopropylbenzene	6.13E+01	6.98E+02	3.66E+00	4.50E+00
Isopropyltoluene[4-]	2.34E+01	1.12E+03	4.10E+00	1.64E+00
Methylene chloride	1.30E+04	2.17E+01	1.25E+00	4.35E+02
Methylnaphthalene[2-]	2.46E+01	2.48E+03	3.86E+00	5.50E-02
Naphthalene	3.10E+01	1.54E+03	3.30E+00	8.50E-02
Phenanthrene	1.15E+00	1.67E+04	4.46E+00	1.21E-04
Pyrene	1.35E-01	5.43E+04	4.88E+00	4.50E-06
Tetrachloroethene	2.06E+02	9.49E+01	3.40E+00	1.85E+01
Toluene	5.26E+02	2.34E+02	2.73E+00	2.84E+01
Trichlorofluoromethane	1.10E+03	4.39E+01	2.53E+00	8.03E+02
Trimethylbenzene[1,2,4-]	5.70E+01	6.14E+02	3.63E+00	2.10E+00

* Information from http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=nrad.

Table G-3.2-3
Physical and Chemical Properties of Radionuclide COPCS
for the Former Los Alamos Inn Property Sites

COPC	Soil-Water Partition Coefficient, K_d[a] (cm^3/g)	Water Solubility[b] (g/L)
Americium-241	680	Insoluble
Cesium-134	1000	Insoluble
Cesium-137	1000	Insoluble
Plutonium-238	4500	Insoluble
Plutonium-239/240	4500	Insoluble
Tritium	9.9	Soluble
Uranium-234	0.4	Insoluble
Uranium-235/236	0.4	Insoluble
Uranium-238	0.4	Insoluble

[a] Denotes reference information from Superfund Chemical Data Matrix (EPA 1996, 064708).

[b] Denotes reference information from http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm.

Table G-4.1-1
Exposure Parameter Values Used to Calculate
Chemical SSLs for the Residential, Industrial, and Construction Worker Scenarios

Parameters	Residential Values	Industrial Values	Construction Worker Values
Target HQ	1	1	1
Target cancer risk	1×10^{-5}	1×10^{-5}	1×10^{-5}
Averaging time (carcinogen/mutagen)	70 yr × 365 d	70 yr × 365 d	70 yr × 365 d
Averaging time (noncarcinogen)	Exposure duration × 365 d	Exposure duration × 365 d	Exposure duration × 365 d
Skin absorption factor	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 $(mg/kg\text{-}d)^{-1}$	Chemical-specific $(mg/kg\text{-}d)^{-1}$	Chemical-specific $(mg/kg\text{-}d)^{-1}$
Inhalation unit risk	Chemical-specific $(\mu g/m^3)^{-1}$	Chemical-specific $(\mu g/m^3)^{-1}$	Chemical-specific $(\mu g/m^3)^{-1}$
Exposure frequency	350 d/yr	225 d/yr	250 d/yr
Exposure time	24 h/d	8 h/day	8 h/d
Exposure duration–child	6 yr[b]	n/a	n/a
Age-adjusted ingestion factor for carcinogens	36,750 mg/kg	n/a	n/a
Age-adjusted ingestion factor for mutagens	166,833 mg/kg	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)	Chemical-specific (mg/kg-d)	Chemical-specific (mg/kg-d)

Table G-4.1-1 (continued)

Parameters	Residential Values	Industrial Values	Construction Worker Values
Reference concentration–inhalation	Chemical-specific (mg/m^3)	Chemical-specific (mg/m^3)	Chemical-specific (mg/m^3)
Exposed surface area–child	2690 cm^2/d	n/a	n/a
Age-adjusted skin contact factor for carcinogens	112,266 mg/kg	n/a	n/a
Age-adjusted skin contact factor for mutagens	475,599 mg/kg	n/a	n/a
Volatilization factor for soil	Chemical-specific	Chemical-specific	Chemical-specific
Body weight–adult	80 kg	80 kg	80 kg
Exposure duration[c]	26 yr[d]	25 yr	1 yr
Adherence factor–adult	0.07 mg/cm^2	0.12 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	6032 cm^2/d	3470 cm^2/d	3470 cm^2/d

Note: Parameter values from NMED (2015, 600915).

[a] n/a = Not applicable.

[b] The child exposure duration for mutagens is subdivided into 0–2 yr and 2–6 yr.

[c] Exposure duration for lifetime resident is 26 yr. For carcinogens, the exposures are combined for child (6 yr) and adult (20 yr).

[d] The adult exposure duration for mutagens is subdivided into 6–16 yr and 16–26 yr.

Table G-4.1-2
Parameters Used to Calculate Radionuclide SALs for the Residential Scenario

Parameters	Residential, Child	Residential, Adult
Inhalation rate (m^3/yr)	4712[a]	7780[b]
Mass loading (g/m^3)	1.5×10^{-7}[c]	1.5×10^{-7}[c]
Outdoor time fraction	0.0926[d]	0.0934[e]
Indoor time fraction	0.8656[f]	0.8648[g]
Soil ingestion (g/yr)	73[h]	36.5[i]

[a] Calculated as 12.9 $m^3/d \times 365.25$ d/yr, where 12.9 m^3/d is the mean upper percentile daily inhalation rate of a child (EPA 2011, 208374, Table 6-1).

[b] Calculated as 21.3 $m^3/d \times 365.25$ d/yr, where 21.3 m^3/d is the mean upper percentile daily inhalation rate of an adult from 21 to less than 61 yr old (EPA 2011, 208374, Table 6-1).

[c] Calculated as $(1 / 6.6 \times 10^9\ m^3/kg) \times 1000$ g/kg, where $6.6 \times 10^9\ m^3/kg$ is the particulate emission factor (NMED 2015, 600915).

[d] Calculated as (2.32 h/d × 350 d/yr) / 8766 h/yr, where 2.32 h/d (139 min) is the largest amount of time spent outdoors for child age groups between 1 to less than 3 mo and 3 to less than 6 yr (EPA 2011, 208374, Table 16-1) and is comparable with the adult time spent outdoors at a residence.

[e] Calculated as (2.34 h/d × 350 d/yr) / 8766 h/yr, where 4.68 h/d is the average total time spent outdoors for adults age 18 to less than 65 yr in all environments (EPA 2011, 208374, Table 16-1); 50% of this value (2.34 h/d) was applied to time spent outdoors at a residence and is similar to mean time outdoors at a residence for this age group (EPA 2011, 208374, Table 16-22).

[f] Calculated as [(24 h/d–2.32 h/d) × 350 d/yr] / 8766 h/yr.

[g] Calculated as [(24 h/d–2.34 h/d) × 350 d/yr] / 8766 h/yr.

[h] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil ingestion pathway. Calculated as [0.2 g/d × 350 d/yr] / [indoor + outdoor time fractions], where 0.2 g/d is the upper percentile site-related daily child soil ingestion rate (NMED 2015, 600915; EPA 2011, 208374, Table 5-1).

[i] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil ingestion pathway. Calculated as [0.1 g/d × 350 d/yr] / [indoor + outdoor time fractions], where 0.1 g/d is the site-related daily adult soil ingestion rate (NMED 2015, 600915).

Table G-4.1-3
Parameter Values Used to Calculate Radionuclide SALs for the Industrial and Construction Worker Scenarios

Parameters	Industrial, Adult	Construction Worker, Adult
Inhalation rate (m^3/yr)	7780[a]	7780[a]
Mass loading (g/m^3)	1.5×10^{-7}[b]	0.0004[c]
Outdoor time fraction	0.2053[d]	0.2282[e]
Indoor time fraction	0[f]	0
Soil ingestion (g/yr)	109.6[g]	362[h]

[a] Calculated as [21.3 m^3/d × 365.25 d/yr], where 21.3 m^3/d is the upper percentile daily inhalation rate of an adult from 21 to less than 61 yr old (EPA 2011, 208374, Table 6-1).

[b] Calculated as (1 / 6.6×10^9 m^3/kg) x 1000 g/kg, where 6.6×10^9 m^3/kg is the particulate emission factor (NMED 2015, 600915).

[c] 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 2015, 600915).

[d] 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 and 225 d/yr is the exposure frequency (NMED 2015, 600915).

[e] Calculated as (8 h/d × 250 d/yr) / 8766 h/yr, where 8 h/d is an estimate of the average length of the work day and 250 d/yr is the exposure frequency (NMED 2015, 600915).

[f] The commercial/industrial worker is defined as someone who "spends most of the work day conducting maintenance or manual labor activities outdoors" (NMED 2015, 600915, p. 13).

[g] The soil-ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil-ingestion pathway. Calculated as [0.1 g/d × 225 d/yr] / [indoor + outdoor time fractions], where 0.1 g/d is the site-related daily adult soil-ingestion rate (NMED 2015, 600915).

[h] The soil-ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil ingestion pathway. Calculated as [0.33 g/d × 250 d/yr] / [indoor + outdoor time fractions], where 0.33 g/d is the site-related daily soil ingestion rate for a construction worker (NMED 2015, 600915).

Table G-4.2-1
Industrial Noncarcinogenic Screening Evaluation for SWMU 01-001(d1)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	HQ
Mercury	1.4	389	0.0036
Selenium	1.05	6490	0.00016
		HI	**0.004**

* SSLs from NMED (2015, 600915).

Table G-4.2-2
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 01-001(d1)

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	HQ
Antimony	1.19(U)	142	0.0084
Copper	12.28	14,200	0.00086
Mercury	0.678	77.1	0.0088
Selenium	1.17	1750	0.00067
Di-n-butylphthalate	0.058	26,900	0.0000022
		HI	**0.02**

Note: Data qualifiers are defined in Appendix A.
* SSLs from NMED (2015, 600915).

Table G-4.2-3
Construction Worker Radionuclide Screening Evaluation for SWMU 01-001(d1)

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-239/240	0.97	200	0.12
		Total Dose	**0.1**

* SALs from LANL (2015, 600929).

Table G-4.2-4
Residential Noncarcinogenic Screening Evaluation for SWMU 01-001(d1)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	HQ
Antimony	1.19(U)	31.3	0.038
Copper	12.28	3130	0.0039
Mercury	0.678	23.5	0.029
Selenium	1.17	391	0.003
Di-n-butylphthalate	0.058	6160	0.0000094
		HI	**0.07**

Note: Data qualifiers are defined in Appendix A.
* SSLs from NMED (2015, 600915).

Table G-4.2-5
Residential Radionuclide Screening Evaluation for SWMU 01-001(d1)

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-239/240	0.97	79	0.31
		Total Dose	**0.3**

* SALs from LANL (2015, 600929).

Table G-4.2-6
Industrial Carcinogenic Screening Evaluation for SWMU 01-001(s1)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Chromium (Total)	20.4	505	4.04E-07
Total Excess Cancer Risk			**4E-07**

* SSLs from NMED (2015, 600915).

Table G-4.2-7
Industrial Noncarcinogenic Screening Evaluation for SWMU 01-001(s1)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	HQ
Cyanide (Total)	0.84	63.3	0.013
Lead	15.7	800	0.02
Nickel	10.7	25,700	0.00042
Selenium	0.26	6490	0.00004
Methylene chloride	0.0033	5130	0.00000064
HI			**0.03**

* SSLs from NMED (2015, 600915).

Table G-4.2-8
Industrial Radionuclide Screening Evaluation for SWMU 01-001(s1)

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Tritium	0.94	2,400,000	0.0000098
Total Dose			**0.00001**

* SALs from LANL (2015, 600929).

Table G-4.2-9
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 01-001(s1)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Chromium (Total)	20.4	134	0.15
Cyanide (Total)	0.84	12.1	0.069
Lead	15.7	800	0.02
Nickel	10.7	753	0.014
Selenium	0.873	1750	0.0005
Butylbenzylphthalate	0.09	54,500[b]	0.0000017
Methylene chloride	0.0033	1210	0.0000027
		HI	**0.3**

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915).

Table G-4.2-10
Construction Worker Radionuclide Screening Evaluation for SWMU 01-001(s1)

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-238	0.117	230	0.013
Plutonium-239/240	0.122	200	0.015
Tritium	0.94	1,600,000	0.000015
Uranium-235/236	0.167	130	0.032
		Total Dose	**0.06**

* SALs from LANL (2015, 600929).

Table G-4.2-11
Residential Carcinogenic Screening Evaluation for SWMU 01-001(s1)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Cancer Risk
Butylbenzylphthalate	0.09	2900[b]	3.10E-10
Chromium (Total)	20.4	96.6	2.11E-06
		Total Excess Cancer Risk	**2E-06**

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] EPA regional screening level (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

Table G-4.2-12
Residential Noncarcinogenic Screening Evaluation for SWMU 01-001(s1)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	HQ
Cyanide (Total)	0.84	11.2	0.075
Lead	15.7	400	0.039
Nickel	10.7	1560	0.0069
Selenium	0.873	391	0.0022
Methylene chloride	0.0033	409	0.0000081
		HI	**0.1**

* SSLs from NMED (2015, 600915).

Table G-4.2-13
Residential Radionuclide Screening Evaluation for SWMU 01-001(s1)

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-238	0.117	84	0.035
Plutonium-239/240	0.122	79	0.039
Tritium	0.94	1700	0.014
Uranium-235/236	0.167	42	0.099
		Total Dose	**0.2**

* SALs from LANL (2015, 600929).

Table G-4.2-14
Industrial Noncarcinogenic Screening Evaluation for SWMU 01-002(a1)-00

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	HQ
Cyanide (Total)	0.83	63.3	0.013
Methylene chloride	0.0026	5130	0.00000051
		HI	**0.01**

* SSLs from NMED (2015, 600915).

Table G-4.2-15
Industrial Radionuclide Screening Evaluation for SWMU 01-002(a1)-00

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Uranium-235/236	0.167	160	0.026
		Total Dose	**0.03**

* SALs from LANL (2015, 600929).

Table G-4.2-16
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 01-002(a1)-00

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	HQ
Chromium (Total)	13.7	134	0.1
Cyanide (Total)	0.83	12.1	0.069
Selenium	0.26	1750	0.00015
Methylene chloride	0.0026	1210	0.0000021
		HI	**0.2**

* SSLs from NMED (2015, 600915).

Table G-4.2-17
Construction Worker Radionuclide Screening Evaluation for SWMU 01-002(a1)-00

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-238	0.117	230	0.013
Plutonium-239/240	0.122	200	0.015
Uranium-235/236	0.167	130	0.032
		Total Dose	**0.06**

* SALs from LANL (2015, 600929).

Table G-4.2-18
Residential Carcinogenic Screening Evaluation for SWMU 01-002(a1)-00

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Chromium (Total)	13.7	96.6	1.42E-06
		Total Excess Cancer Risk	**1E-06**

* SSLs from NMED (2015, 600915).

Table G-4.2-19
Residential Noncarcinogenic Screening Evaluation for SWMU 01-002(a1)-00

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	HQ
Cyanide (Total)	0.83	11.2	0.074
Selenium	0.26	391	0.00066
Methylene chloride	0.0026	409	0.0000064
		HI	**0.07**

* SSLs from NMED (2015, 600915).

Table G-4.2-20
Residential Radionuclide Screening Evaluation for SWMU 01-002(a1)-00

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-238	0.117	84	0.035
Plutonium-239/240	0.122	79	0.039
Uranium-235/236	0.167	42	0.099
		Total Dose	**0.2**

* SALs from LANL (2015, 600929).

Table G-4.2-21
Industrial Carcinogenic Screening Evaluation for AOC 01-003(b1)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.00703	11.5	6.11E-09
Benzo(a)anthracene	0.0196	32.3	6.07E-09
Benzo(a)pyrene	0.0179	3.23	5.54E-08
Benzo(b)fluoranthene	0.0298	32.3	9.23E-09
Benzo(k)fluoranthene	0.0133	323	4.12E-10
Chrysene	0.0165	3230	5.11E-11
		Total Excess Cancer Risk	**8E-08**

* SSLs from NMED (2015, 600915).

Table G-4.2-22
Industrial Noncarcinogenic Screening Evaluation for AOC 01-003(b1)

COPC	EPC (mg/kg)	Industrial SSL[a] (mg/kg)	HQ
Copper	18.2	51,900	0.00035
Perchlorate	0.00168	908	0.0000019
Benzo(g,h,i)perylene	0.0179	25,300[b]	0.00000071
Fluoranthene	0.0238	33,700	0.00000071
Pyrene	0.0182	25,300	0.0000072
		HI	**0.0004**

[a] SSLs from NMED (2015, 600915).

[b] Pyrene used as a surrogate based on structural similarity.

Table G-4.2-23
Industrial Radionuclide Screening Evaluation for AOC 01-003(b1)

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.0291	1000	0.00073
Plutonium-239/240	1.15	1200	0.024
		Total Dose	**0.02**

* SALs from LANL (2015, 600929).

Table G-4.2-24
Construction Worker Carcinogenic Screening Evaluation for AOC 01-003(b1)

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.0203	85.3	2.38E-09
Benzo(a)anthracene	0.0271	240	8.75E-10
Benzo(a)pyrene	0.0306	24	1.28E-08
Benzo(b)fluoranthene	0.0366	240	1.53E-09
Benzo(k)fluoranthene	0.0185	2310	8.01E-11
Chrysene	0.0318	23,100	1.38E-11
Indeno(1,2,3-cd)pyrene	0.0218	240	9.08E-10
		Total Excess Cancer Risk	**2E-08**

* SSLs from NMED (2015, 600915).

Table G-4.2-25
Construction Worker Noncarcinogenic Screening Evaluation for AOC 01-003(b1)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Copper	13	14,200	0.00092
Lead	105	800	0.13
Mercury	0.266	77.1	0.0035
Perchlorate	0.00168	248	0.00007
Zinc	66.1	106,000	0.00062
Acetone	0.00206	242,000	0.0000000085
Aroclor-1254	0.0296	4.91	0.006
Benzo(g,h,i)perylene	0.0236	7530[b]	0.0000031
Fluoranthene	0.0438	10,000	0.0000044
Phenanthrene	0.0381	7530	0.0000051
Pyrene	0.0408	7530	0.0000054
		HI	**0.1**

[a] SSLs from NMED (2015, 600915).

[b] Pyrene used as a surrogate based on structural similarity.

Table G-4.2-26
Construction Worker Radionuclide Screening Evaluation for AOC 01-003(b1)

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.384	230	0.042
Cesium-137	0.121	37	0.082
Plutonium-239/240	12.8	200	1.6
		Total Dose	**2**

* SALs from LANL (2015, 600929).

Table G-4.2-27
Residential Carcinogenic Screening Evaluation for AOC 01-003(b1)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.0203	2.43	8.35E-08
Benzo(a)anthracene	0.0271	1.53	1.77E-07
Benzo(a)pyrene	0.0306	0.153	2.00E-06
Benzo(b)fluoranthene	0.0366	1.53	2.20E-07
Benzo(k)fluoranthene	0.0185	15.3	1.21E-08
Chrysene	0.0318	153	2.08E-09
Indeno(1,2,3-cd)pyrene	0.0218	1.53	1.42E-07
		Total Excess Cancer Risk	**3E-06**

* SSLs from NMED (2015, 600915).

Table G-4.2-28
Residential Noncarcinogenic Screening Evaluation for AOC 01-003(b1)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Copper	13	3130	0.0042
Lead	105	400	0.26
Mercury	0.266	23.5	0.011
Perchlorate	0.00168	54.8	0.000031
Zinc	66.1	23,500	0.0028
Acetone	0.00206	66,300	0.000000031
Aroclor-1254	0.0296	1.14	0.026
Benzo(g,h,i)perylene	0.0236	1740[b]	0.000014
Fluoranthene	0.0438	2320	0.000019
Phenanthrene	0.0381	1740	0.000022
Pyrene	0.0408	1740	0.000023
		HI	**0.3**

[a] SSLs from NMED (2015, 600915).
[b] Pyrene used as a surrogate based on structural similarity.

Table G-4.2-29
Residential Radionuclide Screening Evaluation for AOC 01-003(b1)

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.384	83	0.12
Cesium-137	0.121	12	0.25
Plutonium-239/240	12.8	79	4.05
		Total Dose	**4**

* SALs from LANL (2015, 600929).

Table G-4.2-30
Industrial Carcinogenic Screening Evaluation for SWMU 01-006(b)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Aroclor-1254	0.037	11.5	3.22E-08
Aroclor-1260	0.033	11.5	2.87E-08
		Total Excess Cancer Risk	**6E-08**

* SSLs from NMED (2015, 600915).

Table G-4.2-31
Industrial Radionuclide Screening Evaluation for SWMU 01-006(b)

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.16	1000	0.004
Plutonium-238	0.0174	1300	0.00033
Plutonium-239/240	8.81	1200	0.18
		Total Dose	**0.2**

* SALs from LANL (2015, 600929).

Table G-4.2-32
Construction Worker Carcinogenic Screening Evaluation for SWMU 01-006(b)

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.033	85.3	3.87E-09
		Total Excess Cancer Risk	**4E-09**

* SSLs from NMED (2015, 600915).

Table G-4.2-33
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 01-006(b)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Cyanide (Total)	0.62	12.1	0.051
Lead	21.2	800	0.027
Nickel	8.4	753	0.011
Selenium	0.51(U)	1750	0.00029
Aroclor-1254	0.037	4.91	0.0075
		HI	**0.1**

Note: Data qualifiers are defined in Appendix A.

[a] SSLs from NMED (2015, 600915).

[b] Pyrene used as a surrogate based on structural similarity.

Table G-4.2-34
Construction Worker Radionuclide Screening Evaluation for SWMU 01-006(b)

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.116	230	0.013
Plutonium-238	0.0684	230	0.0074
Plutonium-239/240	11.7	200	1.46
		Total Dose	**1**

* SALs from LANL (2015, 600929).

Table G-4.2-35
Residential Carcinogenic Screening Evaluation for SWMU 01-006(b)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.033	2.43	1.36E-07
		Total Excess Cancer Risk	**1E-07**

* SSLs from NMED (2015, 600915).

Table G-4.2-36
Residential Noncarcinogenic Screening Evaluation for SWMU 01-006(b)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	HQ
Cyanide (Total)	0.62	11.2	0.055
Lead	21.2	400	0.053
Nickel	8.4	1560	0.0054
Selenium	0.51(U)	391	0.0013
Aroclor-1254	0.037	1.14	0.034
		HI	**0.1**

Note: Data qualifiers are defined in Appendix A.
* SSLs from NMED (2015, 600915).

Table G-4.2-37
Residential Radionuclide Screening Evaluation for SWMU 01-006(b)

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.116	83	0.035
Plutonium-238	0.0684	84	0.02
Plutonium-239/240	11.7	79	3.7
		Total Dose	**4**

* SALs from LANL (2015, 600929).

Table G-4.2-38
Industrial Noncarcinogenic Screening Evaluation for SWMU 01-006(c)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	HQ
Lead	67.9	800	0.085
Selenium	2.6(U)	6490	0.0004
Zinc	76.7	389,000	0.0002
		HI	**0.09**

Note: Data qualifiers are defined in Appendix A.
* SSLs from NMED (2015, 600915).

Table G-4.2-39
Industrial Radionuclide Screening Evaluation for SWMU 01-006(c)

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-239/240	0.492	1200	0.01
		Total Dose	**0.01**

* SALs from LANL (2015, 600929).

Table G-4.2-40
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 01-006(c)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Barium	172	4390	0.039
Chromium (Total)	29.2	134	0.22
Lead	67.9	800	0.085
Nickel	15.8	753	0.021
Perchlorate	0.0025	248	0.00001
Selenium	2.6(U)	1750	0.0015
Zinc	76.7	106,000	0.00072
Dibenzofuran	0.14	354[b]	0.0004
Methylene chloride	0.00088	1210	0.00000073
		HI	**0.4**

Note: Data qualifiers are defined in Appendix A.

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915).

Table G-4.2-41
Construction Worker Radionuclide Screening Evaluation for SWMU 01-006(c)

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-239/240	0.679	200	0.085
		Total Dose	**0.09**

* SALs from LANL (2015, 600929).

Table G-4.2-42
Residential Carcinogenic Screening Evaluation for SWMU 01-006(c)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Chromium (Total)	29.2	96.6	3.02E-06
		Total Excess Cancer Risk	**3E-06**

* SSLs from NMED (2015, 600915).

Table G-4.2-43
Residential Noncarcinogenic Screening Evaluation for SWMU 01-006(c)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Barium	172	15,600	0.011
Lead	67.9	400	0.17
Nickel	15.8	1560	0.01
Perchlorate	0.0025	54.8	0.000046
Selenium	2.6(U)	391	0.0066
Zinc	76.7	23,500	0.0033
Dibenzofuran	0.14	73[b]	0.0023
Methylene chloride	0.00088	409	0.0000022
		HI	**0.2**

Note: Data qualifiers are defined in Appendix A.
[a] SSLs from NMED (2015, 600915) unless otherwise noted.
[b] EPA regional screening level (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

Table G-4.2-44
Residential Radionuclide Screening Evaluation for SWMU 01-006(c)

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-239/240	0.679	79	0.21
		Total Dose	**0.2**

* SALs from LANL (2015, 600929).

Table G-4.2-45
Industrial Carcinogenic Screening Evaluation for SWMU 01-006(n)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.52	11.5	4.52E-07
Bis(2-ethylhexyl)phthalate	0.67	1830	3.66-09
		Total Excess Cancer Risk	**5E-07**

* SSLs from NMED (2015, 600915).

Table G-4.2-46
Industrial Noncarcinogenic Screening Evaluation for SWMU 01-006(n)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	HQ
Mercury	0.124	389	0.00033
Nitrate	26	2,080,000	0.000013
Methylene chloride	0.0079	5130	0.0000015
Trichlorofluoromethane	0.0012	6030	0.0000002
		HI	**0.0003**

* SSLs from NMED (2015, 600915).

Table G-4.2-47
Industrial Radionuclide Screening Evaluation for SWMU 01-006(n)

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Cesium-134	0.052	17	0.076
Plutonium-239/240	7.98	1200	0.17
Tritium	0.62	2,400,000	0.0000065
		Total Dose	**0.2**

* SALs from LANL (2015, 600929).

Table G-4.2-48
Construction Worker Carcinogenic Screening Evaluation for SWMU 01-006(n)

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.19	85.3	2.22E-08
		Total Excess Cancer Risk	**2E-08**

* SSLs from NMED (2015, 600915).

Table G-4.2-49
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 01-006(n)

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	HQ
Chromium (Total)	18.9	134	0.14
Lead	19.4	800	0.024
Mercury	0.33	77.1	0.0043
Nickel	6.91	753	0.0092
Nitrate	14.2	566,000	0.000025
Perchlorate	0.016	248	0.000065
Selenium	0.42	1750	0.00024
Bis(2-ethylhexyl)phthalate	0.67	5380	0.00012
Methylene chloride	0.0079	1210	0.0000065
Trichlorofluoromethane	0.0012	1130	0.0000011
		HI	**0.2**

* SSLs from NMED (2015, 600915).

Table G-4.2-50
Construction Worker Radionuclide Screening Evaluation for SWMU 01-006(n)

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.264	230	0.029
Cesium-134	0.052	15	0.087
Plutonium-239/240	4.72	200	0.59
Tritium	0.62	1,600,000	0.00001
		Total Dose	**0.7**

* SALs from LANL (2015, 600929).

Table G-4.2-51
Residential Carcinogenic Screening Evaluation for SWMU 01-006(n)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.19	2.43	4.12E-07
Bis(2-ethylhexyl)phthalate	0.67	380	1.76E-08
Chromium (Total)	18.9	96.6	1.96E-06
		Total Excess Cancer Risk	**2E-06**

* SSLs from NMED (2015, 600915).

Table G-4.2-52
Residential Noncarcinogenic Screening Evaluation for SWMU 01-006(n)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	HQ
Lead	19.4	400	0.049
Mercury	0.33	23.5	0.014
Nickel	6.91	1560	0.0044
Nitrate	14.2	125,000	0.00011
Perchlorate	0.016	54.8	0.00029
Selenium	0.42	391	0.0011
Methylene chloride	0.0079	409	0.000019
Trichlorofluoromethane	0.0012	1230	0.00000098
		HI	**0.07**

* SSLs from NMED (2015, 600915).

Table G-4.2-53
Residential Radionuclide Screening Evaluation for SWMU 01-006(n)

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.264	83	0.08
Cesium-134	0.052	5	0.26
Plutonium-239/240	4.72	79	1.49
Tritium	0.62	1700	0.0091
		Total Dose	**2**

* SALs from LANL (2015, 600929).

Table G-4.2-54
Industrial Carcinogenic Screening Evaluation for SWMU 01-007(a)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.055	11.5	4.78E-08
Bis(2-ethylhexyl)phthalate	1.2	1830	6.56E-09
		Total Excess Cancer Risk	**5E-08**

* SSLs from NMED (2015, 600915).

Table G-4.2-55
Industrial Noncarcinogenic Screening Evaluation for SWMU 01-007(a)

COPC	EPC (mg/kg)	Industrial SSL[a] (mg/kg)	HQ
Beryllium	1.9	2580	0.00074
Mercury	0.11	389	0.00028
Nickel	39.5	25,700	0.0015
Selenium	0.31	6490	0.000048
Zinc	69.1	389,000	0.00018
Acetone	0.0044	960,000	0.0000000046
Isopropyltoluene[4-]	0.0041	14,200[b]	0.00000029
Tetrachloroethene	0.00011	629	0.00000017
Trichlorofluoromethane	0.0012	6030	0.0000002
		HI	**0.003**

[a] SSLs from NMED (2015, 600915).
[b] Isopropylbenzene used as a surrogate based on structural similarity.

Table G-4.2-56
Industrial Radionuclide Screening Evaluation for SWMU 01-007(a)

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.187	1000	0.0047
Plutonium-238	0.053	1300	0.001
Plutonium-239/240	10	1200	0.21
		Total Dose	**0.2**

* SALs from LANL (2015, 600929).

Table G-4.2-57
Construction Worker Carcinogenic Screening Evaluation for SWMU 01-007(a)

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.0226	85.3	2.65E-09
		Total Excess Cancer Risk	**3E-09**

* SSLs from NMED (2015, 600915).

Table G-4.2-58
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 01-007(a)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Aluminum	4685	41,400	0.11
Antimony	0.97	142	0.0068
Arsenic	1.45	57.4	0.025
Beryllium	1.22	148	0.0082
Chromium (Total)	14.2	134	0.11
Lead	20.1	800	0.025
Manganese	309.3	464	0.67
Mercury	0.826	77.1	0.011
Nickel	8.68	753	0.012
Perchlorate	0.0082	248	0.000033
Selenium	0.329	1750	0.00019
Zinc	43	106,000	0.00041
Acetone	0.0044	242,000	0.000000018
Benzyl alcohol	0.036	26,900[b]	0.0000013
Bis(2-ethylhexyl)phthalate	0.515	5380	0.000096
Di-n-butylphthalate	0.065	26,900	0.0000024
Isopropyltoluene[4-]	0.0041	2740[c]	0.0000015
Methylene chloride	0.0065	1210	0.0000054
Tetrachloroethene	0.0018	120	0.000015
Trichlorofluoromethane	0.0012	1130	0.0000011
		HI	**1**

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915).

[c] Isopropylbenzene used as a surrogate based on structural similarity.

Table G-4.2-59
Construction Worker Radionuclide Screening Evaluation for SWMU 01-007(a)

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.0705	230	0.0077
Plutonium-238	0.112	230	0.012
Plutonium-239/240	10.4	200	1.3
Tritium	2.08	1,600,000	0.000033
		Total Dose	**1**

* SALs from LANL (2015, 600929).

Table G-4.2-60
Residential Carcinogenic Screening Evaluation for SWMU 01-007(a)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.0226	2.43	9.30E-08
Arsenic	1.45	4.25	3.41E-06
Bis(2-ethylhexyl)phthalate	0.515	380	1.36E-08
Chromium (Total)	14.2	96.6	1.47E-06
Total Excess Cancer Risk			**5E-06**

* SSLs from NMED (2015, 600915).

Table G-4.2-61
Residential Noncarcinogenic Screening Evaluation for SWMU 01-007(a)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Aluminum	4685	78,000	0.06
Antimony	0.97	31.3	0.031
Beryllium	1.22	156	0.0078
Lead	20.1	400	0.05
Manganese	309.3	10,500	0.029
Mercury	0.826	23.5	0.035
Nickel	8.68	1560	0.0056
Perchlorate	0.0082	54.8	0.00015
Selenium	0.329	391	0.00084
Zinc	43	23,500	0.0018
Acetone	0.0044	66,300	0.000000066
Benzyl alcohol	0.036	6300[b]	0.0000057
Di-n-butylphthalate	0.065	6160	0.000011
Isopropyltoluene[4-]	0.0041	2360[c]	0.0000017
Methylene chloride	0.0065	409	0.000016
Tetrachloroethene	0.0018	111	0.000016
Trichlorofluoromethane	0.0012	1230	0.00000098
		HI	**0.2**

[a] SSLs from NMED (2015, 600915) unless otherwise noted.
[b] EPA regional screening level (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).
[c] Isopropylbenzene used as a surrogate based on structural similarity.

Table G-4.2-62
Residential Radionuclide Screening Evaluation for SWMU 01-007(a)

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.0705	83	0.021
Plutonium-238	0.112	84	0.033
Plutonium-239/240	10.4	79	3.29
Tritium	2.08	1700	0.031
		Total Dose	**3**

* SALs from LANL (2015, 600929).

Table G-4.2-63
Industrial Carcinogenic Screening Evaluation for SWMU 01-007(b)

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Bis(2-ethylhexyl)phthalate	0.054	1830	2.95E-10
Chromium (Total)	18.9	505	3.74E-07
		Total Excess Cancer Risk	**4E-07**

* SSLs from NMED (2015, 600915).

Table G-4.2-64
Industrial Noncarcinogenic Screening Evaluation for SWMU 01-007(b)

COPC	EPC (mg/kg)	Industrial SSL[a] (mg/kg)	HQ
Selenium	0.319	6490	0.000049
Methylene chloride	0.00094	5130	0.00000018
Toluene	0.00039	61,300	0.0000000064
Trichlorofluoromethane	0.0004	6030	0.000000066
		HI	**0.00005**

* SSLs from NMED (2015, 600915).

Table G-4.2-65
Industrial Radionuclide Screening Evaluation for SWMU 01-007(b)

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.24	1000	0.006
Plutonium-239/240	7.46	1200	0.16
		Total Dose	**0.2**

* SALs from LANL (2015, 600929).

Table G-4.2-66
Construction Worker Carcinogenic Screening Evaluation for SWMU 01-007(b)

COPC	EPC (mg/kg)	Construction Worker SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.049	85.3	5.74E-09
		Total Excess Cancer Risk	**6E-09**

* SSLs from NMED (2015, 600915).

Table G-4.2-67
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 01-007(b)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	HQ
Chromium (Total)	14.2	134	0.11
Nickel	6.34	753	0.0085
Perchlorate	0.0077	248	0.000031
Selenium	0.628	1750	0.00036
Bis(2-ethylhexyl)phthalate	0.47	5380	0.000087
Di-n-butylphthalate	0.036	26,900	0.0000014
Isopropylbenzene	0.00012	2740	0.000000044
Isopropyltoluene[4-]	0.00019	2740[b]	0.000000069
Methylene chloride	0.00094	1210	0.00000078
Toluene	0.00039	14,000	0.000000028
Trichlorofluoromethane	0.00024	1130	0.00000021
Trimethylbenzene[1,2,4-]	0.0004	245[c]	0.0000016
		HI	**0.1**

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] Isopropylbenzene used as a surrogate based on structural similarity.

[c] Construction worker SSL calculated using toxicity value from EPA regional screening tables (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) and equation and parameters from NMED (2015, 600915).

Table G-4.2-68
Construction Worker Radionuclide Screening Evaluation for SWMU 01-007(b)

COPC	EPC (pCi/g)	Construction Worker SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.24	230	0.026
Plutonium-238	0.0367	230	0.004
Plutonium-239/240	5.68	200	0.71
		Total Dose	**0.7**

* SALs from LANL (2015, 600929).

Table G-4.2-69
Residential Carcinogenic Screening Evaluation for SWMU 01-007(b)

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Aroclor-1260	0.049	2.43	2.02E-07
Bis(2-ethylhexyl)phthalate	0.47	380	1.24E-08
Chromium (Total)	14.2	96.6	1.47E-06
Total Excess Cancer Risk			**2E-06**

* SSLs from NMED (2015, 600915).

Table G-4.2-70
Residential Noncarcinogenic Screening Evaluation for SWMU 01-007(b)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Nickel	6.34	1560	0.0041
Perchlorate	0.0077	54.8	0.00014
Selenium	0.628	391	0.0016
Di-n-butylphthalate	0.036	6160	0.0000058
Isopropylbenzene	0.00012	2360	0.000000051
Isopropyltoluene[4-]	0.00019	2360[b]	0.000000081
Methylene chloride	0.00094	409	0.0000023
Toluene	0.00039	5230	0.000000075
Trichlorofluoromethane	0.00024	1230	0.0000002
Trimethylbenzene[1,2,4-]	0.0004	58[c]	0.0000068
HI			**0.006**

[a] SSLs from NMED (2015, 600915) unless otherwise noted.
[b] Isopropylbenzene used as a surrogate based on structural similarity.
[c] EPA regional screening level (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

Table G-4.2-71
Residential Radionuclide Screening Evaluation for SWMU 01-007(b)

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Americium-241	0.24	83	0.072
Plutonium-238	0.0367	84	0.011
Plutonium-239/240	5.68	79	1.8
Total Dose			**2**

* SALs from LANL (2015, 600929).

Table G-4.3-1
Residential Noncarcinogenic Screening of Vapor Intrusion for SWMU 01-001(d1)

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Methylene chloride	0.00213	185	0.000012
		HI	**0.00001**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-2
Residential Noncarcinogenic Screening of Vapor Intrusion for SWMU 01-001(s1)

COPC	EPCa (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Methylene chloride	0.0033	57.9	0.000057
		HI	**0.00006**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-3
Residential Carcinogenic Screening of Vapor Intrusion for SWMU 01-002(a1)-00

COPC	EPCa (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Benzene	0.0002	0.953	2.10E-09
		Total Excess Cancer Risk	**2E-09**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-4
Residential Noncarcinogenic Screening of Vapor Intrusion for SWMU 01-002(a1)-00

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Butylbenzene[tert-]	0.00015	9.56	0.000016
Isopropylbenzene	0.00012	127	0.00000094
Methylene chloride	0.0064	191	0.000034
		HI	**0.00005**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-5
Residential Noncarcinogenic Screening of Vapor Intrusion for AOC 01-003(b1)

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Acetone	0.00206	9880	0.00000021
		HI	**0.0000002**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-6
Residential Noncarcinogenic Screening of Vapor Intrusion for SWMU 01-006(b)

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Methylene chloride	0.0064	19.4	0.00033
Trichlorofluoromethane	0.0013	223	0.0000058
		HI	**0.0003**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-7
Residential Noncarcinogenic Screening of Vapor Intrusion for SWMU 01-006(n)

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Methylene chloride	0.0079	203	0.000039
Trichlorofluoromethane	0.0012	236	0.0000051
		HI	**0.00004**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-8
Residential Carcinogenic Screening of Vapor Intrusion for SWMU 01-007(a)

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Benzene	0.0002	0.953	2.10E-09
		Total Excess Cancer Risk	**2E-09**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-9
Residential Noncarcinogenic Screening of Vapor Intrusion for SWMU 01-007(a)

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Acetone	0.0044	10,500	0.00000042
Butylbenzene[tert-]	0.00015	9.56	0.000016
Isopropylbenzene	0.00012	83.1	0.0000014
Isopropyltoluene[4-]	0.0041	135[c]	0.00003
Methylene chloride	0.0083	18.8	0.00044
Tetrachloroethene	0.00011	0.203	0.00054
Trichlorofluoromethane	0.0012	118	0.00001
		HI	**0.001**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.
[c] Isopropylbenzene used as a surrogate based on structural similarity.

Table G-4.3-10
Residential Carcinogenic Screening of Vapor Intrusion for SWMU 01-007(b)

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Chloromethane	0.00029	1.36	2.13E-09
		Total Excess Cancer Risk	**2E-09**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.

Table G-4.3-11
Residential Noncarcinogenic Screening of Vapor Intrusion for SWMU 01-007(b)

COPC	EPC[a] (mg/kg)	Vapor Intrusion Risk-Based Concentration[b] (mg/kg)	HQ
Isopropylbenzene	0.00012	83.1	0.0000014
Isopropyltoluene[4-]	0.00019	123[c]	0.0000015
Methylene chloride	0.00094	67.5	0.000014
Toluene	0.00039	1690	0.00000023
Trichlorofluoromethane	0.00024	149	0.0000016
Trimethylbenzene[1,2,4-]	0.0004	2.36	0.00017
		HI	**0.0002**

[a] Maximum detected concentration.
[b] Vapor intrusion risk values generated by the Johnson and Ettinger advanced soil model.
[c] Isopropylbenzene used as a surrogate based on structural similarity.

Table G-5.3-1
ESLs for Terrestrial Receptors

Analyte	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Inorganic Chemicals (mg/kg)											
Antimony	46	na*	na	na	na	na	2.6	2.6	2.4	78	11
Arsenic	820	850	120	42	26	18	140	15	32	6.8	18
Barium	41,000	28,000	8600	820	930	1000	2900	1300	1800	330	110
Beryllium	5420	na	na	na	na	na	150	18	56	40	2.5
Chromium (Total)	1800	1000	200	68	40	28	750	45	110	na	na
Copper	4000	1300	92	38	22	15	270	38	64	80	70
Cyanide (Total)	2800	0.59	0.4	0.1	0.1	0.1	660	310	340	na	na
Lead	3700	630	95	21	16	14	330	72	120	1700	120
Mercury	61	0.29	0.066	0.07	0.022	0.013	20	1.7	3	0.05	34
Nickel	1200	2300	120	160	38	21	440	9.7	20	280	38
Selenium	90	81	4.3	1	0.87	0.75	1.9	0.66	0.83	4.1	0.52
Zinc	7800	2400	250	350	85	48	1600	98	170	120	160
Organic Chemicals (mg/kg)											
Acetone	7800	76,000	970	7.5	14	170	1.3	15	1.2	na	na
Aroclor-1254	5.9	7.1	0.22	1.3	0.08	0.041	46	0.44	0.88	na	160
Aroclor-1260	14	400	4.8	46	1.7	0.88	2600	10	20	na	na
Benzo(a)anthracene	110	34	7.4	0.8	0.91	1	5.5	3	3.4	na	18
Benzo(a)pyrene	3400	na	na	na	na	na	240	53	85	na	na
Benzo(b)fluoranthene	2400	na	na	na	na	na	110	38	52	na	18

Table G-5.3-1 (continued)

Analyte	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Benzo(g,h,i)perylene	3300	na	na	na	na	na	480	24	47	na	na
Benzo(k)fluoranthene	4300	na	na	na	na	na	310	62	100	na	na
Benzyl alcohol	110,000	na	na	na	na	na	150	260	120	na	na
Bis(2-ethylhexyl)phthalate	280	8.1	0.1	20	0.040	0.02	2400	0.59	1.1	na	na
Butylbenzylphthalate	18,000	na	na	na	na	na	2000	90	160	na	na
Chrysene	110	na	na	na	na	na	5.8	2.4	3.1	na	na
Dibenzofuran	na	na	na	na	na	na	na	na	na	na	6.1
Di-n-butylphthalate	48,000	1.7	0.059	0.39	0.021	0.011	14,000	180	370	na	160
Fluoranthene	3300	na	na	na	na	na	230	22	38	10	na
Indeno(1,2,3-cd)pryene	4600	na	na	na	na	na	530	62	110	na	na
Methylene chloride	4200	na	na	na	na	na	3	9	2.6	na	1600
Phenanthrene	1700	na	na	na	na	na	52	10	15	5.5	na
Pyrene	2800	3100	190	71	46	34	99	22	32	10	na
Tetrachloroethene	97	na	na	na	na	na	7.8	0.18	0.36	na	10
Toluene	11,000	na	na	na	na	na	54	23	25	na	200
Trichlorofluoromethane	52,000	na	na	na	na	na	1500	52	98	na	na

Table G-5.3-1 (continued)

Analyte	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Radionuclides (pCi/g)											
Americium-241	26,000	59,000	47,000	5000	6900	11,000	20,000	33,000	33,000	190	500
Cesium-134	730	1000	1000	690	1200	2100	550	1100	1100	1000	700
Cesium-137	1500	3900	4300	1400	2600	4600	1200	2400	2300	2300	1500
Plutonium-238	45,000	130,000	120,000	5200	7700	14,000	53,000	160,000	170,000	820	1800
Plutonium-239/240	51,000	160,000	140,000	5400	7900	14,000	62,000	270,000	280,000	870	1900
Tritium	220,000	550,000	610,000	300,000	440,000	600,000	210,000	340,000	330,000	48,000	36,000
Uranium-235/236	5200	10,000	10,000	6500	8200	9800	4200	5200	5200	1600	440

Note: ESLs from ECORISK Database, Version 3.3 (LANL 2015, 600921).

*na = Not available.

Table G-5.3-2
Minimum ESL Comparison for SWMU 01-001(d1)

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Antimony	1.19(U)	2.4	Deer mouse	**0.5**
Copper	17.9	15	Robin – insectivore	**1.19**
Mercury	1.4	0.013	Robin – insectivore	**108**
Selenium	1.05	0.52	Plant	**2.02**
Organic Chemicals (mg/kg)				
Di-n-butylphthalate	0.058	0.011	Robin – insectivore	**5.27**
Radionuclides (pCi/g)				
Plutonium-239/240	0.97	870	Earthworm	0.0011

Notes: Bolded values indicate HQ greater than 0.3. Data qualifiers are defined in Appendix A.

Table G-5.3-3
HI Analysis for SWMU 01-001(d1)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Antimony	1.19(U)	0.026	na*	na	na	na	na	**0.46**	**0.46**	**0.5**	0.015	0.11
Copper	17.9	0.0045	0.014	0.19	**0.47**	**0.81**	**1.19**	0.075	**0.47**	0.28	0.22	0.26
Mercury	1.4	0.023	**4.83**	**21.2**	**20**	**63.6**	**108**	0.07	**0.82**	**0.47**	**28**	0.041
Selenium	1.05	0.012	0.013	0.24	**1.05**	**1.21**	**1.4**	**0.55**	**1.59**	**1.27**	0.25	**2.02**
Di-n-butylphthalate	0.058	0.0000012	0.034	**0.98**	0.15	**2.76**	**5.27**	0.0000041	0.00032	0.00016	na	0.00036
HIs		0.06	**5**	**23**	**22**	**68**	**116**	1	**3**	**3**	**28**	**2**

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.
* na = Not available.

Table G-5.3-4
Minimum ESL Comparison for SWMU 01-001(s1)

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Chromium (Total)	20.4	28	Robin – insectivore	**0.73**
Cyanide (Total)	0.84	0.1	Robin – insectivore	**8.4**
Lead	15.7	14	Robin – insectivore	**1.12**
Nickel	10.7	9.7	Montane shrew	**1.1**
Selenium	0.26	0.52	Plant	**0.5**
Organic Chemicals (mg/kg)				
Butylbenzylphthalate	0.09	90	Montane shrew	0.001
Methylene chloride	0.0033	2.6	Deer mouse	0.0013
Radionuclides (pCi/g)				
Plutonium-238	0.117	820	Earthworm	0.00014
Plutonium-239/240	0.122	870	Earthworm	0.00014
Tritium	0.94	36,000	Plant	0.000026
Uranium-235/236	0.167	440	Plant	0.000038

Note: Bolded values indicate HQ greater than 0.3.

Table G-5.3-5
HI Analysis for SWMU 01-001(s1)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Chromium (Total)	20.4	0.011	0.02	0.1	0.3	**0.51**	**0.73**	0.027	**0.45**	0.19	na*	na
Cyanide (Total)	0.84	0.0003	**1.42**	**2.1**	**8.4**	**8.4**	**8.4**	0.0013	0.0027	0.0025	na	na
Lead	15.7	0.0042	0.025	0.17	**0.75**	**0.98**	**1.12**	0.048	0.22	0.13	0.0092	0.13
Nickel	10.7	0.0089	0.0047	0.089	0.067	0.28	**0.51**	0.024	**1.1**	**0.54**	0.038	0.28
Selenium	0.26	0.0029	0.0032	0.06	0.26	0.3	**0.35**	0.14	**0.39**	**0.31**	0.063	**0.5**
HIs		0.03	1	**3**	**10**	**10**	**11**	0.2	**2**	1	0.1	0.9

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.

* na = Not available.

Table G-5.3-6
Minimum ESL Comparison for SWMU 01-002(a1)-00

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Chromium (Total)	13.7	28	Robin – insectivore	**0.49**
Cyanide (Total)	0.83	0.1	Robin – insectivore	**8.3**
Selenium	0.26	0.52	Plant	**0.5**
Organic Chemicals (mg/kg)				
Methylene chloride	0.0026	2.6	Deer mouse	0.001
Radionuclides (pCi/g)				
Plutonium-238	0.117	820	Earthworm	0.00014
Plutonium-239/240	0.122	870	Earthworm	0.00014
Uranium-235/236	0.167	440	Plant	0.00038

Note: Bolded values indicate HQ greater than 0.3.

Table G-5.3-7
HI Analysis for SWMU 01-002(a1)-00

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Chromium (Total)	13.7	0.0076	0.014	0.069	0.2	**0.34**	**0.49**	0.018	**0.304**	0.12	na*	na
Cyanide (Total)	0.83	0.0003	**1.41**	**2.08**	**8.3**	**8.3**	**8.3**	0.0035	0.022	0.013	0.01	0.012
Selenium	0.26	0.0029	0.0032	0.06	**0.26**	0.3	**0.35**	0.14	**0.39**	**0.31**	0.063	**0.5**
HIs		0.01	1	**2**	**9**	**9**	**9**	0.2	0.7	0.4	0.07	0.5

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.
* na = Not available.

Table G-5.3-8
Minimum ESL Comparison for AOC 01-003(b1)

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Copper	13	15	Robin – insectivore	**0.87**
Lead	105	14	Robin – insectivore	**7.5**
Mercury	0.266	0.013	Robin – insectivore	**20.5**
Zinc	66.1	48	Robin – insectivore	**1.38**
Organic Chemicals (mg/kg)				
Acetone	0.00206	1.2	Deer mouse	0.0017
Aroclor-1254	0.0296	0.041	Robin – insectivore	**0.72**
Aroclor-1260	0.0203	0.88	Robin – insectivore	0.023
Benzo(a)anthracene	0.0271	0.8	Robin – herbivore	0.089
Benzo(a)pyrene	0.0306	53	Montane shrew	0.00058
Benzo(b)fluoranthene	0.0366	18	Plant	0.002
Benzo(g,h,i)perylene	0.0236	24	Montane shrew	0.00098
Benzo(k)fluoranthene	0.0185	62	Montane shrew	0.0003
Chrysene	0.0318	2.4	Montane shrew	0.013
Fluoranthene	0.0438	10	Earthworm	0.0044
Indeno(1,2,3-cd)pyrene	0.0218	62	Montane shrew	0.00035
Phenanthrene	0.0381	5.5	Earthworm	0.0069
Pyrene	0.0408	10	Earthworm	0.0041
Radionuclides (pCi/g)				
Americium-241	0.384	190	Earthworm	0.002
Cesium-137	0.121	1200	Cottontail	0.0001
Plutonium-239/240	16.9	870	Earthworm	0.019

Note: Bolded values indicate HQ greater than 0.3.

Table G-5.3-9
HI Analysis for AOC 01-003(b1)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Copper	13	0.0033	0.01	0.14	**0.34**	**0.59**	**0.87**	0.054	**0.34**	0.2	0.16	0.19
Lead	105	0.028	0.17	**1.11**	**5**	**6.56**	**7.5**	**0.32**	**1.46**	**0.88**	0.062	**0.88**
Mercury	0.266	0.0044	**0.92**	**4.03**	**3.8**	**12.1**	**20.5**	0.013	0.16	0.089	**5.32**	0.0078
Zinc	66.1	0.0085	0.028	0.26	0.19	**0.78**	**1.38**	0.041	**0.67**	**0.39**	**0.55**	**0.41**
Aroclor-1254	0.0296	0.005	0.0042	0.13	0.023	**0.37**	**0.72**	0.00064	0.067	0.034	na*	0.00019
HIs		0.05	1	**6**	**9**	**20**	**31**	0.4	**3**	**2**	**6**	1

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.

* na = Not available.

Table G-5.3-10
Minimum ESL Comparison for SWMU 01-006(b)

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Cyanide (Total)	0.62	0.1	Robin – insectivore	**6.2**
Lead	21.2	14	Robin – insectivore	**1.51**
Nickel	8.4	9.7	Montane shrew	**0.87**
Selenium	0.51(U)	0.52	Plant	**0.98**
Organic Chemicals (mg/kg)				
Aroclor-1254	0.037	0.041	Robin – insectivore	**0.9**
Aroclor-1260	0.033	0.88	Robin – insectivore	0.038
Radionuclides (pCi/g)				
Americium-241	0.116	190	Earthworm	0.00061
Plutonum-238	0.0684	820	Earthworm	0.000083
Plutonium-239/240	5.48	870	Earthworm	0.0063

Notes: Bolded values indicate HQ greater than 0.3. Data qualifiers are defined in Appendix A.

Table G-5.3-11
HI Analysis for SWMU 01-006(b)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Cyanide (Total)	0.62	0.00022	**1.05**	**1.55**	**6.2**	**6.2**	**6.2**	0.00094	0.002	0.0018	na*	na
Lead	21.2	0.0057	0.034	0.22	**1.01**	**1.33**	**1.51**	0.064	0.29	0.18	0.012	0.18
Nickel	8.4	0.007	0.0037	0.07	0.053	0.22	**0.4**	0.019	**0.87**	**0.42**	0.03	0.22
Selenium	0.51(U)	0.0057	0.0063	0.12	**0.51**	**0.59**	**0.68**	0.27	**0.77**	**0.61**	0.12	**0.98**
Aroclor-1254	0.037	0.0063	0.0052	0.17	0.028	**0.46**	**0.9**	0.0008	0.084	0.042	na	0.00023
HIs		0.02	1	**2**	**8**	**9**	**10**	0.4	**2**	1	0.2	1

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.

* na = Not available.

Table G-5.3-12
Minimum ESL Comparison for SWMU 01-006(c)

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Barium	172	110	Plant	**1.56**
Chromium (Total)	29.2	28	Robin – insectivore	**1.04**
Lead	67.9	14	Robin – insectivore	**4.85**
Nickel	15.8	9.7	Montane shrew	**1.63**
Selenium	2.6(U)	0.52	Plant	**5**
Zinc	76.7	48	Robin – insectivore	**1.6**
Organic Chemicals (mg/kg)				
Dibenzofuran	0.14	6.1	Plant	0.028
Methylene chloride	0.00088	2.6	Deer mouse	0.00034
Radionuclides (pCi/g)				
Plutonium-239/240	0.492	870	Earthworm	0.00057

Notes: Bolded values indicate HQ greater than 0.3. Data qualifiers are defined in Appendix A.

Table G-5.3-13
HI Analysis for SWMU 01-006(c)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Barium	172	0.0042	0.0061	0.02	0.21	0.18	0.17	0.059	0.13	0.096	**0.52**	**1.56**
Chromium (Total)	29.2	0.016	0.029	0.15	**0.43**	**0.73**	**1.04**	0.01	**0.65**	0.27	na*	na
Lead	67.9	0.018	0.11	**0.71**	**3.23**	**4.24**	**4.85**	0.21	**0.94**	**0.57**	0.04	**0.57**
Nickel	15.8	0.013	0.0069	0.13	0.099	**0.42**	**0.75**	0.036	**1.63**	**0.79**	0.056	**0.42**
Selenium	2.6(U)	0.029	0.032	**0.6**	**2.6**	**2.99**	**3.47**	**1.37**	**3.94**	**3.13**	**0.63**	**5**
Zinc	76.7	0.0098	0.032	**0.31**	0.22	**0.9**	**1.6**	0.048	**0.78**	**0.45**	**0.64**	**0.48**
HIs		0.09	0.2	**2**	**7**	**9**	**12**	**2**	**8**	**5**	**2**	**8**

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.
* na = Not available.

Table G-5.3-14
Minimum ESL Comparison for SWMU 01-006(n)

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Lead	44.1	14	Robin – insectivore	**3.15**
Mercury	0.555	0.013	Robin – insectivore	**42.7**
Selenium	0.56(U)	0.52	Plant	**1.08**
Organic Chemicals (mg/kg)				
Aroclor-1260	0.52	0.88	Robin – insectivore	**0.59**
Bis(2-ethylhexyl)phthalate	0.67	0.02	Robin – insectivore	**33.5**
Methylene chloride	0.0079	2.6	Deer mouse	0.003
Trichlorofluoromethane	0.0012	52	Montane shrew	0.000023
Radionuclides (pCi/g)				
Americium-241	0.264	190	Earthworm	0.0014
Cesium-134	0.052	550	Desert cottontail	0.000095
Plutonium-239/240	6.24	870	Earthworm	0.0072
Tritium	0.62	36,000	Plant	0.000017

Notes: Bolded values indicate HQ greater than 0.3. Data qualifiers are defined in Appendix A.

Table G-5.3-15
HI Analysis for SWMU 01-006(n)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Lead	44.1	0.012	0.07	**0.46**	**2.1**	**2.76**	**3.15**	0.13	**0.61**	**0.37**	0.026	**0.37**
Mercury	0.555	0.0091	**1.91**	**8.41**	**7.93**	**25.2**	**42.7**	0.028	**0.33**	0.19	**11.1**	0.016
Selenium	0.56(U)	0.0062	0.0069	0.13	**0.56**	**0.64**	**0.75**	0.29	**0.85**	**0.67**	0.14	**1.08**
Aroclor-1260	0.52	0.037	0.0013	0.11	0.011	**0.31**	**0.59**	0.0002	0.052	0.026	na*	na
Bis(2-ethylhexyl)phthalate	0.67	0.002	0.083	**6.7**	0.034	**16.8**	**33.5**	0.00028	**1.14**	**0.61**	na	na
HIs		0.07	**2**	**16**	**11**	**46**	**81**	0.4	**3**	**2**	**11**	1

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.

* na = Not available.

Table G-5.3-16
Minimum ESL Comparison for SWMU 01-007(a)

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Antimony	0.1	2.4	Deer mouse	0.042
Arsenic	1.9	6.8	Earthworm	0.28
Beryllium	1.46	2.5	Plant	**0.58**
Chromium (total)	15.9	28	Robin – insectivore	**0.57**
Mercury	0.11	0.013	Robin – insectivore	**8.46**
Nickel	12.8	9.7	Montane shrew	**1.32**
Selenium	0.33	0.52	Plant	**0.63**
Zinc	43.2	48	Robin – insectivore	**0.9**
Organic Chemicals (mg/kg)				
Acetone	0.0044	1.2	Deer mouse	0.0037
Aroclor-1260	0.055	0.88	Robin – insectivore	0.063
Benzyl alcohol	0.036	120	Deer mouse	0.0003
Bis(2-ethylhexyl)phthalate	0.675	0.02	Robin – insectivore	**33.8**
Tetrachloroethene	0.00011	0.18	Montane shrew	0.00061
Trichlorofluoromethane	0.0012	52	Montane shrew	0.000023
Radionuclides (pCi/g)				
Americium-241	0.187	190	Earthworm	0.00098
Plutonum-238	0.112	820	Earthworm	0.00014
Plutonium-239/240	11.1	870	Earthworm	0.013

Note: Bolded values indicate HQ greater than 0.3.

Table G-5.3-17
HI Analysis for SWMU 01-007(a)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Beryllium	1.46	0.0035	na*	na	na	na	na	0.0097	0.081	0.026	0.037	**0.58**
Chromium (Total)	15.9	0.0088	0.016	0.08	0.23	**0.4**	**0.57**	0.021	**0.35**	0.14	na	na
Mercury	0.11	0.0018	**0.38**	**1.67**	**1.57**	**5**	**8.46**	0.0055	0.065	0.037	**2.2**	0.0032
Nickel	12.8	0.01	0.0056	0.11	0.08	**0.34**	**0.61**	0.029	**1.32**	**0.64**	0.046	**0.34**
Selenium	0.33	0.0037	0.0041	0.077	**0.33**	**0.38**	**0.44**	0.17	**0.5**	**0.4**	0.08	**0.63**
Zinc	43.2	0.0055	0.018	0.17	0.12	**0.51**	**0.9**	0.027	**0.44**	0.25	**0.36**	0.27
Bis(2-ethylhexyl)phthalate	0.675	0.0018	0.083	**6.75**	0.034	**16.9**	**33.8**	0.00028	**1.14**	**0.61**	na	na
HIs		0.04	0.5	**9**	**2**	**24**	**45**	0.3	**4**	**2**	**3**	**2**

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.

* na = Not available.

Table G-5.3-18
Minimum ESL Comparison for SWMU 01-007(b)

COPC	EPC	ESL	Receptor	HQ
Inorganic Chemicals (mg/kg)				
Chromium (Total)	14.2	28	Robin – insectivore	**0.51**
Nickel	5.59	9.7	Montane shrew	**0.58**
Selenium	0.385	0.52	Plant	**0.74**
Organic Chemicals (mg/kg)				
Aroclor-1260	0.035	0.88	Robin – insectivore	0.04
Bis(2-ethylhexyl)phthalate	0.055	0.02	Robin – insectivore	**2.75**
Di-n-butylphthalate	0.036	0.011	Robin – insectivore	**3.27**
Methylene chloride	0.00094	2.6	Deer mouse	0.00036
Toluene	0.00039	23	Montane shrew	0.000017
Radionuclides (pCi/g)				
Americium-241	0.24	190	Earthworm	0.0013
Plutonium-238	0.0367	820	Earthworm	0.000045
Plutonium-239/240	5.87	870	Earthworm	0.0067

Note: Bolded values indicate HQ greater than 0.3.

Table G-5.3-19
HI Analysis for SWMU 01-007(b)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Chromium (Total)	14.2	0.0079	0.014	0.071	0.21	**0.36**	**0.51**	0.019	**0.32**	0.13	na*	na
Nickel	5.59	0.0047	0.0024	0.047	0.035	0.15	0.27	0.013	**0.58**	0.28	0.02	0.15
Selenium	0.385	0.0043	0.0048	0.09	**0.39**	**0.44**	**0.51**	0.2	**0.58**	**0.46**	0.094	**0.74**
Bis(2-ethylhexyl)phthalate	0.055	0.00014	0.0068	**0.55**	0.0028	**1.38**	**2.75**	0.000023	0.093	0.05	na	na
Di-n-butylphthalate	0.036	0.00000075	0.021	**0.61**	0.092	**1.71**	**3.27**	0.0000026	0.0002	0.000097	na	0.00023
HIs		0.02	0.05	1	0.7	**4**	**7**	0.2	**2**	0.9	0.1	0.9

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.

* na = Not available.

Table G-5.4-1
PAUFs for Ecological Receptors at SWMU 01-001(d1)

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.0000078
American Robin	0.42	16.8	0.0019
Deer Mouse	0.077	3	0.011
Desert Cottontail	3.1	124	0.00027
Montane Shrew	0.39	15.6	0.0021
Red Fox	1038	41,520	0.00000079

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).

[b] PAUF is calculated as the area of the site (0.033 ha) divided by the population area.

Table G-5.4-2
Adjusted HIs for SWMU 01-001(d1)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Antimony	1.19(U)	2.05E-08	na*	na	na	na	na	1.24E-04	9.66E-04	0.0055	0.015	0.11
Copper	17.9	3.56E-09	1.09E-07	1.48E-06	8.93E-04	0.0015	0.0023	2.03E-05	9.87E-04	0.0031	0.22	0.26
Mercury	1.4	1.82E-08	3.77E-05	1.65E-04	0.038	0.12	0.21	1.89E-05	0.0017	0.0052	**28**	0.041
Selenium	1.05	9.48E-09	1.01E-07	1.87E-06	0.002	0.0023	0.0027	1.49E-04	0.0033	0.014	0.25	**2.02**
Di-n-butylphthalate	0.058	9.48E-13	2.65E-07	7.64E-06	2.85E-04	0.0052	0.01	1.11E-09	6.72E-07	1.76E-06	na	0.00036
Adjusted HIs		5E-08	0.00004	0.0002	0.04	0.1	0.2	0.0003	0.007	0.03	**28**	**2**

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.

* na = Not available.

Table G-5.4-3
PAUFs for Ecological Receptors at SWMU 01-001(s1)

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.0000038
American Robin	0.42	16.8	0.00095
Deer Mouse	0.077	3	0.0053
Desert Cottontail	3.1	124	0.00013
Montane Shrew	0.39	15.6	0.001
Red Fox	1038	41,520	0.00000039

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).

[b] PAUF is calculated as the area of the site (0.016 ha) divided by the population area.

Table G-5.4-4
Adjusted HIs for SWMU 01-001(s1)

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Chromium (Total)	20.4	4.29E-09	7.60E-08	3.80E-07	2.85E-04	4.85E-04	6.94E-04	3.51E-06	4.50E-04	0.001	na*	na
Cyanide (Total)	0.84	1.17E-10	5.40E-06	7.98E-06	0.008	0.008	0.008	1.69E-07	2.70E-06	1.33E-05	na	na
Lead	15.7	1.64E-09	9.50E-08	6.46E-07	7.12E-04	9.31E-04	0.0011	6.24E-06	2.20E-04	6.89E-04	0.0092	0.13
Nickel	10.7	3.47E-09	1.79E-08	3.38E-07	6.37E-05	2.66E-04	4.85E-04	3.12E-06	0.0011	0.0029	0.038	0.28
Selenium	0.26	1.13E-09	1.22E-08	2.28E-07	2.47E-04	2.85E-04	3.33E-04	1.82E-05	3.90E-04	0.0016	0.063	**0.5**
Adjusted HIs		1E-08	5E-06	1E-05	0.009	0.01	0.01	3E-05	0.002	0.006	0.1	0.9

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.

* na = Not available.

Table G-5.4-5
PAUFs for Ecological Receptors at SWMU 01-002(a1)-00

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.000019
American Robin	0.42	16.8	0.0049
Deer Mouse	0.077	3	0.027
Desert Cottontail	3.1	124	0.00066
Montane Shrew	0.39	15.6	0.0055
Red Fox	1038	41,520	0.000002

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).

[b] PAUF is calculated as the area of the site (0.082 ha) divided by the population area.

Table G-5.4-6
Adjusted HIs for SWMU 01-002(a1)-00

COPEC	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Chromium (Total)	13.7	1.52E-08	2.66E-07	1.31E-06	9.80E-04	0.0017	0.0024	1.19E-05	0.0017	0.0032	na*	na
Cyanide (Total)	0.83	6.00E-10	2.70E-05	3.95E-05	0.041	0.041	0.041	2.31E-06	1.21E-04	3.51E-04	0.01	0.012
Selenium	0.26	5.80E-09	6.08E-08	1.14E-06	0.0013	0.0015	0.0017	9.24E-05	0.0021	0.0084	0.063	**0.5**
Adjusted HIs		2E-08	0.00003	0.00004	0.04	0.04	0.05	0.0001	0.004	0.01	0.07	0.5

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.

* na = Not available.

Table G-5.4-7
PAUFs for Ecological Receptors at AOC 01-003(b1)

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.00000066
American Robin	0.42	16.8	0.00017
Deer Mouse	0.077	3	0.00093
Desert Cottontail	3.1	124	0.000023
Montane Shrew	0.39	15.6	0.00018
Red Fox	1038	41,520	0.000000067

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).

[b] PAUF is calculated as the area of the site (0.0028 ha) divided by the population area.

Table G-5.4-8
Adjusted HIs for AOC 01-003(b1)

COPECs	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Copper	13	2.21E-10	6.60E-09	9.24E-08	5.78E-05	1.00E-04	1.48E-04	1.24E-06	6.12E-05	1.86E-04	0.16	0.19
Lead	105	1.88E-09	1.22E-07	7.33E-07	8.50E-04	0.0011	0.0013	7.36E-06	2.63E-04	8.18E-04	0.062	**0.88**
Mercury	0.266	2.95E-10	6.07E-07	2.66E-06	6.46E-04	0.0021	0.0035	2.99E-07	2.88E-05	8.28E-05	**5.32**	0.0078
Zinc	66.1	5.70E-10	1.85E-08	1.72E-07	3.23E-05	1.33E-04	2.35E-04	9.43E-07	1.21E-04	3.63E-04	**0.55**	**0.41**
Aroclor-1254	0.0296	3.35E-10	2.77E-09	8.58E-08	3.91E-06	6.29E-05	1.22E-04	1.47E-08	1.21E-05	3.16E-05	na*	0.00019
Adjusted HIs		3E-09	8E-07	4E-06	0.002	0.003	0.005	0.00001	0.0005	0.001	**6**	1

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.
* na = Not available.

Table G-5.4-9
PAUFs for Ecological Receptors at SWMU 01-006(b)

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.0000035
American Robin	0.42	16.8	0.00089
Deer Mouse	0.077	3	0.005
Desert Cottontail	3.1	124	0.00012
Montane Shrew	0.39	15.6	0.00096
Red Fox	1038	41,520	0.00000036

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).
[b] PAUF is calculated as the area of the site (0.015 ha) divided by the population area.

Table G-5.4-10
Adjusted HIs for SWMU 01-006(b)

COPECs	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Cyanide (Total)	0.62	7.92E-11	3.68E-06	5.43E-06	0.0055	0.0055	0.0055	1.13E-07	1.92E-06	9.00E-06	na*	na
Lead	21.2	2.05E-09	1.19E-07	7.70E-07	8.99E-04	0.0012	0.0013	7.68E-06	2.78E-04	9.00E-04	0.012	0.18
Nickel	8.4	2.52E-09	1.30E-08	2.45E-07	4.72E-05	1.96E-04	3.56E-04	2.28E-06	8.35E-04	0.0021	0.03	0.22
Selenium	0.51(U)	2.05E-09	2.21E-08	4.20E-07	4.54E-04	5.25E-04	6.05E-04	3.24E-05	7.39E-04	0.0031	0.12	**0.98**
Aroclor-1254	0.037	2.27E-09	1.82E-08	5.95E-07	2.49E-05	4.09E-04	8.01E-04	9.60E-08	8.06E-04	2.10E-04	na	0.00023
Adjusted HIs		9E-09	4E-06	7E-06	0.007	0.008	0.009	4E-05	0.003	0.006	0.2	1

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.
* na = Not available.

Table G-5.4-11
PAUFs for Ecological Receptors at SWMU 01-006(c)

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.000000024
American Robin	0.42	16.8	0.000006
Deer Mouse	0.077	3	0.000033
Desert Cottontail	3.1	124	0.00000081
Montane Shrew	0.39	15.6	0.0000064
Red Fox	1038	41,520	0.0000000024

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).
[b] PAUF is calculated as the area of the site (0.0001 ha) divided by the population area.

Table G-5.4-12
Adjusted HIs for SWMU 01-006(c)

COPECs	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Barium	172	1.01E-11	1.46E-10	4.80E-10	1.26E-06	1.08E-06	1.02E-06	4.78E-08	8.32E-07	3.17E-06	**0.52**	**1.56**
Chromium (Total)	29.2	3.84E-11	6.96E-10	3.60E-09	2.58E-06	4.38E-06	6.24E-06	8.10E-09	4.16E-06	8.91E-06	na*	na
Lead	67.9	4.32E-11	2.64E-09	1.70E-08	1.94E-05	2.54E-05	2.91E-05	1.70E-07	6.02E-06	1.88E-05	0.04	**0.57**
Nickel	15.8	3.12E-11	1.66E-10	3.12E-09	5.94E-07	2.52E-06	4.50E-06	2.92E-08	1.04E-05	2.61E-05	0.056	**0.42**
Selenium	2.6(U)	5.80E-11	7.68E-10	1.44E-07	1.56E-05	1.79E-05	2.08E-05	1.11E-06	2.52E-05	1.03E-04	**0.63**	**5**
Zinc	76.7	2.35E-11	7.68E-10	7.44E-09	1.32E-06	5.40E-07	9.60E-06	3.89E-08	4.99E-06	1.49E-05	**0.64**	**0.48**
Adjusted HIs		2E-10	5E-09	1E-07	0.00004	0.00005	0.00007	1E-06	0.00005	0.0002	**2**	**8**

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.
* na = Not available.

Table G-5.4-13
PAUFs for Ecological Receptors at SWMU 01-006(n)

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.0000061
American Robin	0.42	16.8	0.0015
Deer Mouse	0.077	3	0.0087
Desert Cottontail	3.1	124	0.00021
Montane Shrew	0.39	15.6	0.0017
Red Fox	1038	41,520	0.00000063

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).

[b] PAUF is calculated as the area of the site (0.026 ha) divided by the population area.

Table G-5.4-14
Adjusted HIs for SWMU 01-006(n)

COPECs	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Lead	44.1	7.56E-09	4.27E-07	2.81E-06	0.0032	0.0041	0.0047	2.73E-05	0.001	0.0032	0.026	**0.37**
Mercury	0.555	5.73E-09	1.17E-05	5.13E-05	0.012	0.038	0.064	5.88E-06	5.61E-04	0.0017	**11.1**	0.016
Selenium	0.56(U)	3.91E-09	4.21E-08	7.93E-07	8.40E-04	9.60E-04	0.0011	6.09E-05	0.0014	0.0058	0.14	**1.08**
Aroclor-1260	0.52	2.33E-08	7.93E-09	6.71E-07	1.65E-05	4.65E-04	8.85E-04	4.20E-08	8.84E-05	2.26E-04	na*	na
Bis(2-ethylhexyl)phthalate	0.67	1.26E-09	5.06E-07	4.09E-05	5.10E-05	0.025	0.05	5.88E-08	0.0019	0.0053	na	na
Adjusted HIs		4E-08	0.00001	0.0001	0.02	0.07	0.1	0.00009	0.005	0.02	**11**	1

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.
* na = Not available.

Table G-5.4-15
PAUFs for Ecological Receptors at SWMU 01-007(a)

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.00011
American Robin	0.42	16.8	0.029
Deer Mouse	0.077	3	0.16
Desert Cottontail	3.1	124	0.0039
Montane Shrew	0.39	15.6	0.031
Red Fox	1038	41,520	0.000012

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).
[b] PAUF is calculated as the area of the site (0.48 ha) divided by the population area.

Table G-5.4-16
Adjusted HIs for SWMU 01-007(a)

COPECs	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Beryllium	1.46	4.20E-08	na*	na	na	na	na	3.78E-05	0.0025	0.0041	0.037	**0.58**
Chromium (Total)	15.9	1.06E-07	1.76E-06	8.80E-06	0.0067	0.012	0.017	8.19E-05	0.011	0.022	na	na
Mercury	0.11	2.16E-08	4.18E-05	1.84E-04	0.046	0.15	0.25	2.15E-05	0.002	0.0059	**2.2**	0.0032
Nickel	12.8	1.20E-07	6.16E-07	1.21E-05	0.0023	0.0099	0.018	1.13E-04	0.041	0.1	0.046	**0.34**
Selenium	0.33	4.44E-08	4.51E-07	8.47E-06	0.0096	0.011	0.013	6.63E-04	0.016	0.064	0.08	**0.63**
Zinc	43.2	6.60E-08	1.98E-06	1.87E-05	0.0035	0.015	0.026	1.05E-04	0.014	0.04	**0.36**	0.27
Bis(2-ethylhexyl)phthalate	0.675	2.16E-08	9.13E-06	7.43E-04	9.86E-04	**0.49**	**0.98**	1.09E-06	0.035	0.098	na	na
Adjusted HIs		4E-07	6E-05	0.0001	0.07	0.7	1	0.0009	0.1	0.3	**3**	**2**

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.
* na = Not available.

Table G-5.4-17
PAUFs for Ecological Receptors at SWMU 01-007(b)

Receptor	HR[a] (ha)	Population Area (ha)	PAUF[b]
American Kestrel	106	4240	0.00011
American Robin	0.42	16.8	0.027
Deer Mouse	0.077	3	0.15
Desert Cottontail	3.1	124	0.0037
Montane Shrew	0.39	15.6	0.029
Red Fox	1038	41,520	0.000011

[a] Values from EPA (1993, 059384) and LANL (2015, 600982).

[b] PAUF is calculated as the area of the site (0.46 ha) divided by the population area.

Table G-5.4-18
Adjusted HIs for SWMU 01-007(b)

COPECs	EPC (mg/kg)	Red Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Desert Cottontail (mammalian herbivore)	Montane shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Chromium (Total)	14.2	8.69E-08	1.54E-06	7.81E-06	0.0057	0.0097	0.014	7.03E-05	0.0092	0.02	na*	na
Nickle	5.59	5.17E-08	2.64E-07	5.17E-06	9.45E-04	0.0041	0.0073	4.81E-05	0.017	0.042	0.02	0.15
Selenium	0.385	4.73E-08	5.28E-07	1.08E-05	0.011	0.012	0.014	7.40E-04	0.017	0.069	0.094	**0.74**
Bis(2-ethylhexyl)phthalate	0.055	1.54E-09	7.48E-07	6.05E-05	7.29E-05	0.037	0.074	8.51E-08	0.0027	0.0075	na	na
Di-n-butylphthalate	0.036	8.25E-12	2.31E-06	6.71E-05	0.0025	0.046	0.088	9.62E-09	5.80E-06	1.44E-05	na	0.00023
Adjusted HIs		2E-07	5E-06	0.0002	0.02	0.1	0.2	0.0009	0.05	0.1	0.1	0.9

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.
* na = Not available.

Table G-5.4-19
LOAEL-Based ESLs for Terrestrial Receptors

COPEC	Receptor	LOAEL–Based ESL* (mg/kg)
Barium	Earthworm	3200
	Plant	260
Beryllium	Plant	25
Lead	Plant	570
Mercury	Earthworm	0.5
Nickel	Plant	270
Selenium	Earthworm	41
	Plant	3
Zinc	Earthworm	930
	Plant	810
Bis(2-ethylhexyl)phthalate	Robin – insectivore	0.2

* LOAEL-based ESLs from ECORISK Database, Version 3.3 (LANL 2015, 600921).

Table G-5.4-20
HI Analysis Using LOAEL-Based ESLs at SWMU 01-001(d1)

COPEC	EPC (mg/kg)	Earthworm	Plant
Mercury	1.4	**2.8**	n/a*
Selenium	1.05	n/a	**0.35**
	HI	**3**	0.4

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1.
* n/a = Not applicable.

Table G-5.4-21
HI Analysis Using LOAEL-Based ESLs at AOC 01-003(b1)

COPEC	EPC (mg/kg)	Earthworm	Plant
Lead	105	n/a*	0.18
Mercury	0.266	**0.53**	n/a
Zinc	66.1	0.071	0.082
	HI	0.6	0.3

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1.
* n/a = Not applicable.

Table G-5.4-22
HI Analysis Using LOAEL-Based ESLs at SWMU 01-006(b)

COPEC	EPC (mg/kg)	Plant
Selenium	0.51(U)	0.17
	HI	0.2

Note: Data qualifiers are defined in Appendix A.

Table G-5.4-23
HI Analysis Using LOAEL-Based ESLs at SWMU 01-006(c)

COPEC	EPC (mg/kg)	Earthworm	Plant
Barium	172	0.054	**0.66**
Lead	67.9	n/a*	0.12
Nickel	15.8	n/a	0.059
Selenium	2.6(U)	0.063	**0.87**
Zinc	76.7	0.082	0.095
	HI	0.2	**2**

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.

* n/a = Not applicable.

Table G-5.4-24
HI Analysis Using LOAEL-Based ESLs at SWMU 01-006(n)

COPEC	EPC (mg/kg)	Earthworm	Plant
Lead	44.1	n/a*	0.077
Mercury	0.555	**1.11**	n/a
Selenium	0.56(U)	n/a	0.19
	HI	1	0.3

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1. Data qualifiers are defined in Appendix A.

* n/a = Not applicable.

Table G-5.4-25
HI Analysis Using LOAEL-Based ESLs at SWMU 01-007(a)

COPEC	EPC (mg/kg)	Robin (insectivore)	Earthworm	Plant
Beryllium	1.46	na[a]	n/a[b]	0.058
Mercury	0.11	n/a	0.22	n/a
Nickel	12.8	n/a	n/a	0.047
Selenium	0.33	n/a	n/a	0.11
Zinc	43.2	n/a	0.046	n/a
Bis(2-ethylhexyl)phthalate	0.675	**3.39**	na	na
	HI	**3**	0.3	0.2

Notes: Bolded values indicate HQ greater than 0.3 or HI greater than 1.

[a] na = Not available.

[b] n/a = Not applicable.

Table G-5.4-26
Adjusted HI Analysis Using LOAEL-Based ESLs at SWMU 01-007(a)

COPEC	EPC (mg/kg)	Robin (insectivore)
Bis(2-ethylhexyl)phthalate	0.675	0.098
	HI	0.1

Attachment G-1

ProUCL Files
(on CD included with this document)

Attachment G-2

Vapor Intrusion Spreadsheets
(on CD included with this document)

Attachment G-3

As Low as Reasonably Achievable Analyses
for Sites within the Former Los Alamos Inn Property

An as low as reasonably achievable (ALARA) analysis is generally used to assess the balance between remediation cost and dose reduction among competing alternatives. The dose calculations assume that the top 10 ft represents the surface soil upon which residents live (residential scenario). Dose calculations are based on 95% upper confidence limits and consider all radionuclides detected, though cleanup analysis focuses on residual plutonium-239/240.

Residential Scenario

Calculate Number of Persons Potentially Residing on Tract:

http://quickfacts.census.gov/qfd/states/35/35028.html: persons/mi^2 in Los Alamos County–168.2 (0.65 persons/ha)

Estimated areas = 0.0028 ha [Area of Concern (AOC) 01-003(b1)]; 0.015 ha [Solid Waste Management Unit (SWMU) 01-006(b)]; 0.48 ha [SWMU 01-007(a)]

Total number of persons potentially residing on tract: 0.65 persons/ha × 0.48 ha <1 person, but assume one residence on the plot with a family of four.

Calculate Collective Dose Reduction:

Use individual dose rate calculated for chemicals of potential concern (residential scenario): 4.4 mrem/yr at AOC 01-003(b1); 3.8 mrem/yr at SWMU 01-006(b); 3.3 mrem/yr at SWMU 01-007(a).

For cleanup of site to < 3 mrem/yr: Dose reduction = 4.4 mrem/yr – 3 mrem/yr = 1.4 mrem/yr (0.0014 rem/yr) at AOC 01-003(b1); 3.8 mrem/yr – 3 mrem/yr = 0.8 mrem/yr (0.0008 rem/yr) at SWMU 01-006(b); 3.3 mrem/yr – 3 mrem/yr = 0.3 mrem/yr (0.0003 rem/yr) at SWMU 01-007(a)

Cumulative Dose Saved:

Assume that collective dose integration period is 200 yr (refer to U.S. Department of Energy [DOE] ALARA Standard, Vol. 2, p. E-20)

For cleanup of site to <3 mrem/yr: 0.0014 rem/yr × 200 yr × 4 persons = 1.12 person-rem [AOC 01-003(b1)]; 0.0008 × 200 yr × 4 persons = 0.64 person-rem [SWMU 01-006(b)]; 0.0003 × 200 yr × 4 persons = 0.24 person-rem [SWMU 01-007(a)]

Estimated Costs for Dose Reduction:

Assume $2000 per person-rem as nominal value recommended in DOE ALARA standard.

For cleanup of site to < 3 mrem/yr: 1.12 person-rem × $2000/person-rem = **$2240**; [AOC 01-003(b1)]; 0.64 person-rem × $2000/person-rem = **$1280** [SWMU 01-006(b)]; 0.24 person-rem × $2000/person-rem = **$480** [SWMU 01-007(a)]

Estimated Costs for Remediation:

Remediation to reduce dose to < 3 mrem/yr based on removing soil with > 20 pCi/g plutonium-239/240 from 0.0 to 10.0 ft below ground surface (bgs) at each site.

Residential: Cleanup of sites to < 3 mrem/yr

Transportation/disposal of low-level waste (LLW) per contract ($800.45/yd^3)

Excavation and containerization of fill/soil/sediment per contract ($3132/$yd^3$)

Sample analysis per analytical statement of work (isotopic plutonium) = $110/sample

Soil volumes excavated estimated as follows:

AOC 01-003(b1) – One location excavated to 4.0 ft bgs (area excavated assumed to be 2 ft × 2 ft × 4 ft = 16 ft^3 or 0.6 yd^3)

SWMU 01-006(b) – Two locations to 9.0 ft bgs and 3.0 ft bgs, respectively (areas excavated assumed to be 2 ft × 2 ft × 9 ft = 36 ft^3 or 1.33 yd^3 and 2 ft × 2 ft × 3 ft = 12 ft^3 or 0.44 yd^3 = total of 1.8 yd^3)

SWMU 01-007(a) – Four locations to 4.0 ft bgs (three locations) and 1.0 ft bgs (one location) (three areas excavated assumed to be 2 ft × 2 ft × 4 ft = 16 ft^3 or 0.6 yd^3 × 3 = 1.8 yd^3 and one area excavated assumed to be 2 ft × 2 ft × 1 ft = 4 ft^3 or 0.15 yd^3 = total of 1.9 yd^3)

AOC 01-003(b1)

Transportation/disposal of LLW = $800.45 × 0.6 yd^3 = $480

Excavation and containerization of fill/soil/sediment = $3132 × 0.6 yd^3 = $1879

Sample analysis = $110 × 16 samples = $1760

Estimated Total Cost of Cleanup = Labor + transport/disposal + sample analysis = $480 + $1879 + $1760 = **$4119**

SWMU 01-006(b)

Transportation/disposal of LLW = $800.45 × 1.8 yd^3 = $1441

Excavation and containerization of fill/soil/sediment = $3132 × 1.8 yd^3 = $5638

Sample analysis = $110 × 20 samples = $2200

Estimated Total Cost of Cleanup = Labor + transport/disposal + sample analysis = $1441 + $5638 + $2200 = **$9279**

SWMU 01-007(a)

Transportation/disposal of LLW = $800.45 × 1.9 yd^3 = $1521

Excavation and containerization of fill/soil/sediment = $3132 × 1.9 yd^3 = $5951

Sample analysis = $110 × 39 samples = $4290

Estimated Total Cost of Cleanup = Labor + transport/disposal + sample analysis = $1521 + $5951 + $4290 = **$11,762**

Conclusion: The cost of cleanup at each site is greater than the benefit derived from dose reduction.

Attachment G-4

Ecological Scoping Checklists for
Former Los Alamos Inn Property Sites

PART A—SCOPING MEETING DOCUMENTATION

Site ID	Solid Waste Management Units (SWMUs) 01-001(d1), 01-001(s1), 01-002(a1)-00, and 01-006(h1)
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.	SWMU 01-001(d1) consists of the sanitary waste line within the Los Alamos (LA) Inn property leading to septic tank 138. Currently, the location of the waste line is on privately owned and commercially developed land with buildings and an asphalt parking lot. SWMU 01-001(s1) consists of the portion of the western sanitary waste line located within the LA Inn property on the mesa top. Currently, the area has been developed and the line is under an asphalt parking lot. SWMU 01-002(a1)-00 consists of the portion of the industrial waste line located within the LA Inn property on the mesa top. Chemical and radioactive process wastes passed through this section of pipe en route to discharge in Acid Canyon. Currently, the area has been developed and the line is under an asphalt parking lot. SWMU 01-006(h1) consists of the storm water drainage system within the LA Inn property boundary on the mesa top. The system served the northwest side of former building R (model, glass, carpentry, and plumbing shops) and the east side of former building Y (physics laboratory). The location of the storm water drainage system is on privately owned and commercially developed land.
List of Primary Impacted Media **(Indicate all that apply.)**	**Surface soil – X** **Surface water/sediment –** **Subsurface – X** **Groundwater –** **Other, explain –**
Vegetation class based on GIS vegetation coverage **(Indicate all that apply.)**	**Water** – **Bare Ground/Unvegetated** – **X** **Spruce/fir/aspen/mixed conifer** – **Ponderosa pine –** **Piñon juniper/juniper savannah** – **X** **Grassland/shrubland** – **Developed** – **X** **Burned –**
Is T&E Habitat Present? **If applicable, list species known or suspected of using the site for breeding or foraging.**	No threatened or endangered (T&E) species habitat is present. The area is developed.
Provide list, of Neighboring/ Contiguous/ Upgradient sites, includes a brief summary of COPCs and the form of releases for relevant sites and reference a map as appropriate. **(Use this information to evaluate the need to aggregate sites for screening.)**	The sites are partially within the former LA Inn property with the remainder of the original sites extending beyond the boundaries onto private or U.S. Department of Energy (DOE) land. In addition, other SWMUs and areas of concern (AOCs) are present within the property but do not affect these sites.
Surface Water Erosion Potential **Indicate if erosion is present and type; terminal point of surface water transport; slope; and surface water run-on sources.**	The terminal point of surface water transport is Los Alamos Canyon. The mesa-top area is flat (<10% slope) and partially or wholly covered with asphalt. Erosion is not apparent on the mesa top.

PART B—SITE VISIT DOCUMENTATION

Site ID	SWMUs 01-001(d1), 01-001(s1), 01-002(a1)-00, and 01-006(h1)
Date of Site Visit	08/08/2016
Site Visit Conducted by	Richard Mirenda and Todd Haagenstad

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none)** = low **Relative wetland cover (high, medium, low, none)** = none **Relative structures/asphalt, etc., cover (high, medium, low, none)** = high
Field notes on the GIS vegetation class to assist in verifying the Arcview information	The area is commercially developed with large amounts of asphalt and includes parking areas, structures, buildings, and roads. There is some landscaping with grass and trees present.
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 area on the mesa top is commercially developed and does not provide good quality habitat for ecological receptors. Some small mammals and birds are probably present despite the limitations, and some areas are landscaped and provide grass and trees.

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 mesa-top ground surface is typically flat (<10% slope) and the area is commercially developed. The asphalt and structural cover contribute to stabilization of the surface media, resulting in a low potential for erosion and surface-water infiltration. Runoff moves as sheet flow onto the bench below and into the canyon. The terminal point of surface water transport is Los Alamos Canyon.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	Yes. There is potential for surface-water transport. It is unlikely contaminants will be transported as fugitive dust because most of the area is paved and contains structures. No potential for groundwater contamination exists because the depth to groundwater is greater than 1000 ft below ground surface (bgs).

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities, review historical aerial photos where appropriate.)**	The areas in and around the sites are disturbed and developed. Large portions of the surrounding area are covered with asphalt and structures.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	Effects are the result of the physical disturbances and commercial development of the mesa top.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature and extent of contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if the maximum value was captured by existing sample data.)**	Yes. Investigations have defined the nature and extent of contamination for the sites. Additional sampling and analyses are not necessary.
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 be aggregated to characterize potential ecological risk.)**	Yes. The data addresses the potential transport pathways.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors onsite and no transport pathways to off-site 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 the likelihood that future construction activities could make contamination more available for exposure or transport. Not applicable.

PART C—ECOLOGICAL PATHWAYS CONCEPTUAL EXPOSURE MODEL

Provide answers to Questions A to V to develop the Ecological Pathways Conceptual Exposure Model

Question A:

Could soil contaminants reach receptors through vapors?

- Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant >10^{-5} atm-m^3/mol and molecular weight <200 g/mol).

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: The lines have been removed and a source no longer exists. Only a few volatile organic compounds (VOCs) were detected at trace concentrations (below the estimated quantitation limits).

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 the burrows occur.

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Large portions of the surrounding area are covered with asphalt and structures.

Question C:

Can contaminated soil be transported to aquatic ecological communities?

- 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: No aquatic communities exist at the sites or on the canyon slope.

Question D:

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

- **The potential exists for contaminants to migrate through 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.**
- **Terrestrial wildlife receptors generally will not come in contact with groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No seeps, springs, or perched groundwater is present on or near the sites. The depth of groundwater is greater than 1000 ft bgs.

Question E:

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **The potential for contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate to 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.**
- **Terrestrial wildlife receptors generally will not come in contact with groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Contaminants are not likely to migrate to the regional aquifer given the depth to groundwater (greater than 1000 ft bgs). The lack of a significant hydraulic driver (e.g., no standing surface water) facilitating infiltration also mitigates the potential for contaminants to reach 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 applicable only to release sites located on or near the mesa edge.**
- **Consider the potential erosion of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No perched aquifers exist on or near these sites. Erosion potential is low, and no evidence of mass wasting events was found in these areas.

Question G:

Could airborne contaminants interact with receptors through the respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of the inhalation of vapors for burrowing animals.**
- **Foliar uptake of 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 Unlikely Pathway

Terrestrial Animals: 1 Unlikely Pathway

Provide explanation: VOCs are detected infrequently and at very low concentrations. Little evidence of burrowing was observed at the sites.

Question H:

Could airborne contaminants interact with plants through the deposition of particulates or with animals through the inhalation of fugitive dust?

- **For this exposure pathway to be complete, contaminants must be present as particulates in the air or as dust.**
- **Exposure through the 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 Minor Pathway

Terrestrial Animals: 2 Minor Pathway

Provide explanation: Little evidence of burrowing was observed, and the ground is covered with asphalt and structures. Deposition of particulates on plants may be an exposure pathway, but few receptors, including plants, exist on the mesa top.

Question I:

Could contaminants interact with plants through root uptake or rain splash from surficial soil?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants may occur through particulates deposited on leaf and stem surfaces by rain striking contaminated soil (i.e., rain splash).**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2 Minor Pathway

Provide explanation: Chemicals of potential concern (COPCs) were detected at low concentrations in surface soil.

Question J:

Could contaminants interact with receptors through food web transport from surficial soil?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2 Minor Pathway

Provide explanation: COPCs were detected at low concentrations in surface soil.

Question K:

Could contaminants interact with receptors through the incidental ingestion of surficial soil?

- **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 groom themselves.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2 Minor Pathway

Provide explanation: COPCs were detected in surface soil.

Question L:

Could contaminants interact with receptors through dermal contact with surficial soil?

- **Exposure through 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 Minor Pathway

Provide explanation: Lipophilic chemicals were detected at low concentrations at some sites.

Question M:

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation is 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 No Pathway

Terrestrial Animals: 0 No Pathway

Provide explanation: No gamma-emitting radionuclides were detected.

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 sediment (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 No Pathway

Provide explanation: No surface water is present at the sites.

Question O:

Could contaminants interact with receptors through food web transport from water and sediment?

- **The chemicals may bioconcentrate in food.**
- **Animals may ingest contaminated food.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question P:

Could contaminants interact with receptors through the ingestion of water and suspended sediment?

- **If sediment is present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediment.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a source of drinking water.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question Q:

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediment is 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 No Pathway

Provide explanation: No surface water is present at the sites.

Question R:

Could suspended or sediment-based contaminants interact with plants or animals through external irradiation?

- **External irradiation is 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 No Pathway

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question S:

Could contaminants bioconcentrate in free-floating aquatic plants, 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 No Pathway

Provide explanation: No surface water is present at the sites.

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 sediment 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 No Pathway

Provide explanation: No surface water is present at the sites.

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 may result in 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 No Pathway

Provide explanation: No surface water is present at the sites.

Question V:

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation is most relevant for gamma-emitting radionuclides.**
- **The water column acts to absorb radiation; therefore, 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):

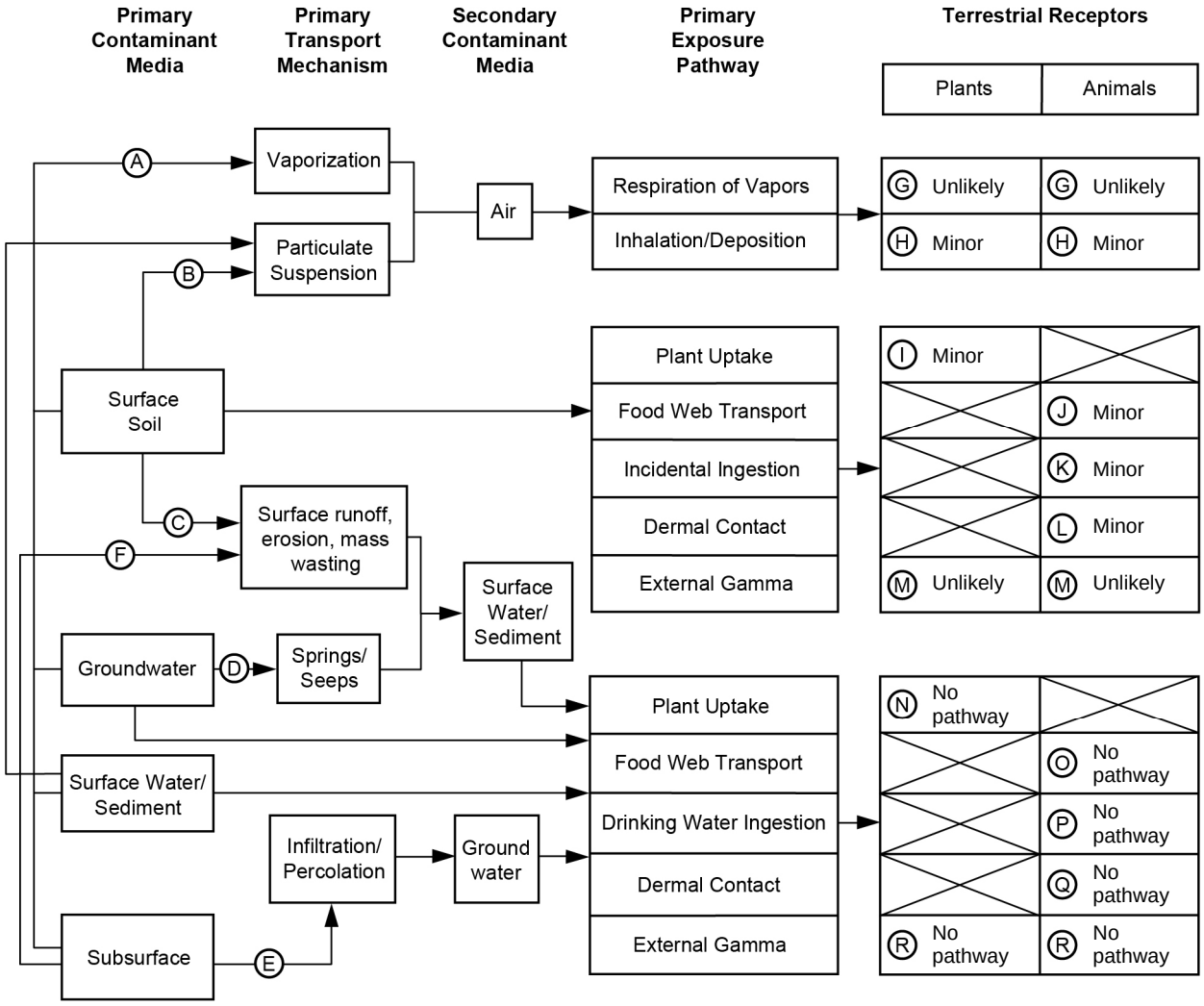
Aquatic Plants: 0 No Pathway

Aquatic Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

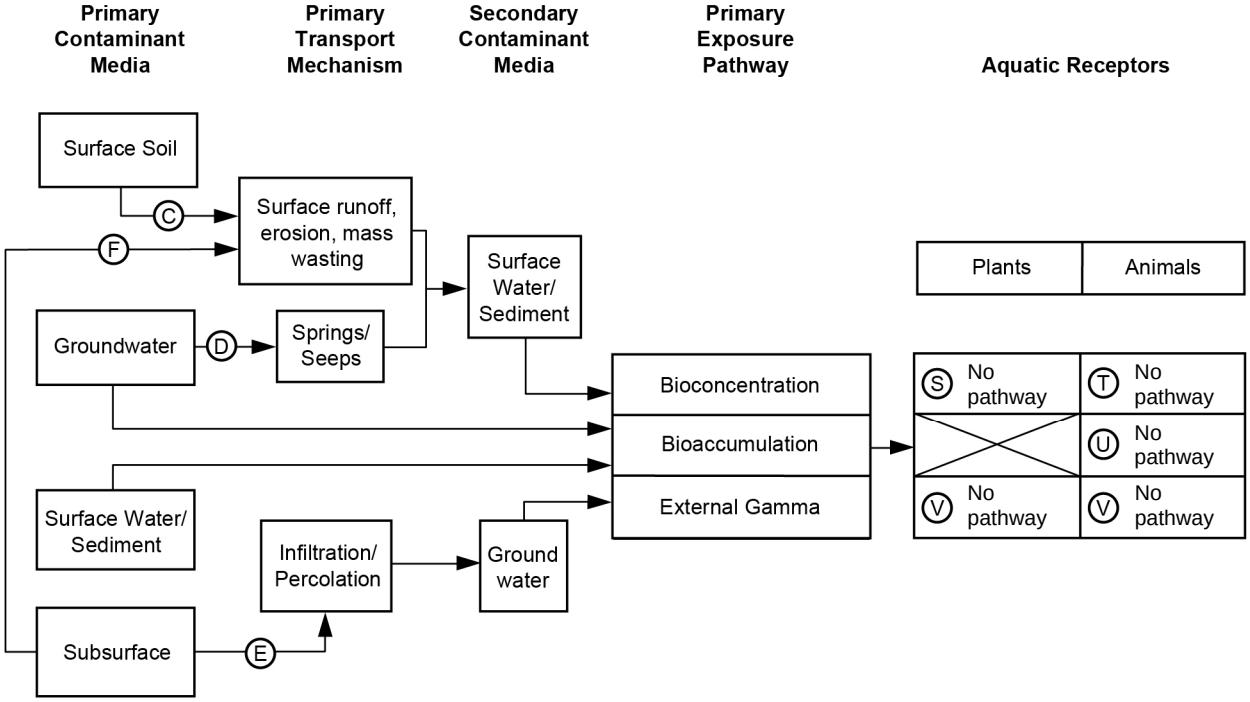
Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the scoping checklist.



Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the scoping checklist.



SIGNATURES AND CERTIFICATIONS:

Checklist Completed by:

Name (printed): Richard Mirenda
Name (signature): Richard Mirenda
Organization: Los Alamos National Laboratory
Date completed: 8/23/16

Checklist Reviewed by:

Name (printed): Tracy McFarland
Name (signature): Tracy McFarland
Organization: Los Alamos National Laboratory
Date Reviewed 12/15/16

PART A—SCOPING MEETING DOCUMENTATION

Site Identification	SWMUs 01-006(b), 01-006(c), 01-006(n)
Form of Site Releases (Solid, Liquid, Vapor) **Describe known or suspected mechanisms of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential areas of release. Reference map if appropriate.**	SWMU 01-006(b) consists of a drainline and outfall that served former building D, which was used to process plutonium. During the excavation of the areas in and around former buildings D and D-2, all drainlines were removed along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). Currently, the area is undeveloped. SWMU 01-006(c) consists of possibly four drainlines and two outfalls that served former building D-2, which served as the facility for laundering radioactively contaminated clothing and recyclable equipment for the entire technical area (TA) from 1943 to 1945. The two drainlines and outfall at the southeast end of the former building were indicated on engineering drawings but were not located. The two drainlines and outfall at the southwest end of the building were encountered during trenching and were removed (Ahlquist et al. 1977, 005710, p. 49). Currently, the site has been covered with fill material and is undeveloped. SWMU 01-006(n) is the storm water drainage system that served former building D, which was used to process plutonium. During the excavation of the buildings D and D-2 areas, all drainlines were removed, along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). Currently, the site is under a paved parking lot.
Directly Impacted Media **Indicate all that apply.**	**Surface soil** – **X** **Surface water/sediment** – **Subsurface** – **X** **Groundwater** – **Other, explain** –
Vegetation Class Based on Geographic Information System (GIS) Vegetation Coverage **Indicate all that apply.**	**Water** – **Bare Ground/Unvegetated** – **X** **Spruce/fir/aspen/mixed conifer** – **Ponderosa pine** – **Piñon juniper/juniper savannah** – **Grassland/shrubland** – **X** **Developed** – **X** **Burned** –
Threatened and Endangered Species Habitat **If applicable, list threatened and endangered species known or suspected of using the site for breeding or foraging.**	A portion of the area is developed and provides no T&E habitat. The only T&E species that could frequent the area is the Mexican spotted owl. The owl's primary habitat is densely forested canyons, and it may use the area below the mesa top for foraging.
Neighboring/Contiguous/Upgradient Sites **Include a summary of chemicals of potential concern and the type of releases if impacting site.**	SWMUs are partially or wholly within the former LA Inn property with the portions extending beyond the boundaries onto DOE land. In addition, other SWMUs are present within the property but do not have any influence on these sites.
Surface Water Erosion Potential **Indicate if erosion is present and type; terminal point of surface water transport; slope; and surface water run-on sources.**	The terminal point of surface water transport is Los Alamos Canyon. The mesa-top ground surface is typically flat (<10% slope) and the area is commercially developed. The bench area has a steep slope with the potential for erosion and the canyon slope is well vegetated. Best management practices (BMPs) have been put in place, and the bench slope has been hydroseeded following recent field activities.

PART B—SITE VISIT DOCUMENTATION

Site ID	SWMUs 01-006(b), 01-006(c), 01-006(n)
Date of Site Visit	08/08/2016
Site Visit Conducted by	Richard Mirenda and Todd Haagenstad

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none)** = low to high **Relative wetland cover (high, medium, low, none)** = none **Relative structures/asphalt, etc., cover (high, medium, low, none)** = low to high
Field notes on the GIS vegetation class	The mesa top area is commercially developed with large areas of asphalt and includes parking areas, structures, buildings, and roads. The bench area is sparsely vegetated and the canyon slope is vegetated with grasses, shrubs, and trees.
Are ecological receptors present at the site? **(yes/no/uncertain)** **Describe the general types of receptors present at the site (terrestrial and aquatic), and note the quality of habitat present at the site.**	Yes. The areas have terrestrial biota such as small mammals, insects, birds, and plants. The bench and canyon habitat quality is good and provides habitat to support plant and animal populations. No aquatic communities exist.

Contaminant Transport Information:

Surface Water Transport **Field notes on the erosion potential and BMPs, including a discussion of the terminal point of surface water transport (if applicable).**	The mesa-top ground surface is typically flat (<10% slope) and the area is commercially developed. The asphalt and structural cover contribute to stabilization of the surface media, resulting in a low potential for erosion and surface-water infiltration. The bench area has a high potential for surface-water transport along the mesa edge and canyon slope. Runoff moves as sheet flow or in drainage channels into the canyon. BMPs have been put in place and the slope has been hydroseeded following recent field activities. The terminal point of surface water transport is Los Alamos Canyon.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	Yes. There is potential for surface-water transport. BMPs have been put in place, and the slope has been hydroseeded following recent field activities. There is also the potential for contaminants to be transported as fugitive dust because the areas have been disturbed by recent field activities. In time, the areas will be revegetated and this pathway will become less likely. No potential for groundwater contamination exists because the depth to groundwater is greater than 1000 ft bgs.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities; review historical aerial photos where appropriate.)**	The areas in and around the sites are disturbed and/or developed. Large portions of the surrounding area are covered with asphalt or structures. The areas have been disturbed by recent field activities, which may increase erosion potential. BMPs have been put in place and the slope has been hydroseeded following recent field activities.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	Effects are the result of the physical disturbances from recent field activities and commercial development of the area.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature and extent of contamination? **(yes/no/uncertain)** **Provide explanation**	Yes. Investigations have defined the nature and extent of contamination for the sites. Additional sampling and analyses are not necessary.
Do existing or proposed data for the site address potential transport pathways of site contamination? **(yes/no/uncertain)** **Provide explanation**	Yes. The data addresses the potential transport pathways.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors on-site and no transport pathways to off-site receptors, do not complete Part C. Provide explanation/justification for proposing an ecological "No Further Action" recommendation.
Not applicable.

PART C—ECOLOGICAL PATHWAYS CONCEPTUAL EXPOSURE MODEL

Provide answers to Questions A to V to develop the Ecological Pathways Conceptual Exposure Models (use to complete figures at end of Part C).

Question A:

Could soil contaminants reach receptors through vapors?

- **Determine the volatility of the hazardous substance (volatile chemicals generally have Henry's law constant >1E-05 atm-m^3/mol and molecular weight <200 g/mol).**
- **In the case of burrowing animals, the contamination would have to occur in the depth interval where burrows are present (near surface to 5 ft below ground surface).**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: VOCs were detected in only one to four samples at very low concentrations (less than 0.01 mg/kg).

Question B:

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual soil surface 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 the burrows occur.**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: The mesa top area is developed and covered with asphalt and structures. Also, little evidence of burrowing was observed at the sites. However, because of recent field activities, the vegetative cover has been removed from the bench area and slope. BMPs have been put in place and the slope has been hydroseeded following recent field activities.

Question C:

Can contaminated soil be transported to aquatic communities?

If erosion is an off-site transport pathway, determine the terminal point to see if aquatic receptors could be impacted by contamination from the site.

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No aquatic communities exist at the sites or on the canyon slope.

Question D:

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

- **The potential exists for contaminants to migrate through 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.**
- **Terrestrial wildlife receptors generally will not come in contact with groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No seeps, springs, or perched groundwater is present on or near the sites. The depth of groundwater is greater than 1000 ft bgs.

Question E:

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **The potential for contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate to 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.**
- **Terrestrial wildlife receptors generally will not come in contact with groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Contaminants are not likely to migrate to the regional aquifer given the depth to groundwater (greater than 1000 ft bgs). The lack of a significant hydraulic driver (e.g., no standing surface water) facilitating infiltration also mitigates the potential for contaminants to reach 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 applicable only to release sites located on or near the mesa edge.**
- **Consider the potential erosion of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No perched aquifers exist on or near these sites. Erosion potential is currently high, but BMPs have been put in place and the slope has been hydroseeded following recent field activities. No evidence was found of mass wasting events in these areas.

Question G:

Could airborne contaminants interact with receptors through the respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of the inhalation of vapors for burrowing animals.**
- **Foliar uptake of 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 Unlikely Pathway

Terrestrial Animals: 1 Unlikely Pathway

Provide explanation: VOCs are infrequently detected and detected at very low concentrations. Little evidence of burrowing was observed at the sites.

Question H:

Could airborne contaminants interact with plants through the deposition of particulates or with animals through the inhalation of fugitive dust?

- **For this exposure pathway to be complete, contaminants must be present as particulates in the air or as dust.**
- **Exposure through the 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 Minor Pathway

Terrestrial Animals: 2 Minor Pathway

Provide explanation: Little evidence of burrowing was observed, and the mesa top is covered with asphalt and structures. The bench area is currently devoid of vegetation, but BMPs have been put in place and the slope has been hydroseeded following recent field activities. Deposition of particulates on plants might be an exposure pathway.

Question I:

Could contaminants interact with plants through root uptake or rain splash from surficial soil?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants may occur through particulates deposited on leaf and stem surfaces by rain striking contaminated soil (i.e., rain splash).**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2 Minor Pathway

Provide explanation: COPCs were detected at low concentrations in surface soil.

Question J:

Could contaminants interact with receptors through food web transport from surficial soil?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2 Minor Pathway

Provide explanation: COPCs were detected at low concentrations in surface soil.

Question K:

Could contaminants interact with receptors through the incidental ingestion of surficial soil?

- **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 groom themselves.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2 Minor Pathway

Provide explanation: COPCs were detected in surface soil.

Question L:

Could contaminants interact with receptors through dermal contact with surficial soil?

- **Exposure through 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 Minor Pathway

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 is 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: 1 Unlikely Pathway

Terrestrial Animals: 1 Unlikely Pathway

Provide explanation: No or few gamma-emitting radionuclides were detected.

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 sediment (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 No Pathway

Provide explanation: No surface water is present at the sites.

Question O:

Could contaminants interact with receptors through food web transport from water and sediment?

- **The chemicals may bioconcentrate in food.**
- **Animals may ingest contaminated food.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question P:

Could contaminants interact with receptors through the ingestion of water and suspended sediment?

- **If sediment is present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediment.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a source of drinking water.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question Q:

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediment is 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 No Pathway

Provide explanation: No surface water is present at the sites.

Question R:

Could suspended or sediment-based contaminants interact with plants or animals through external irradiation?

- **External irradiation is 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 No Pathway

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question S:

Could contaminants bioconcentrate in free-floating aquatic plants, 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 No Pathway

Provide explanation: No surface water is present at the sites.

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 sediment 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 No Pathway

Provide explanation: No surface water is present at the sites.

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 may result in 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 No Pathway

Provide explanation: No surface water is present at the sites.

Question V:

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation is most relevant for gamma-emitting radionuclides.**
- **The water column acts to absorb radiation; therefore, 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):

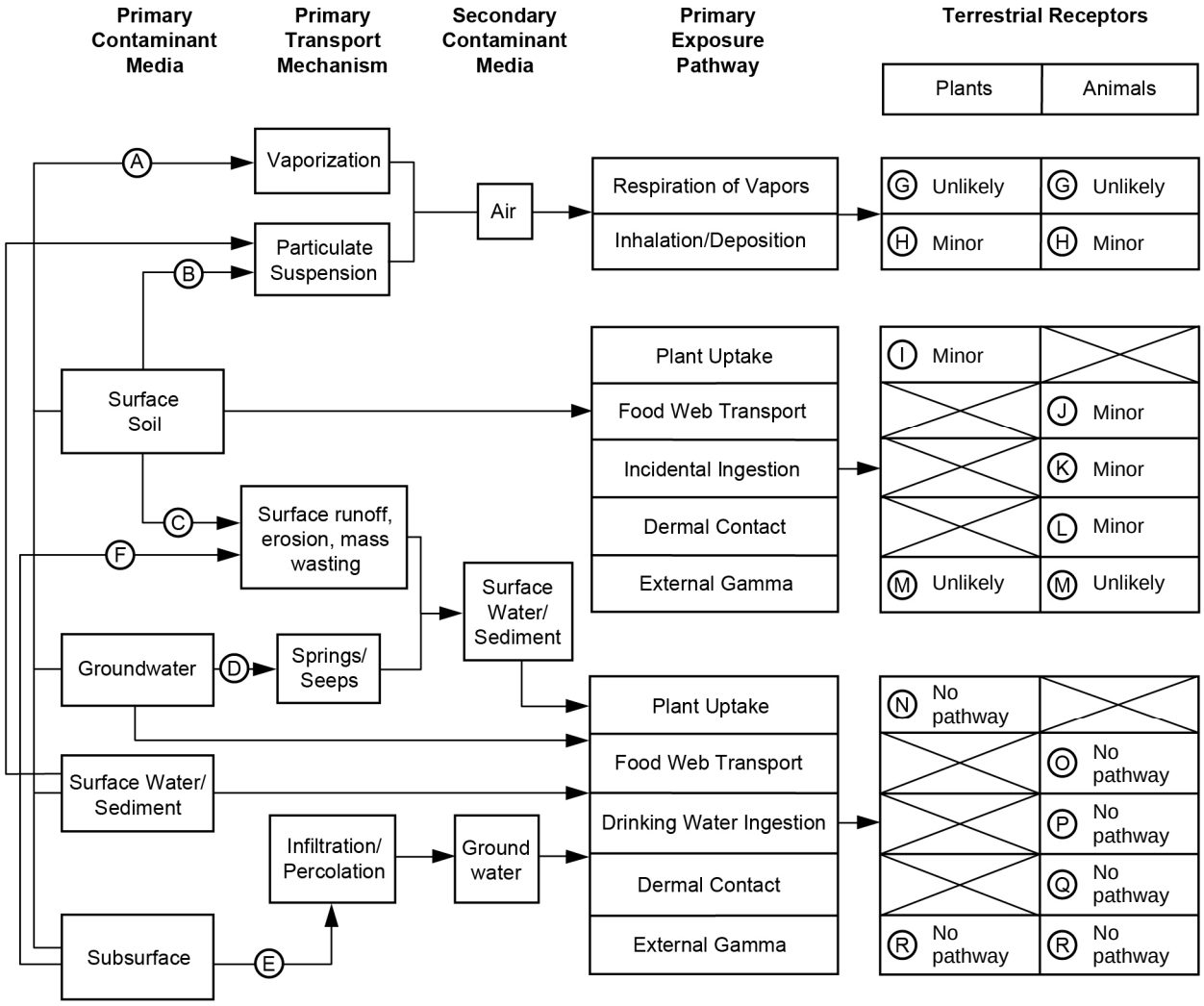
Aquatic Plants: 0 No Pathway

Aquatic Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

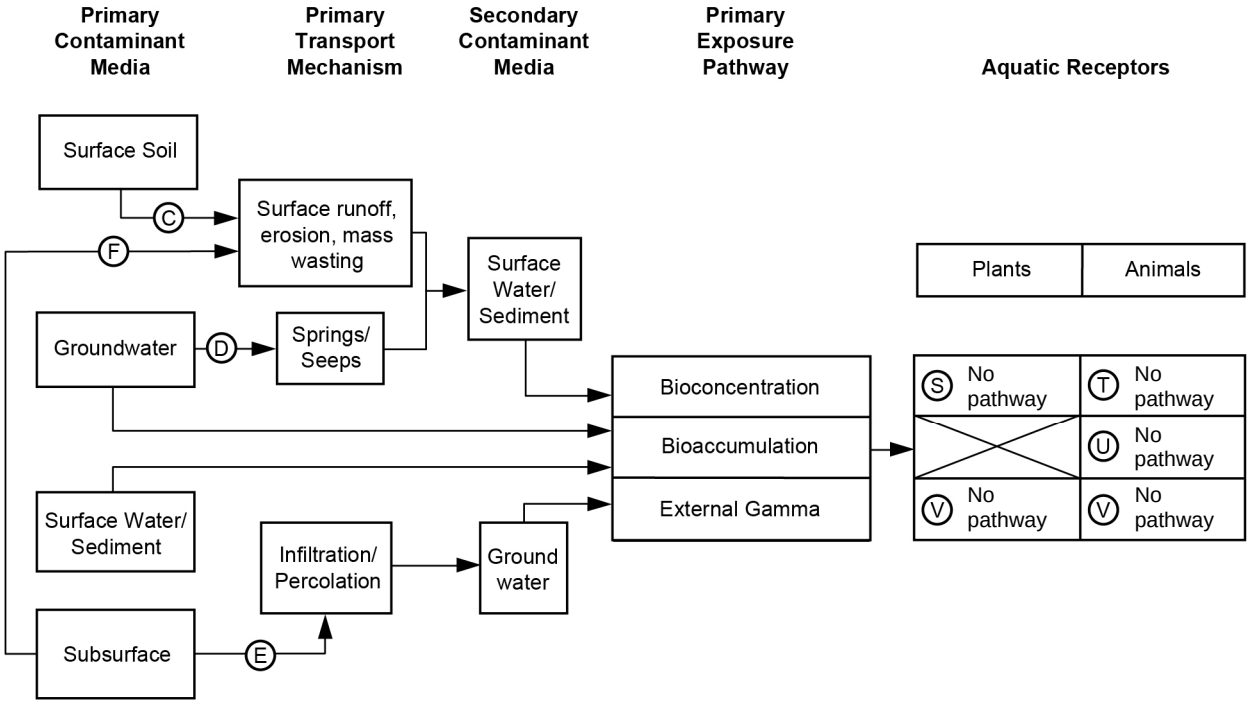
Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the scoping checklist.



Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the scoping checklist.



SIGNATURES AND CERTIFICATIONS:

Checklist Completed by:

Name (printed): Richard Mirenda

Name (signature): Richard Mirenda

Organization: Los Alamos National Laboratory

Date completed: 8/23/16

Checklist Reviewed by:

Name (printed): Tracy McFarland

Name (signature): Tracy McFarland

Organization: Los Alamos National Laboratory

Date Reviewed 12/15/16

PART A—SCOPING MEETING DOCUMENTATION

Site Identification	SWMUs 01-007(a) and 01-007(b)
Form of Site Releases (Solid, Liquid, Vapor) **Describe known or suspected <u>mechanisms</u> of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential <u>areas</u> of release. Reference map if appropriate.**	SWMU 01-007(a) is an area of suspected subsurface soil radiological contamination near former building D, which was used for processing plutonium. During the Ahlquist radiological survey between 1974 and 1976, almost 9000 m^3 of soil was removed from the buildings D and D-2 areas (Ahlquist et al. 1977, 005710, p. 40). Currently, the mesa-top portion of the SWMU area is a parking lot, the bench area has been covered with fill and undeveloped, and the hillside portion is undeveloped. SWMU 01-007(b) is an area of suspected subsurface soil radiological contamination associated with the drainlines and outfalls from building D-2 laundry facility. During the Ahlquist Radiological Survey, almost 9000 m^3 of soil was removed from the buildings D and D-2 areas (Ahlquist et al. 1977, 005710, p. 40). Currently, the mesa-top portion of the site is developed, the bench has been covered with fill material and is undeveloped, and the canyon portion is undeveloped.
Directly Impacted Media **Indicate all that apply.**	**Surface soil** – **X** **Surface water/sediment** **Subsurface** – **X** **Groundwater** **Other, explain**
Vegetation Class Based on Geographic Information System (GIS) Vegetation Coverage **Indicate all that apply.**	**Water** **Bare Ground/Unvegetated** – **X** **Spruce/fir/aspen/mixed conifer** **Ponderosa pine** **Piñon juniper/juniper savannah** **Grassland/shrubland** – **X** **Developed** – **X** **Burned**
Threatened and Endangered Species Habitat **If applicable, list threatened and endangered species known or suspected of using the site for breeding or foraging.**	A portion of the area is developed and provides no T&E habitat. The only T&E species that could frequent the area is the Mexican spotted owl. The owl's primary habitat is densely forested canyons, and it may use the area below the mesa top for foraging.
Neighboring/Contiguous/Upgradient Sites **Include a summary of chemicals of potential concern and the type of releases if impacting site.** **(Use this information to evaluate the need to aggregate sites for scoping and screening.)**	SWMUs are partially within the former LA Inn property with the remainder of the original SWMUs extending beyond the boundaries onto DOE land. In addition, other SWMUs are present within the property but do not have any influence on these sites.
Surface Water Erosion Potential **Indicate if erosion is present and type; terminal point of surface water transport; slope; and surface water run-on sources. Indicate if best management practices (BMPs) are in place or are needed.**	The terminal point of surface water transport is Los Alamos Canyon. The mesa-top areas are flat (<10% slope) and partially or wholly covered with asphalt. Erosion is not apparent on the mesa top. The bench area has a high potential for surface-water transport along the mesa edge and canyon slope and the canyon slope is well vegetated. Runoff moves as sheet flow or in drainage channels into the canyon. BMPs have been put in place and the slope has been hydroseeded following recent field activities.

PART B—SITE VISIT DOCUMENTATION

Site ID	SWMUs 01-007(a) and 01-007(b)
Date of Site Visit	08/08/2016
Site Visit Conducted by	Richard Mirenda and Todd Haagenstad

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none)** = low to high **Relative wetland cover (high, medium, low, none)** = none **Relative structures/asphalt, etc., cover (high, medium, low, none)** = low to high
Field notes on the GIS vegetation class	The mesa top area is commercially developed with large amounts of asphalt and includes parking areas, structures, buildings, and roads. The bench area is sparsely vegetated and the canyon slope is vegetated with grasses, shrubs, and trees.
Are ecological receptors present at the site? **(yes/no/uncertain)** **Describe the general types of receptors present at the site (terrestrial and aquatic), and note the quality of habitat present at the site.**	Yes. The area has terrestrial biota such as small mammals, insects, birds, and plants. The habitat quality is good and provides habitat to support plant and animal populations. No aquatic communities exist.

Contaminant Transport Information:

Surface Water Transport **Field notes on the erosion potential and BMPs, including a discussion of the terminal point of surface water transport (if applicable).**	The mesa-top ground surface is typically flat (<10% slope) and the area is commercially developed. The asphalt and structural cover contribute to stabilization of the surface media, resulting in a low potential for erosion and surface-water infiltration. The bench area has a high potential for surface-water transport along the mesa edge and canyon slope. Runoff moves as sheet flow or in drainage channels into the canyon. BMPs have been put in place and the slope has been hydroseeded following recent field activities. The terminal point of surface water transport is Los Alamos Canyon.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	Yes. There is potential for surface-water transport. BMPs have been put in place and the slope has been hydroseeded following recent field activities. There is also the potential for contaminants to be transported as fugitive dust because the areas have been disturbed by recent field activities. In time, the areas will be revegetated and this pathway will become less likely. No potential for groundwater contamination exist because the depth to groundwater is greater than 1000 ft bgs.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities; review historical aerial photos where appropriate.)**	The areas in and around the sites are disturbed and developed. Large portions of the surrounding area are covered with asphalt or structures. The areas have been disturbed by recent field activities, which might increase erosion potential. BMPs have been put in place and the slope has been hydroseeded following recent field activities.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	Effects are the result of the physical disturbances from recent field activities and commercial development of the area.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature and extent of contamination? **(yes/no/uncertain)** **Provide explanation**	Yes. Investigations have defined the nature and extent of contamination for the sites. Additional sampling and analyses are not necessary.
Do existing or proposed data for the site address potential transport pathways of site contamination? **(yes/no/uncertain)** **Provide explanation**	Yes. The data addresses potential transport pathways.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors on-site and no transport pathways to off-site receptors, do not complete Part C. Provide explanation/justification for proposing an ecological "No Further Action" recommendation.
Not applicable.

PART C—ECOLOGICAL PATHWAYS CONCEPTUAL EXPOSURE MODEL

Provide answers to Questions A to V to develop the Ecological Pathways Conceptual Exposure Models (use to complete figures at end of Part C).

Question A:

Could soil contaminants reach receptors through vapors?

- **Determine the volatility of the hazardous substance (volatile chemicals generally have Henry's law constant >1E-05 atm-m^3/mol and molecular weight <200 g/mol).**
- **In the case of burrowing animals, the contamination would have to occur in the depth interval where burrows are present (near surface to 5 ft below ground surface).**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: VOCs were detected in only one to six samples at very low concentrations (less than 0.01 mg/kg).

Question B:

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual soil surface 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 the burrows occur.**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: The mesa top area is developed and covered with asphalt and structures. Also, little evidence of burrowing was observed at the sites. However, because of recent field activities, the vegetative cover has been removed from the bench area and slope. BMPs have been put in place and the slope has been hydroseeded following recent field activities.

Question C:

Can contaminated soil be transported to aquatic communities?

If erosion is an off-site transport pathway, determine the terminal point to see if aquatic receptors could be impacted by contamination from the site.

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No aquatic ecological communities exist on the sites.

Question D:

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

- **The potential exists for contaminants to migrate through 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.**
- **Terrestrial wildlife receptors generally will not come in contact with groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No seeps, springs, or perched groundwater is present on or near the sites. The depth of groundwater is greater than 1000 ft bgs.

Question E:

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **The potential for contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate to 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.**
- **Terrestrial wildlife receptors generally will not come in contact with groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Contaminants are not likely to migrate to the regional aquifer given the depth to groundwater (greater than 1000 ft bgs). The lack of a significant hydraulic driver (e.g., no standing surface water) facilitating infiltration also mitigates the potential for contaminants to reach 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 applicable only to release sites located on or near the mesa edge.**
- **Consider the potential erosion of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No perched aquifers exist on or near these sites. Erosion potential is currently high, but BMPs have been put in place and the slope has been hydroseeded following recent field activities. No evidence was found of mass wasting events in these areas.

Question G:

Could airborne contaminants interact with receptors through the respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of the inhalation of vapors for burrowing animals.**
- **Foliar uptake of 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 Unlikely Pathway

Terrestrial Animals: 1 Unlikely Pathway

Provide explanation VOCs are infrequently detected and detected at very low concentrations. Little evidence of burrowing was observed at the sites.

Question H:

Could airborne contaminants interact with plants through the deposition of particulates or with animals through the inhalation of fugitive dust?

- **For this exposure pathway to be complete, contaminants must be present as particulates in the air or as dust.**
- **Exposure through the 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 Minor Pathway

Terrestrial Animals: 2 Minor Pathway

Provide explanation: Little evidence of burrowing was observed, and the mesa top is covered with asphalt and structures. The bench area is currently devoid of vegetation, but BMPs have been put in place and the slope has been hydroseeded following recent field activities. Deposition of particulates on plants may be an exposure pathway.

Question I:

Could contaminants interact with plants through root uptake or rain splash from surficial soil?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants may occur through particulates deposited on leaf and stem surfaces by rain striking contaminated soil (i.e., rain splash).**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2 Minor Pathway

Provide explanation: COPCs were detected at low concentrations in surface soil.

Question J:

Could contaminants interact with receptors through food web transport from surficial soil?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2 Minor Pathway

Provide explanation: A few COPCs were detected at low concentrations in surface soil.

Question K:

Could contaminants interact with receptors through the incidental ingestion of surficial soil?

- **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 groom themselves.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2 Minor Pathway

Provide explanation: A few COPCs were detected in surface soil.

Question L:

Could contaminants interact with receptors through dermal contact with surficial soil?

- **Exposure through 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 Minor Pathway

Provide explanation: Lipophilic chemicals were detected at low concentrations.

Question M:

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation is 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 No Pathway

Terrestrial Animals: 0 No Pathway

Provide explanation: No gamma-emitting radionuclides were detected.

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 sediment (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 No Pathway

Provide explanation: No surface water is present at the sites.

Question O:

Could contaminants interact with receptors through food web transport from water and sediment?

- **The chemicals may bioconcentrate in food.**
- **Animals may ingest contaminated food.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question P:

Could contaminants interact with receptors through the ingestion of water and suspended sediment?

- **If sediment is present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediment.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a source of drinking water.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question Q:

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediment is 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 No Pathway

Provide explanation: No surface water is present at the sites.

Question R:

Could suspended or sediment-based contaminants interact with plants or animals through external irradiation?

- **External irradiation is 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 No Pathway

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

Question S:

Could contaminants bioconcentrate in free-floating aquatic plants, 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 No Pathway

Provide explanation: No surface water is present at the sites.

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 sediment 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 No Pathway

Provide explanation: No surface water is present at the sites.

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 may result in 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 No Pathway

Provide explanation: No surface water is present at the sites.

Question V:

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation is most relevant for gamma-emitting radionuclides.**
- **The water column acts to absorb radiation; therefore, 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):

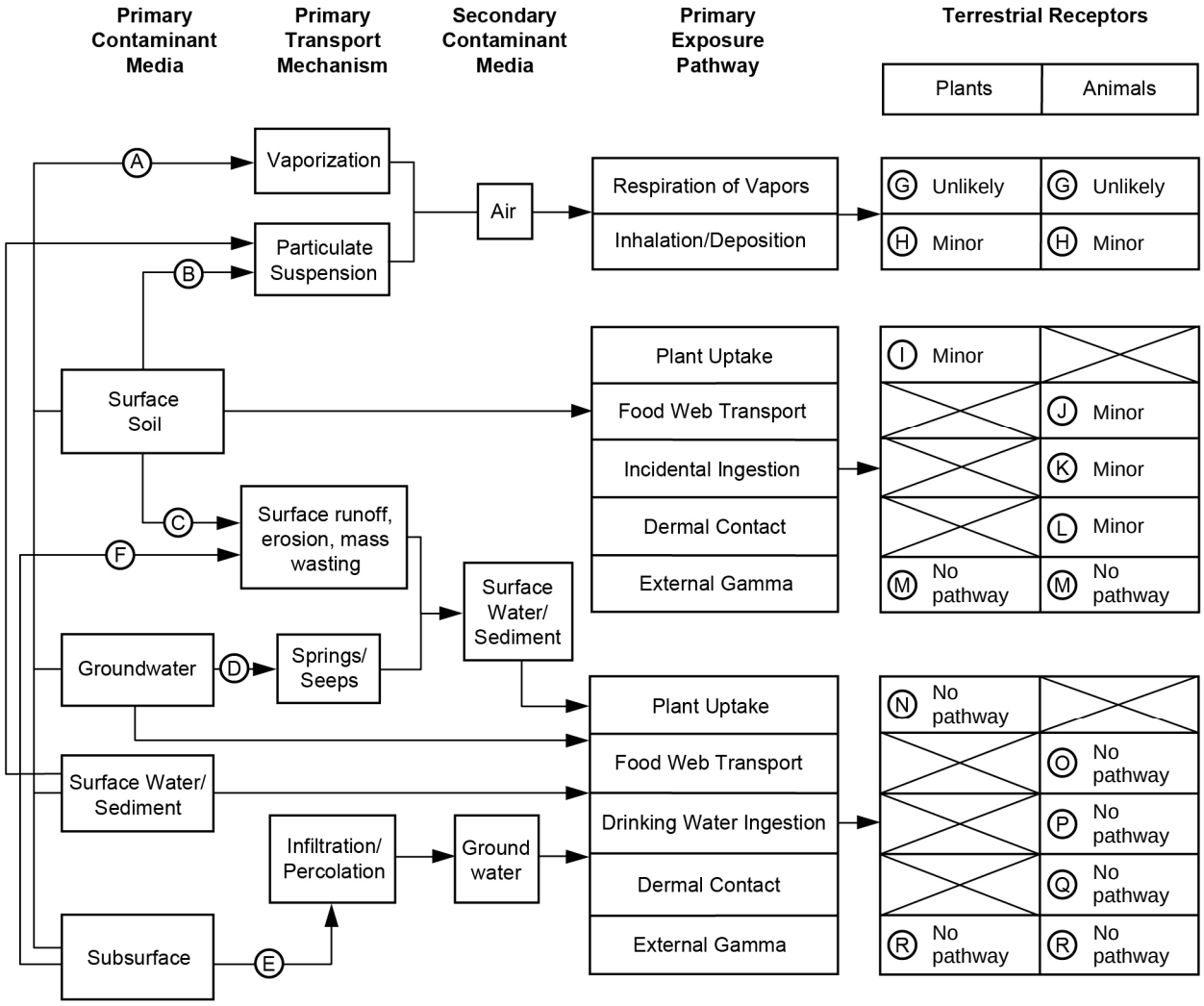
Aquatic Plants: 0 No Pathway

Aquatic Animals: 0 No Pathway

Provide explanation: No surface water is present at the sites.

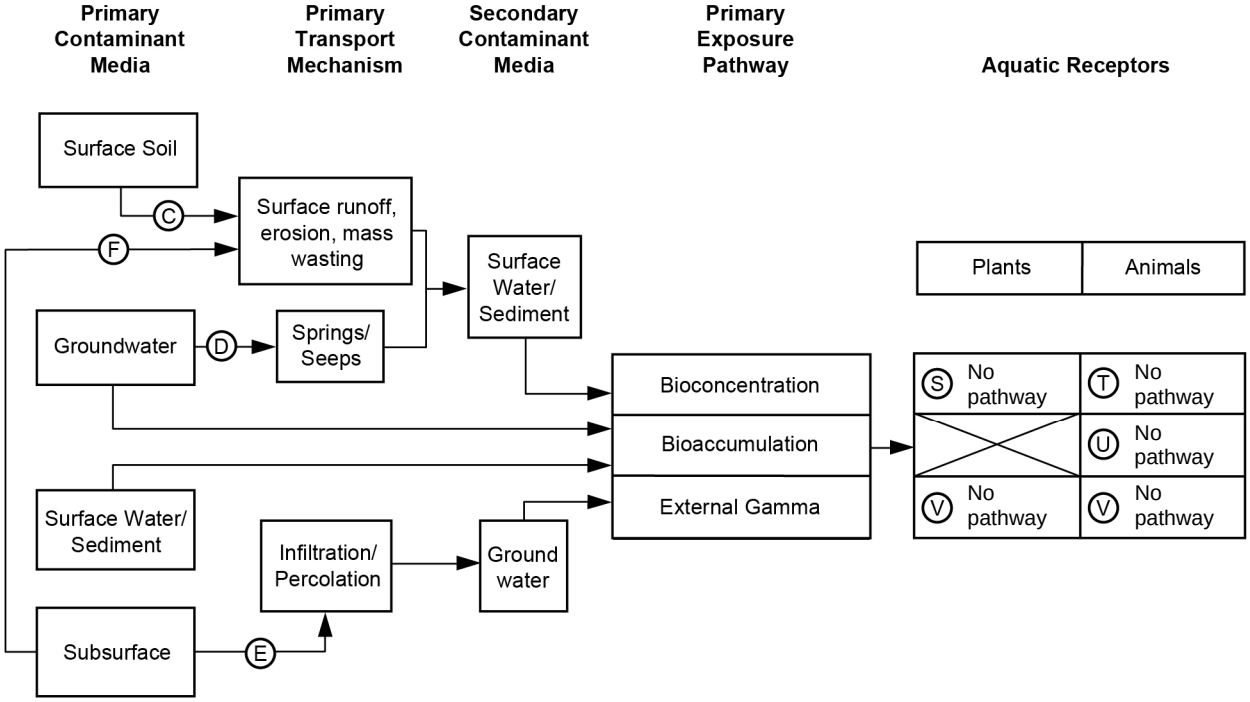
Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the scoping checklist.



Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the scoping checklist.



SIGNATURES AND CERTIFICATIONS:

Checklist Completed by:

Name (printed): Richard Mirenda

Name (signature): Richard Mirenda

Organization: Los Alamos National Laboratory

Date completed: 8/23/16

Checklist Reviewed by:

Name (printed): Tracy McFarland

Name (signature): Tracy McFarland

Organization: Los Alamos National Laboratory

Date Reviewed 12/15/16

PART A—SCOPING MEETING DOCUMENTATION

Site Identification	AOC 01-003(b1)
Form of Site Releases (Solid, Liquid, Vapor) **Describe known or suspected <u>mechanisms</u> of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential <u>areas</u> of release. Reference map if appropriate.**	AOC 01-003(b1) is part of a former surface disposal area [AOC 01-003(b)] for construction debris reported to be below the north rim of Los Alamos Canyon approximately 450 ft east of Bailey Bridge Canyon (LANL 1990, 007511). Several pieces of metal piping were found, a few objects were found scattered over more than an acre on the hillside, and the portable beta/gamma instruments used to screen each object registered only background radiation. Currently, the area is on undeveloped land.
Directly Impacted Media **Indicate all that apply.**	**Surface soil – X** **Surface water/sediment** **Subsurface – X** **Groundwater** **Other, explain**
Vegetation Class Based on Geographic Information System (GIS) Vegetation Coverage **Indicate all that apply.**	**Water** **Bare Ground/Unvegetated** **Spruce/fir/aspen/mixed conifer** **Ponderosa pine** **Piñon juniper/juniper savannah** **Grassland/shrubland – X** **Developed** **Burned**
Threatened and Endangered Species Habitat **If applicable, list threatened and endangered species known or suspected of using the site for breeding or foraging.**	The only T&E species that could frequent the area is the Mexican spotted owl. The owl's primary habitat is densely forested canyons, and it may use the area for foraging.
Neighboring/Contiguous/Upgradient Sites **Include a summary of chemicals of potential concern and the type of releases if impacting site.** **(Use this information to evaluate the need to aggregate sites for scoping and screening.)**	The sites are partially within the former LA Inn property with the remainder of the original sites extending beyond the boundaries onto private or DOE land. In addition, other SWMUs and AOCs are present within the property but do not affect these sites.
Surface Water Erosion Potential **Indicate if erosion is present and type; terminal point of surface water transport; slope; and surface water run-on sources.**	The terminal point of surface water transport is Los Alamos Canyon. The ground surface is flat (<10% slope). Erosion is not apparent.

PART B—SITE VISIT DOCUMENTATION

Site ID	AOC 01-003(b1)
Date of Site Visit	08/08/2016
Site Visit Conducted by	Richard Mirenda and Todd Haagenstad

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none)** = high **Relative wetland cover (high, medium, low, none)** = none **Relative structures/asphalt, etc., cover (high, medium, low, none)** = low
Field notes on the GIS vegetation class	The area is undeveloped with some grasses and shrubs.
Are ecological receptors present at the site? **(yes/no/uncertain)** **Describe the general types of receptors present at the site (terrestrial and aquatic), and note the quality of habitat present at the site.**	Yes. The area contains some terrestrial biota, such as small mammals, insects, birds, and plants. The habitat quality of the site is good. No aquatic community exists.

Contaminant Transport Information:

Surface Water Transport **Field notes on the erosion potential and BMPs, including a discussion of the terminal point of surface water transport (if applicable).**	The area has a low potential for surface-water transport. The ground surface is typically flat (<10% slope). Runoff moves as sheet flow or in drainage channels into the canyon. The terminal point of surface water transport is Los Alamos Canyon.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	Yes. There is potential for surface-water transport. It is unlikely that contaminants could be transported as fugitive dust because of the vegetative cover. No potential for groundwater contamination exists because the depth to groundwater is greater than 1000 ft bgs.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities; review historical aerial photos where appropriate.)**	The area around the site is developed. The area is relatively undisturbed.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	There are no obvious ecological effects.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature and extent of contamination? **(yes/no/uncertain)** **Provide explanation**	Yes. Investigations have defined the nature and extent of contamination for the sites. Additional sampling and analyses are not necessary.
Do existing or proposed data for the site address potential transport pathways of site contamination? **(yes/no/uncertain)** **Provide explanation**	Yes. The data addresses potential transport pathways.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors on-site and no transport pathways to off-site receptors, do not complete Part C. Provide explanation/justification for proposing an ecological "No Further Action" recommendation. Not applicable.

PART C—ECOLOGICAL PATHWAYS CONCEPTUAL EXPOSURE MODEL

Provide answers to Questions A to V to develop the Ecological Pathways Conceptual Exposure Models (use to complete figures at end of Part C).

Question A:

Could soil contaminants reach receptors through vapors?

- **Determine the volatility of the hazardous substance (volatile chemicals generally have Henry's law constant >1E-05 atm-m^3/mol and molecular weight <200 g/mol).**
- **In the case of burrowing animals, the contamination would have to occur in the depth interval where burrows are present (near surface to 5 ft below ground surface).**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: One VOC was detected and was below the estimated quantitation limit.

Question B:

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual soil surface 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 the burrows occur.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: The area is undeveloped and relatively undisturbed with vegetative cover. Little evidence of burrowing was observed.

Question C:

Can contaminated soil be transported to aquatic communities?

If erosion is an off-site transport pathway, determine the terminal point to see if aquatic receptors could be impacted by contamination from the site.

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No aquatic ecological communities are present at the site or on the canyon slope.

Question D:

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

- **The potential exists for contaminants to migrate through 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.**
- **Terrestrial wildlife receptors generally will not come in contact with groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No seeps, springs, or perched groundwater is present on or near the sites. The depth of groundwater is greater than 1000 ft bgs.

Question E:

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **The potential for contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate to 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.**
- **Terrestrial wildlife receptors generally will not come in contact with groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Contaminants are not likely to migrate to the regional aquifer given the depth to groundwater (greater than 1000 ft bgs). The lack of a significant hydraulic driver (e.g., no standing surface water) facilitating infiltration also mitigates the potential for contaminants to reach 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 applicable only to release sites located on or near the mesa edge.**
- **Consider the potential erosion of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No perched aquifers exist on or near the site. Erosion potential is low, and no evidence was found of mass wasting events.

Question G:

Could airborne contaminants interact with receptors through the respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of the inhalation of vapors for burrowing animals.**
- **Foliar uptake of 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 Unlikely Pathway

Terrestrial Animals: 1 Unlikely Pathway

Provide explanation: VOCs are infrequently detected and at very low concentrations. Little evidence of burrowing was observed.

Question H:

Could airborne contaminants interact with plants through the deposition of particulates or with animals through the inhalation of fugitive dust?

- **For this exposure pathway to be complete, contaminants must be present as particulates in the air or as dust.**
- **Exposure through the 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 Minor Pathway

Terrestrial Animals: 2 Minor Pathway

Provide explanation: Little evidence of burrowing was observed. The area is undeveloped and relatively undisturbed with vegetative cover. Deposition of particulates would be from adjacent areas.

Question I:

Could contaminants interact with plants through root uptake or rain splash from surficial soil?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants may occur through particulates deposited on leaf and stem surfaces by rain striking contaminated soil (i.e., rain splash).**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2 Minor Pathway

Provide explanation: COPCs were detected at low concentrations in surface soil.

Question J:

Could contaminants interact with receptors through food web transport from surficial soil?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2 Minor Pathway

Provide explanation: COPCs were detected at low concentrations in surface soil.

Question K:

Could contaminants interact with receptors through the incidental ingestion of surficial soil?

- **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 groom themselves.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2 Minor Pathway

Provide explanation: COPCs were detected in surface soil.

Question L:

Could contaminants interact with receptors through dermal contact with surficial soil?

- **Exposure through 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 Minor Pathway

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 is 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: 1 Unlikely Pathway

Terrestrial Animals: 1 Unlikely Pathway

Provide explanation: Gamma-emitting radionuclides were detected in one sample.

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 sediment (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 No Pathway

Provide explanation: No surface water is present.

Question O:

Could contaminants interact with receptors through food web transport from water and sediment?

- **The chemicals may bioconcentrate in food.**
- **Animals may ingest contaminated food.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present.

Question P:

Could contaminants interact with receptors through the ingestion of water and suspended sediment?

- **If sediment is present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediment.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a source of drinking water.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present.

Question Q:

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediment is 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 No Pathway

Provide explanation: No surface water is present.

Question R:

Could suspended or sediment-based contaminants interact with plants or animals through external irradiation?

- **External irradiation is 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 No Pathway

Terrestrial Animals: 0 No Pathway

Provide explanation: No surface water is present.

Question S:

Could contaminants bioconcentrate in free-floating aquatic plants, 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 No Pathway

Provide explanation: No surface water is 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 sediment 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 No Pathway

Provide explanation: No surface water is 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 may result in 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 No Pathway

Provide explanation: No surface water is present.

Question V:

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation is most relevant for gamma-emitting radionuclides.**
- **The water column acts to absorb radiation; therefore, 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):

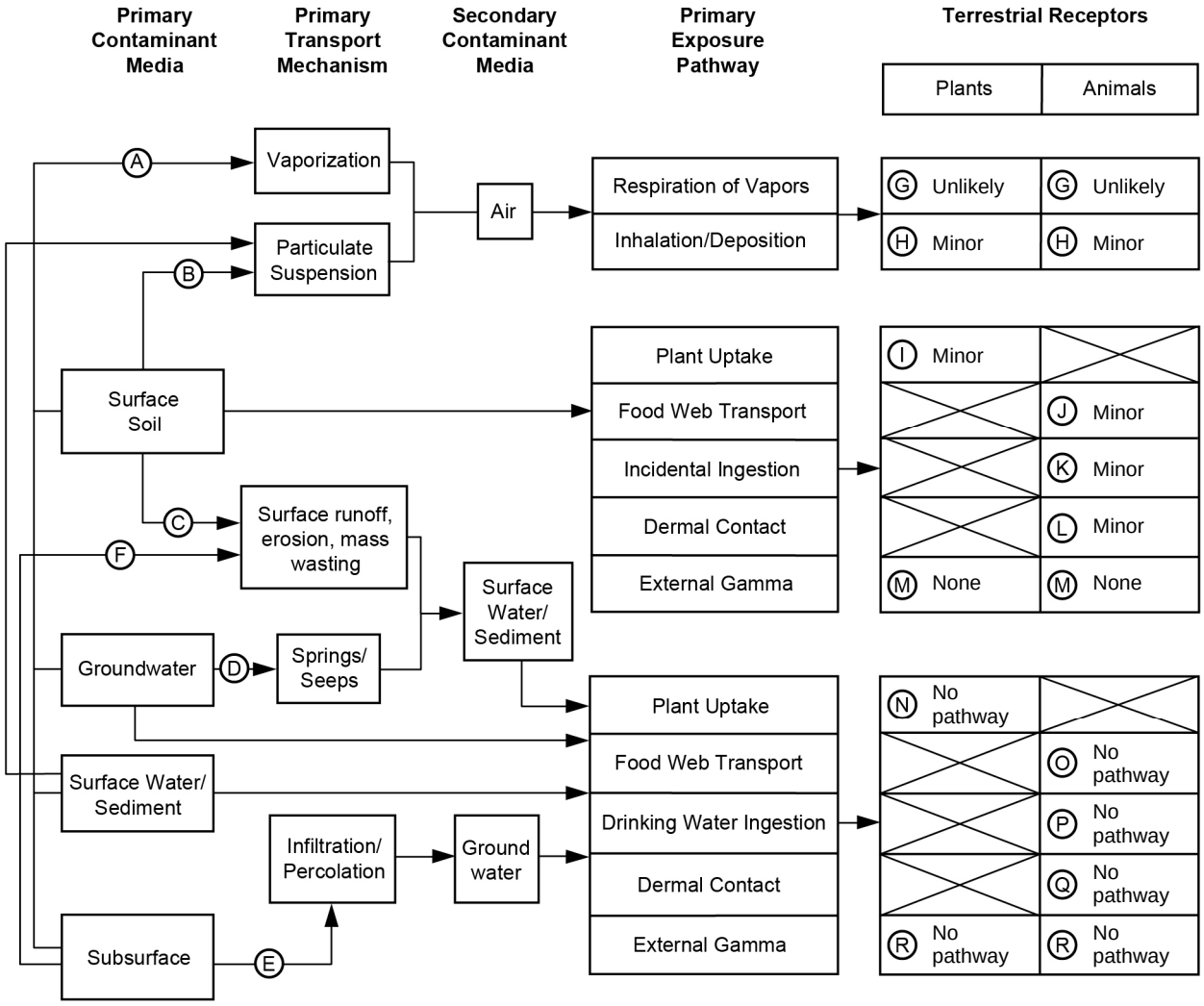
Aquatic Plants: 0 No Pathway

Aquatic Animals: 0 No Pathway

Provide explanation: No surface water is present.

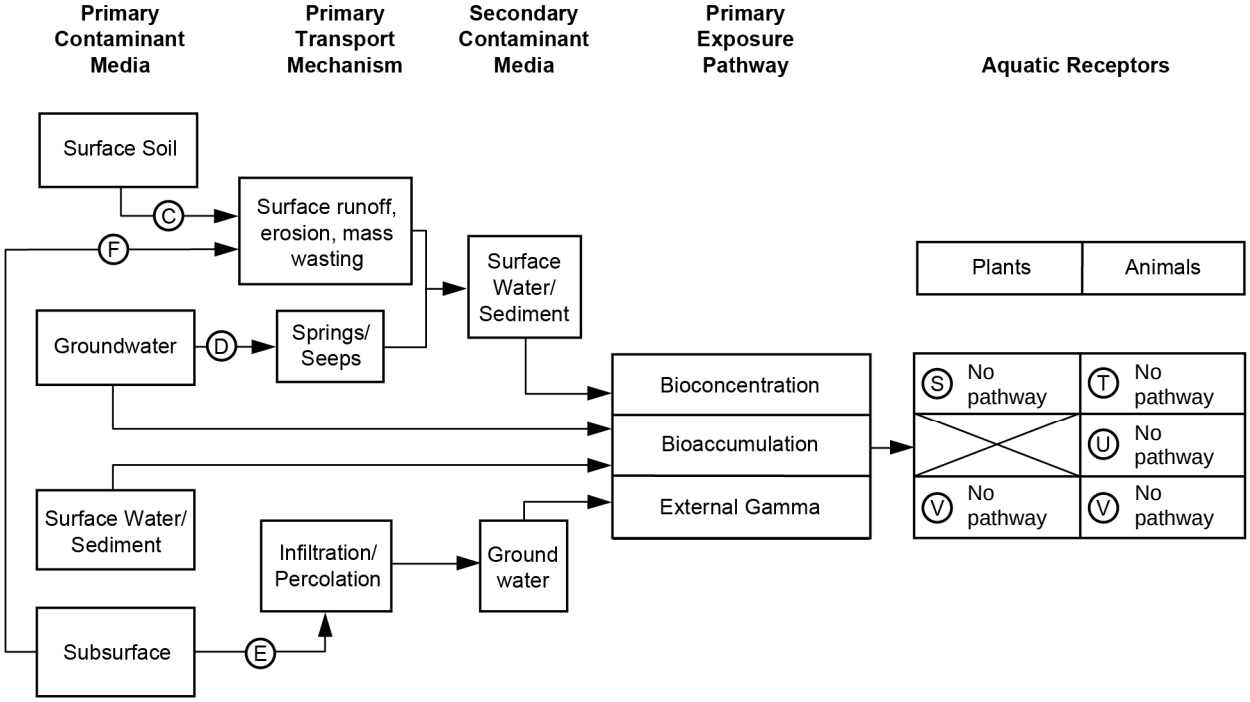
Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the scoping checklist.



Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the scoping checklist.



SIGNATURES AND CERTIFICATIONS:

Checklist Completed by:

Name (printed): Richard Mirenda
Name (signature): Richard Mirenda
Organization: Los Alamos National Laboratory
Date completed: 8/23/16

Checklist Reviewed by:

Name (printed): Tracy McFarland
Name (signature): Tracy McFarland
Organization: Los Alamos National Laboratory
Date Reviewed 12/15/16

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 or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System 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 ESH 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.

Ahlquist, A.J., A.K. Stoker, and L.K. Trocki (Comp.), December 1977. "Radiological Survey and Decontamination of the Former Main Technical Area (TA-1) at Los Alamos, New Mexico," Los Alamos Scientific Laboratory report LA-6887, Los Alamos, New Mexico. (Ahlquist et al. 1977, 005710)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Vol. I of IV (TA-0 through TA-9), Los Alamos National Laboratory document LA-UR-90-3400, Los Alamos, New Mexico. (LANL 1990, 007511)

Appendix H

Site Photographs

Figure H-1 **Solid Waste Management Unit (SWMU) 01-007(a) containing the former outfall area of SWMU 01-006(b) at the bottom of the slope showing conditions before recent remediation activities at both sites**

Figure H-2 Pieces of asphalt and debris in the former outfall area of SWMU 01-006(b)

Figure H-3 Pieces of asphalt and debris in the former outfall area of SWMU 01-006(b)

Figure H-4 The mesa-top portion of SWMU 01-007(a)

Figure H-5 **Asphalt pavement and pieces on the slope of SWMU 01-007(a) above the bench area leading to the canyon slope**

Figure H-6 **SWMU 01-007(a) containing the former outfall area of SWMU 01-006(b) following recent remediation and site-restoration activities**

Figure H-7 **SWMU 01-006(c) former outfall area showing debris, including concrete and asphalt**

Figure H-8 SWMU 01-006(c) former outfall area showing debris, including asphalt

Figure H-9 SWMU 01-006(n) former outfall area showing asphalt and other debris

Figure H-10 SWMU 01-006(n) former outfall area farther downslope showing asphalt

Figure H-11 SWMU 01-007(a) close up of asphalt scattered on the slope leading to the bench area