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Phase II Investigation Work Plan for Middle Los Alamos Canyon Aggregate Area, Revision 1

Los Alamos
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EXECUTIVE SUMMARY

This Phase II investigation work plan includes proposed investigation and remediation activities for 40 solid waste management units (SWMUs), areas of concern (AOCs), and consolidated units in the Middle Los Alamos Canyon Aggregate Area at Los Alamos National Laboratory (the Laboratory). The sites are located within the northern portion of the Laboratory, south of NM 502 and generally south and east of the Los Alamos townsite in Technical Area 02 (TA-02), TA-21, TA-26, and TA-61 [one site, SWMU 02-006(a), is physically located in TA-61, adjacent to TA-02, but is designated as part of TA-02]. The objectives of this work plan are to (1) specify areas where soil removal will be performed to reduce excess cancer risk or radiation dose and (2) propose additional sampling to define the lateral and vertical extent of contamination for all sites.

The Middle Los Alamos Canyon Aggregate Area was investigated in 2007 according to the approved investigation work plan. The results of the investigation were reported in the investigation report for Middle Los Alamos Canyon Aggregate Area. The investigation report concluded that although the nature of site contamination was defined for all sites in TA-02, TA-21, and TA-26, the extent of contamination was not defined sufficiently to conduct risk-screening assessments. In particular, evaluation of the lateral extent of contamination was complicated by the high density and overlapping nature of sites at TA-02. The report recommended that the lateral extent of contamination be defined by considering the core area of TA-02 as a whole. In addition, the vertical extent of contamination was not defined because of increasing concentrations of contaminants with depth, contaminants detected only in the deepest sample at some locations, or the inability to collect samples at more than one depth due to auger refusal (at TA-02).

While risk-screening assessments were not included in the report, preliminary screening assessments were performed to identify any sites or portions of sites with contamination that warranted remediation by soil removal. The report recommended limited soil removal at four sites at TA-02 where preliminary risk screening indicated either excess cancer risk or radiation dose above target levels. Additionally, one more site is proposed for soil removal in this work plan. At TA-02, four sites—Areas of Concern (AOCs) 02-004(a), 02-004(f), and 02-011(a), and SWMU 02-005 (02-005 was not recommended for remediation in the investigation report)—will be remediated to reduce excess cancer risk due to polychlorinated biphenyls or polycyclic aromatic hydrocarbons. Excavation depths will range from approximately 2 ft to 7 ft below ground surface (bgs). AOC 02-010 will be remediated to reduce the radiation dose due to cesium-137. This site will be excavated to approximately 2 ft bgs. Confirmation samples will be collected at each excavated area, and the excavations will be backfilled with clean soil or other clean fill material.

Additional sampling is proposed at TA-02 (including the site located in TA-61), TA-21, and TA-26 to define the lateral and vertical extent of contamination. At TA-02, sampling locations are proposed at key points in the core area (sites of former Laboratory structures and operations) to determine the vertical extent of contamination for inorganic chemicals, organic chemicals, and radionuclides. Analytical requirements determined by the data needs specific to each location. Additional sampling locations are proposed at points surrounding the core area to define the lateral extent of contamination for TA-02 as a whole.

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1.0 INTRODUCTION

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

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

This Phase II work plan addresses sites in Technical Area 02 (TA-02), TA-21, and TA-26 within the Middle Los Alamos Canyon Aggregate Area at the Laboratory (Figure 1.0-1), which lies within the Los Alamos Canyon watershed (Figure 1.0-2). These sites are potentially contaminated with hazardous chemicals and radionuclides. Corrective actions at the Laboratory are subject to the March 1, 2005, Compliance Order on Consent (Consent Order). Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with DOE policy.

1.1 General Site Information

The Middle Los Alamos Canyon Aggregate Area consists of 80 sites, 40 of which did not warrant investigation (LANL 2008, 102093). The remaining 40 sites underwent sampling activities in 2007. These 40 sites are located at TA-02, TA-21, and TA-26, including 8 SWMUs, 26 AOCs, and 2 consolidated units consisting of 5 SWMUs and 1 AOC. Table 1.1-1 includes a list of the 40 sites that will undergo a Phase II investigation, with a brief description, associated structure or facility, previous investigation(s) conducted, and chemicals of potential concern (COPCs) identified for each site.

TA-02 is located in the western end of the Middle Los Alamos Canyon Aggregate Area (Figure 1.1-1). The canyon is approximately 1350 ft wide at the top and varies in depth from 350 to 360 ft in the vicinity of TA-02. The floor of the canyon is relatively flat, approximately 200–300 ft wide at TA-02. Los Alamos Creek streams along the canyon floor with intermittent flow near TA-02.

TA-21 is located on Delta Prime (DP) Mesa on the northern boundary of the Laboratory and is immediately east-southeast of the Los Alamos townsite (Figure 1.1-1). It extends from the mesa top to the stream channels in two adjacent canyons, DP Canyon to the north and Los Alamos Canyon to the south.

TA-26 is a former technical area located south of NM 502 toward the east end of Los Alamos Mesa. It slopes to Los Alamos Canyon on the south (Figure 1.1-1). This area is currently within the boundary of TA-73.

1.2 Phase II Investigation Objectives

The objectives of the Phase II investigation are to (1) conduct limited soil removal to reduce risk at sites where it is apparent that target levels have been exceeded and (2) collect samples to define the lateral and vertical extent of contamination at the sites located in TA-02, TA-21, and TA-26.

1.3 Conceptual Site Model

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

1.3.1 Potential Contaminant Sources

Releases at the sites occurred as a result of Laboratory operations (production and research), reactor processes, chemical storage, and waste disposal practices. Those sites previously sampled indicate inorganic chemicals, organic chemicals, and radionuclides are present, but further sampling is necessary to determine the extent of contamination.

1.3.2 Potential Contaminant Transport Mechanisms

Potential transport mechanisms that may lead to exposure of potential receptors include

- vaporization and gaseous diffusion and advection of volatile organic compounds (VOCs) and tritium in air (TA-02 and TA-21),
- dissolution and/or particulate transport of surface contaminants during precipitation and runoff events (all three areas),
- transport within the shallow saturated zone (TA-02 only),
- airborne transport of contaminated surface soil (all three areas),
- continued dissolution and advective/dispersive transport of chemical and radiological contaminants contained in subsurface soil and bedrock (all three areas), and
- disturbance and uptake of contaminants in shallow soil by plants and animals (all three areas).

1.3.3 Current and Future Contaminant Potential Receptors

Potential receptors of possible contaminants include

- site workers (TA-02 and TA-21),
- trail users on the mesas (TA-26) and in the canyons (TA-02), and
- plants and animals both on-site and in areas immediately surrounding the sites (all three areas).

2.0 BACKGROUND

2.1 TA-02

TA-02 was used to house a series of research reactors from 1943 to 2003 when the decontamination and decommissioning (D&D) of the site occurred. The main reactor building (02-1) was constructed in 1943. It

housed five separate nuclear reactors: three iterations of water boiler reactors (WBRs) located on the east side of the building, one plutonium-fueled reactor (the Clementine Reactor) followed by an enriched uranium reactor, and the Omega West Reactor (OWR). A number of facilities were constructed over the years to support the TA-02 research activities. TA-02 was active from 1943 to 1993 (LANL 2003, 082646, pp. 1-2).

Various remedial actions, such as soil removal and D&D, were conducted in the bottom of Los Alamos Canyon, including at TA-02, after the Cerro Grande fire. These actions were taken to reduce the risk of contaminants dispersing from post-fire floods. Approximately 54 yd^3 of soil contaminated with cesium-137 was removed in 2000, following an extensive field survey for gross-gamma radiation (LANL 2001, 070352). The OWR and associated structures underwent D&D in 2002 and 2003 (LANL 2003, 082646). After all structures at TA-02 were removed, field radiological surveys were conducted to confirm that surface contamination release limits were not exceeded (LANL 2003, 082646, pp. 18-19). The land was returned to its original contour and reseeded (LANL 2003, 082646, pp. 1-2). The road accessing the reactor site is controlled by the Laboratory via a locked gate.

The TA-02 sites addressed in this Phase II work plan, shown on Plate 1, include all the sites investigated in 2007 and are grouped in following categories:

- sites associated with the WBR gaseous effluent vent system: AOCs 02-003(a–e)
- former OWR building: AOC 02-004(a)
- holding or storage tanks: AOCs 02-004(b–d,g) and AOC 02-012
- sump and associated drainline: AOC 02-004(e) and AOC 02-006(e)
- former OWR equipment building: AOC 02-004(f)
- airborne contaminant deposition: SWMU 02-005
- drainlines, acid waste line, and outfalls: SWMUs 02-006(a,b), AOCs 02-006(c,d), SWMU 02-008(a), AOC 02-008(c), and AOCs 02-011(b,d)
- septic tank and outfall: SWMU 02-007 of Consolidated Unit 02-007-00
- soil contamination identified during Phase I D&D of the WBR: SWMUs 02-009(a–c) of Consolidated Unit 02-007-00 and AOC 02-009(d)
- former chemical waste shack: AOC 02-010
- storm drains: AOCs 02-011(a,c)

2.1.1 Historical Site Use and Decommissioning

OWR

The OWR was the core facility (building 02-1) at TA-02. The western third of building 02-1 first housed the Clementine Reactor that operated from 1946 to 1953. The OWR was built on the former site of Clementine. The OWR was put online in 1956 and put on standby status in 1993 after a cooling system water leak (WD-3 2003, 082646).

The OWR operated with a cooling-liquid recirculating system that consisted of a series of closed-loop pipes in a 100-ft-long corridor that extended from the OWR west to the reactor facility equipment building (02-44). The water was routed through pumps, filters, and chillers in the reactor facility equipment building and back to the reactor. The cooling tower (structure 02-49) was added in 1959 to supplement the chillers

in this closed system. The recirculating system was active from 1956 to 1993 when it was put on standby status during the OWR shutdown.

Three liquid waste storage tanks (structures 02-54, 02-55, and 02-56) were located approximately 150 ft west of building 02-1 in a concrete vault. The top of the vault was approximately 4 ft below ground surface (bgs). The tanks received liquid waste that was primarily flushed effluent from the ion-exchange system associated with the OWR. The tanks also received any spills or leaks collected from the floor of the OWR equipment building (02-44). A liquid transfer system, the OWR acid pit/transfer sump (structure 02-53) that consisted of a series of valves and pumps, transferred waste from the OWR equipment building (02-44) to the three liquid waste storage tanks, to a portable aboveground tank (no structure number), or to the liquid waste line leading to TA-50. The tanks, vault, acid pit/transfer sump, portable aboveground tank, and waste lines were installed in 1962 and were put on standby in 1993.

Off-gas from the OWR was routed through the gaseous effluent vent line to a connection into line 119 on the east side of TA-02 where the effluent continued up to the mesa-top stack (structure 02-9) at TA-61.

After all systems were shut down in 1993, all liquid waste was drained in 1995, structures and equipment were removed in 2000, and the remaining piping and drains were removed in 2003 (LANL 2000, 090087; WD-3 2003, 082646). The sites associated with the former operations of the OWR are summarized in Table 1.1-1, and additional details are included in the 2008 investigation report (LANL 2008, 102093).

WBR

The WBR was the name for three generations of reactors located in the eastern third of the OWR building (02-1). The first reactor was functional in May 1944 and was soon replaced with a stronger reactor in December 1944, which was later upgraded and became functional in 1951. The WBR was placed in safe-shutdown mode in 1974.

The WBR off-gas system consisted of the stack-gas valve house (building 02-19), the condensate trap (structure 02-48), the mesa-top vent stack (structure 02-9) located at TA-61, and associated gaseous vent lines. From 1944 to 1948, gaseous effluent entered the stack-gas valve house (building 02-19) from line 117 and was directed via line 118 until July 1948 when the condensate trap (structure 02-48) and line 119 became operational. Line 118 became inactive in 1948. Line 119 ran from the stack-gas valve house (building 02-19) to the condensate trap (structure 02-48), then to the delay tanks (structure 02-131), continued to the junction with the main OWR gaseous effluent vent line, and then up to the mesa-top stack (structure 02-9) and French drain located at TA-61. A holding tank (structure 02-62), installed in 1944, was adjacent to the stack-gas valve house (building 02-19) and was designed to collect WBR cooling water if a cooling coil breach occurred. The mesa-top stack system was the termination point of the gaseous effluent from OWR and WBR. A temporary vent line was reported used from 1943 to 1948 when the mesa-top stack was built. The stack was in use from 1948 to 1993, serving either the WBR or OWR or both of them at various times.

The stack-gas valve house, condensate trap, line 117, line 119, delay tanks, and holding tank operated through 1974 when the WBR was placed in safe-shutdown mode. They were removed and disposed of in the 1985 WBR Decommission Project, Phase I. The reactor was removed and disposed of in the 1990 WBR Decommission Project, Phase II. The sites associated with the former operations of the WBR and other TA-02 structures are summarized in Table 1.1-1, and additional details are included in the 2008 investigation report (LANL 2008, 102093).

2.1.2 Previous Investigations

The sites at TA-02 underwent two phases of decommissioning in 1985 and 1990. Resource Conservation and Recovery Act facility investigation (RFI) activities were conducted in 1995. An underground storage tank was removed and disposed of in 1998. In 2000, additional investigation activities were conducted as part of the Cerro Grande fire recovery effort. In 2003, the OWR facility and all remaining structures associated with it were decommissioned. Details of these activities are included in the historical investigation report (LANL 2005, 090631) and are summarized in Table 1.1-1.

Sampling was conducted at the Middle Los Alamos Canyon Aggregate Area from July 2007 to November 2007, according to the approved investigation work plan (LANL 2006, 092571.12). Activities included a geophysical survey and collection of surface and subsurface samples. A total of 1062 samples plus 130 field duplicates were collected from 336 locations in 2007 at TA-02. All samples were analyzed for inorganic chemicals, organic chemicals, and radionuclides. Plates 2 and 3 show all the previous sampling locations. The 2007 investigation activities are summarized in Table 2.1-1.

2.1.3 Results of Previous Investigations

Results of previous investigations have been presented in the 2008 investigation report (LANL 2008, 102093). The nature of contamination at TA-02 is defined by the analytical results of previous investigations. The COPCs identified for each site are listed in Table 1.1-1. COPCs that occurred in at least one site include target analyte (TAL) metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbons–diesel range organic (TPH-DRO), VOCs, and radionuclides (americium-241, cesium-137, cobalt-60, isotopic plutonium, isotopic uranium, strontium-90, and tritium).

Based on the information presented in the investigation report (LANL 2008, 102093), the vertical and lateral extent of contamination at TA-02 are not completely defined for TAL metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOCs, and radionuclides (americium-241, cesium-137, cobalt-60, isotopic plutonium, isotopic uranium, strontium-90, and tritium). Extent of TPH-DRO has been defined.

The vertical extent of contamination is not defined for all COPCs at any individual SWMU, AOC, or consolidated unit. At some locations, the concentrations of COPCs increase with depth. At other locations, samples were collected at a single-depth interval because the locations were not accessible with a drill rig, and hand-augering met refusal at shallow depths.

The lateral extent of contamination is not defined for many of the individual sites because other SWMUs or AOCs are immediately adjacent to them. In most cases, it is not possible to define the lateral extent of contamination for individual sites within the main TA-02 investigation area because any new locations would be within the footprint of another SWMU or AOC. The lateral extent of contamination for TA-02 as a whole is also not defined at the periphery of the investigation area.

2.2 TA-21

Operations at TA-21 started in 1945 for establishing the chemical and metallurgical properties of the nuclear material necessary to achieve and sustain the required nuclear fission reaction. The primary operation at DP West (western portion of TA-21) was to produce metal and alloys of plutonium from the nitrate solution feedstock provided by other production facilities. A major research objective at DP West was the development of new purification techniques that would increase the efficiency of the separation processes (Christensen and Maraman 1969, 004779). Details of the purification techniques are discussed

in the operable unit (OU) work plan for TA-21 (LANL 1991, 007529). Other operations at DP West included nuclear fuel reprocessing. In 1977, a transfer of work to the new plutonium facility at TA-55 began, and much of the DP West complex was vacated. Operations at DP East (eastern portion of TA-21) were to process polonium and actinium and to produce initiators (a nuclear weapons component). In 1964, building 21-209 was built to house research into high-temperature and actinide chemistry. Building 21-155 currently houses the Tritium Systems Test Assembly for developing and demonstrating effective technology for handling and processing deuterium and tritium fuels for use in fusion reactors.

TA-21 also includes Material Disposal Areas (MDAs) A, B, T, U, and V. Process wastes, transuranic wastes, and liquid wastes were disposed of in the MDAs from the early 1940s to the late 1970s; details of the disposal methods are presented in the TA-21 OU work plan (LANL 1991, 007529).

Two TA-21 sites are addressed in this Phase II work plan. Both were investigated in 2007.

- Consolidated Unit 21-006(e)-99, which includes SWMU 21-006(e) and AOC 21-006(f), seepage pits
- AOC 21-028(c), satellite storage areas

2.2.1 Historical Site Use and Decommissioning

SWMU 21-006(e) is a seepage pit that may be located south of building 21-4. The location of this seepage pit is unclear (LANL 1990, 007512), but it may be the same seepage pit as AOC 21-006(f) (LANL 1991, 007680, p. 18-13). AOC 21-006(f) is described as a gravel seepage pit located on the south side of the DP West complex (Tribby 1947, 001404, p. 1). The seepage pit(s) received hydrogen fluoride wastewater effluent from a hydrofluorination process located in room 413, the southernmost room of building 21-4 (Tribby 1947, 001404, p. 1). The period of operation is not known. During repair work on the drain system under room 413, a hole in the ground was identified under the drainlines. It was evident that acid waste had escaped from the drain system into the ground (Meyer 1978, 000526). This hole may have been one of the seepage pits of Consolidated Unit 21-006(e)-99.

AOC 21-028(c) consists of four satellite container storage areas located at building 21-3. The period of operation for the storage areas is not available but probably began in 1945 when the building was constructed (LANL 1991, 007680, p. 18-21). The areas had stored a wide variety of chemicals and were in use as late as 1990 (LANL 1991, 007680, pp. 18-23–18-24).

DP West operations had ceased after a transfer of work to the new plutonium facility at TA-55 began in 1977. Buildings 21-3 and 21-4 have been largely dismantled, and only small portions of the central sections of those buildings remain.

2.2.2 Previous Investigations

Buildings 21-3 and 21-4 underwent D&D in 1995 and 1996. The approximate areas of the seepage pits [Consolidated Unit 21-006(e)-99] and the satellite storage areas [AOC 21-028(c)] were excavated (LANL 1996, 065025). Confirmation samples were collected at the bottom of the excavations; however, the sample depths were not recorded.

In 2007, a total of 46 samples (3 soil and 43 tuff), plus 5 field duplicates, were collected from 15 locations at Consolidated Unit 21-006(e)-99, with a maximum sample depth of 13.0 ft bgs. A total of 52 samples (13 soil and 39 tuff), plus 4 field duplicates, were collected from 17 locations at AOC 21-028(c), with a

maximum sample depth of 13.0 ft bgs. All samples were analyzed for inorganic chemicals, organic chemicals, and radionuclides. Figure 2.2-1 shows the previous sample locations.

2.2.3 Results of Previous Investigations

Results of previous investigations were presented in the investigation report (LANL 2008, 102093). Extent of contamination has not been defined at the two TA-21 sites. The vertical extent is not defined because concentrations of COPCs either increased with depth or did not show decreasing concentrations with depth. The lateral extent of contamination is not defined because COPCs were detected or detected above background values (BVs) at locations on the periphery of the sites, and concentrations did not consistently decrease laterally.

Consolidated Unit 21-006(e)-99

The nature of contamination at Consolidated Unit 21-006(e)-99 is defined by the analytical results of the 2007 investigation. COPCs identified in the investigation report (LANL 2008, 102093) include TAL metals, cyanide (total), nitrate, PCBs, SVOCs, VOCs, americium-241, cesium-134, cesium-137, plutonium-238, plutonium-239/240, tritium, uranium-234, and uranium-235.

The vertical and lateral extent of contamination at Consolidated Unit 21-006(e)-99 are not defined for TAL metals, nitrate, PCBs, SVOCs, VOCs, and radionuclides (isotopic plutonium, isotopic uranium, and tritium). Extent has been defined for cyanide (total), americium-241, cesium-134, and cesium-137.

AOC 21-028(c)

The nature of contamination at AOC 21-028(c) is defined by the analytical results of the 2007 investigation. COPCs identified in the investigation report (LANL 2008, 102093) include TAL metals, cyanide (total), nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, plutonium-238, plutonium-239/240, tritium, uranium-234, and uranium-235.

The vertical and lateral extent of contamination at AOC 21-028(c) are not defined for TAL metals, nitrate, PCBs, VOCs, and radionuclides (americium-241, isotopic plutonium, isotopic uranium, and tritium). Extent has been defined for cyanide (total), perchlorate, SVOCs, and cesium-137.

2.3 TA-26

TA-26, also called D-Site, contained the East Gate vault. The site was established in 1946 for Los Alamos Scientific Laboratory's Chemistry and Metallurgical Research division to store radioactive materials (LASL 1947, 000664). The area consisted of several structures, including the East Gate vault, two guard towers, a guard building, east room septic system, and a sump system. TA-26 was demolished from 1965 to 1966.

The TA-26 sites addressed in this Phase II work plan include all the sites investigated in 2007:

- SWMU 26-001, surface disposal site
- SWMU 26-002(a), soil contamination resulted from the sump system
- SWMU 26-002(b), drainline that served the concrete vault
- SWMU 26-003, east room septic system

2.3.1 Historical Site Use and Decommissioning

The concrete storage vault (building 26-1) operated at TA-26 from 1946 to 1965. In later years, the Zia Company used the vault to store high explosives (Lojek 1991, 001904). Before the East Gate vault was dismantled in 1966, the contaminated contents that could be removed, including shelving, the sump, drainlines, and duct work, were disposed of at MDA C (Blackwell 1973, 000619). The septic tank (structure 26-5) may have been removed at the same time as the sump system and other removable material in 1966, but no clear documentation is available (Blackwell 1973, 000619). The tank was not observed on the slope of Los Alamos Canyon during the investigation in 2007. The remains of the vault were broken up and bulldozed onto the south-facing slope of Los Alamos Canyon. Additional soil was pushed over to cover the rubble to a minimum of 3 ft (Blackwell 1973, 000619). Most of the vault debris rested on the bench below the mesa top; however, some debris may have fallen as far as the canyon floor (Buckland 1978, 000496).

2.3.2 Previous Investigations

Investigations in earlier years at TA-26 included the following field surveys:

- a radiological survey inside and around the vault area before the vault was decommissioned in 1965
- a phoswich radioactivity survey on the mesa top at the location of the former D-Site storage vault area in 1985
- the Comprehensive Environmental Assessment and Response Program field survey in 1986

At the time of the investigation in 2007, a small amount of reinforced concrete debris was visible on the bench below the mesa top. A total of 95 samples, plus 8 field duplicates, were collected in 2007 from 39 locations at TA-26, with a maximum sampling depth of 13.5 ft bgs. The samples were analyzed for inorganic chemicals, organic chemicals, and radionuclides. Figure 2.3-1 shows the sampling locations.

2.3.3 Results of Previous Investigation

Results of previous investigation at TA-26 were presented in the investigation report (LANL 2008, 102093). The nature of contamination at TA-26 is defined by the analytical results of the 2007 investigation. COPCs identified in the investigation report include TAL metals, cyanide (total), nitrate, perchlorate, PCBs, SVOCs, VOCs, cesium-137, plutonium-238, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235, and uranium-238.

The vertical and lateral extent of contamination at the TA-26 site are not defined for TAL metals, cyanide (total), nitrate, perchlorate, PCBs, SVOCs, VOCs, and radionuclides (cesium-137, isotopic plutonium, isotopic uranium, and tritium). Extent has been defined for strontium-90.

The vertical extent is not defined because concentrations of COPCs increased with depth or did not show decreasing concentrations with depth. The lateral extent of contamination is not defined because COPCs are detected or detected above BVs at locations on the periphery of the sites, and concentrations did not consistently decrease laterally.

3.0 SCOPE OF ACTIVITIES

3.1 Phase II Investigation at TA-02

3.1.1 Site Remediation and Proposed Sampling within the TA-02 Core Area

Site Remediation

The presence of elevated concentrations of some COPCs at TA-02 indicates that remediation is warranted in the following areas. The proposed confirmation sampling areas (1–14) are shown on Plate 3. Additional confirmation samples may be collected at the excavation sites if the excavation area is larger than anticipated. Table 3.1-1 provides a summary of the proposed sampling locations and depths, the objectives each sample addresses, and the proposed analytical suites. Confirmation samples will be analyzed only for the COPCs identified in the investigation report that pose a potentially unacceptable risk to human health.

- AOC 02-004(a): The concentration of benzo(a)pyrene exceeded the industrial soil screening level (SSL) and concentrations of other polycyclic aromatic hydrocarbons (PAHs) (benzo[a]anthracene; benzo[b]fluoranthene; and benzo[g,h,i]perylene) were elevated at the surface at location 02-600580. The surface soil at this location (1 on Plate 3) will be excavated to approximately 3 ft bgs. Because PAHs are not readily detected by field-screening methods, preexcavation sampling will be conducted to further define lateral extent. These samples will be collected from two depths 4 ft to the north, south, east, and west of location 02-600580. Obvious geographic features, such as drainages and sediment accumulation, may be used to modify the step-out sampling design and/or removal. Following removal, two confirmation samples will be collected: one at the bottom of the excavation and the other 2 ft deeper. Additional confirmation samples will be collected if lateral and vertical extent are not adequately defined by the preexcavation samples. An additional sample (from 2007) remains at 11–16 ft bgs.
- AOC 02-004(f): Concentrations of Aroclor-1254 and Aroclor-1260 exceeded 1 mg/kg at the surface at locations 02-600469, 02-600470, 02-600474, and 02-600567. The surface soil at these locations (2–5 on Plate 3) will be excavated to approximately 4 ft bgs. PCB test kits may be used in the field to further define the extent of soil contamination requiring removal. Confirmation samples will be collected at a minimum of five locations, two depths each, and submitted for fixed laboratory analysis for PCBs. One sampling location will be within the footprint of the excavation, and the remaining locations will be stepped out in four directions from the excavation. Additional confirmation samples may be collected if the excavation area is larger than anticipated.
- AOC 02-010: Concentrations of cesium-137 exceeded the industrial screening action level (SAL) at the surface at locations 02-600636 and 02-600640. The surface soil at these locations (6 and 7 on Plate 3) will be excavated to approximately 2 ft bgs. Field-screening instruments will be used to guide the removal. Confirmation samples will be collected at a minimum of five locations, two depths each, at each excavated area and submitted for fixed laboratory analysis for cesium-137. One sampling location will be within the footprint of the excavation, and the remaining locations will be stepped out in four directions from the excavation.
- AOC 02-011(a): Concentrations of Aroclor-1254 and Aroclor-1260 exceeded 1 mg/kg at locations 02-600385, 02-600386, 02-600406, 02-600449, 02-600450, and 02-600664. The concentration of benzo(a)pyrene exceeded the industrial SSL at the surface at location 02-600532. Soil at locations 02-600385 (8 on Plate 3), 02-600386 (9 on Plate 3), and 02-600449 (11 on Plate 3) will be excavated to approximately 4, 7, and 6 ft bgs, respectively. Soil at locations 02-600406 (10 on Plate 3), 02-600450 (12 on Plate 3), 02-600664 (13 on Plate 3), and 02-600532 (14 on Plate 3)

will be excavated to approximately 2 ft bgs. Preexcavation sampling or PCB test kits may be used, as applicable, to define lateral extent of soil contamination requiring removal, as described above for AOCs 02-004(a) and 02-004(f). Confirmation sampling will also be conducted as described above.

Proposed Sampling

The vertical and lateral extent have not been defined for TAL metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOCs, and radionuclides (americium-241, cesium-137, cobalt-60, isotopic plutonium, isotopic uranium, strontium-90, and tritium) for each individual site at TA-02. A reevaluation of the data indicated further sampling for some COPCs was not warranted. For VOCs, 227 of 41,598 VOC results were detects (0.5%), with a maximum concentration of 0.133 mg/kg; 91% of the detects were at or below the estimated quantitation limits (EQLs). Nitrate and perchlorate were detected at low concentrations across much of the site (90% of detected nitrate concentrations were less than 5 mg/kg, within the expected range of naturally occurring nitrate; 99% of detected perchlorate concentrations were less than 0.05 mg/kg). Therefore, proposed sampling suites do not include VOCs, nitrate, or perchlorate.

The sampling plan has been developed for all the canyon sites at TA-02 as a group. The north and south sides of the investigation area are bounded by the steep slopes of Los Alamos Canyon, with limited areas available for sampling. The proposed sampling locations will extend to the west near the boundary of TA-41, to the east near the boundary of TA-53, and extend upslope on both canyon walls to define lateral extent. Borehole locations are also proposed within the main TA-02 site boundaries to define vertical extent as necessary. Proposed sampling locations are shown on Plate 2 and Plate 3. Table 3.1-1 provides a summary of the proposed sampling locations and depths, the objectives each sample addresses, and the proposed analytical suites.

Vertical extent near former TA-02 structures. A total of 24 locations (15–38 on Plate 3) will be sampled across the core area of the former TA-02 facilities to define the vertical extent of contamination. The proposed locations are either (1) within the footprint of a SWMU/AOC or overlapping sites, or (2) in the area of previous sampling locations for a SWMU/AOC or overlapping sites, or (3) between two adjacent sites. These locations are used to define vertical extent for individual sites as needed and are also used to define vertical extent of the sites located in the canyon as a whole. They will be drilled to a total depth (TD) of 50 ft bgs and sampled at 5.0–6.0, 15.0–16.0, 25.0–26.0, 35.0–36.0, and 49.0–50.0 ft bgs, unless refusal is encountered more than twice at a given location. In the case of repeated refusal, the maximum achievable depth will be sampled.

- Location 15 will be at the northwest corner of the TA-02 structures where the former OWR equipment building was located. This location will define the vertical extent for that portion of AOC 02-004(f) and AOC 02-011(c). Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium.
- Location 16 will be where AOCs 02-004(b–e) and AOC 02-011(d) are collocated. This location will define the vertical extent for these sites. Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium.
- Location 17 will be near SWMU 02-004(g). This location will define the vertical extent of this SWMU. Based on previous investigation results, samples will be analyzed for TAL metals, PCBs,

SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, strontium-90, and tritium.

- Location 18 will be near AOC 02-011(a)(i–iii,v). This location will define the vertical extent of this AOC. Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium.
- Location 19 will be to the west of the former main reactor building (02-1) footprint to define the vertical extent of contamination for AOC 02-011(a)(iv) and the acid waste line associated with AOCs 02-004(a,f). Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium.
- Location 20 will be near the drainline of AOC 02-006(e) and storm drains of AOC 02-011(a)(vii,viii) to define the vertical extent of contamination. Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, and tritium.
- Location 21 will be near SWMU 02-006(b) and AOC 02-012 to define the vertical extent of contamination. Based on previous investigation results, samples will be analyzed for TAL metals, PCBs, TPH-DRO, SVOCs, isotopic plutonium, isotopic uranium, strontium-90, and tritium.
- Location 22 will be near AOC 02-011(a)(ix) and the southern portion of AOC 02-006(c) to define the vertical extent of contamination. Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium.
- Locations 23 through 26 will be within the west, middle, northeast, and southeast portions of the main reactor building (02-1) footprint to define the vertical extent of contamination for AOC 02-004(a). Based on previous investigation results, samples will be analyzed for TAL metals, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium.
- Location 27 will be within AOC 02-009(d), the northwest portion of AOC 02-003(a), and at the north portion of AOC 02-011(a)(x) to define vertical extent. Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.
- Location 28 will be at AOC 02-010 and near part of AOC 02-006(c) to define vertical extent. Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, americium-241, gamma-emitting radionuclides, isotopic uranium, strontium-90, and tritium.
- Location 29 will be between AOC 02-008(c)(ii) and the outfall of AOC 02-011(a)(x) to define vertical extent in that area. Based on previous investigation results, samples will be analyzed for TAL metals, hexavalent chromium, PCBs, SVOCs, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and tritium.
- Location 30 will be at SWMU 02-009(b) to define vertical extent. Based on previous investigation results, samples will be analyzed for TAL metals, PCBs, SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.
- Location 31 will be at the former stack house (structure 02-19) where vent gas lines converged and diverged. This location will define the vertical extent for AOCs 02-003(a,e) and AOC 02-011(b). Based on previous investigation results, samples will be analyzed for TAL

metals, PCBs, SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.

- Location 32 will be near AOCs 02-003(b), 02-008(c)(i), 02-011(b), and SWMU 02-007 to define vertical extent at these sites. Based on previous investigation results, samples will be analyzed for TAL metals, PCBs, SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.
- Locations 33, 34, and 35 will be at the western, central, and eastern portions at SWMU 02-009(c) to define vertical extent. Based on previous investigation results, samples will be analyzed for TAL metals, PCBs, SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.
- Location 36 will be between AOC 02-003(c) and the southern part of SWMU 02-009(c) to define vertical extent in that area. Based on previous investigation results, samples will be analyzed for TAL metals, PCBs, SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.
- Locations 37 and 38 will be at SWMU 02-009(a) to define vertical extent. Based on previous investigation results, samples will be analyzed for TAL metals, PCBs, SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.
- Location 46 will be placed near previous location 02-600218 at AOC 02-003(d) to define the vertical extent of TAL metals. Samples at this location will be analyzed for TAL metals, cyanide (total), hexavalent chromium, PCBs, SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, tritium, moisture, and pH. This location also will be used for definition of lateral extent for the TA-02 core area, as discussed below.

Lateral extent for TA-02 core area. A total of 24 locations (39–59 and 68–70 on Plate 2) will be sampled surrounding the TA-02 core area, including to the west toward the boundary of TA-41, and to the east toward the boundary of TA-53/TA-21. These locations will be no more than 150 ft apart. Samples will be collected at 0–0.5, 4.0–5.0, and 9.0–10.0 ft bgs, unless refusal is encountered more than twice at a given location. In the case of repeated refusal, the maximum achievable depth will be sampled. Samples will be analyzed for TAL metals, cyanide (total), hexavalent chromium, PCBs, SVOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium.

3.1.2 Site Remediation and Proposed Sampling at SWMU 02-005

Sampling was conducted in 2007 at SWMU 02-005, which consists of an area potentially affected by airborne drift of potassium dichromate used to inhibit corrosion in the OWR cooling tower. The COPCs identified in the investigation report (LANL 2008, 102093) include TAL metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOC, americium-241, cesium-137, plutonium-239/240, and tritium.

Site Remediation

Although not cited in the investigation report, the presence of elevated concentrations of Aroclor-1260 (1.42 mg/kg) at location 02-600561 within SWMU 02-005 indicates that remediation is warranted. The area around location 02-600561 (60 on Plate 2) will be excavated to a depth of approximately 1 ft bgs to remove Aroclor-1260 contamination. PCB test kits may be used in the field to further define the extent of soil contamination requiring removal. Confirmation samples will be collected at a minimum of five locations, two depths each, and submitted for fixed laboratory analysis for PCBs. One sampling location will be within the footprint of the excavation, and the remaining locations will be stepped out in four

directions from the excavation. Additional confirmation samples may be collected if the excavation area is larger than anticipated. Because location 60 will define the vertical extent of Aroclor-1260 and the lateral extent for SWMU 02-005, samples for this location only will be analyzed for TAL metals and previously detected radionuclides as well as PCBs. The proposed confirmation sampling area is shown on Plate 2. Table 3.1-2 provides a summary of the proposed sampling location and depths, the objectives each sample addresses, and the proposed analytical suites.

Proposed Sampling

A total of 16 locations were sampled, as shown on Plate 2 (locations 02-600547–02-600562). The identification of COPCs and evaluation of nature and extent of contamination are discussed in the investigation report, Appendix F, section F-2.11 (LANL 2008, 102093). Figures F-2.11-1 through F-2.11-3 show concentrations of COPCs detected or detected above BVs or fallout values (FVs), with data presented in Tables F-2.11-1 through F-2.11-3.

Cyanide (total) was detected only once at 0.547 mg/kg (Table F-2.11-1). Hexavalent chromium, nitrate, and perchlorate were detected at six or more locations, with maximum concentrations at 1.06, 4.74, and 0.00253 mg/kg, respectively (Table F-2.11-1). Aroclor-1254 and Aroclor-1260 were detected with concentrations less than 0.0094 mg/kg (Table F-2.11-2), except at locations 02-600559 and 02-600561. A few PAHs and toluene were detected with concentrations less than 0.0182 mg/kg (Table F-2.11-2). These distributions and concentrations are not indicative of operational releases and do not warrant further investigation. Therefore, proposed sampling suites do not include cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs (except at locations 02-600559 and 02-600561), SVOCs, and VOCs.

A total of nine locations (proposed sampling locations 40 and 60–67) will be sampled to define the extent of air-dispersed contamination related to SWMU 02-005 (see Tables 3.1-1 and 3.1-2).

- At location 02-600559, at 2.0–2.5-ft depth, concentrations of Aroclor-1260 increased with depth to 0.513 mg/kg; concentrations of plutonium-239/240 increased with depth (from 1.6 pCi/g to 6.8 pCi/g). Location 40 (on Plate 2) will be near previous location 02-600559 to define the vertical extent of Aroclor-1260 and plutonium-239/240 as well as lateral extent for SWMU 02-005.
- A total of 8 locations will be sampled on the south-facing slope (60–67 on Plate 2). These locations will be farther north than the previous sampling locations for SWMU 02-005 in order to define lateral extent. Samples will be collected at 0–0.5 and 1.5–2.5 ft. Samples will be analyzed for TAL metals and radionuclides detected previously (americium-241, gamma-emitting radionuclides, isotopic plutonium, and tritium).

3.1.3 Extent of Contamination and Proposed Sampling at SWMU 02-006(a)

Sampling was conducted at SWMU 02-006(a) in 2003 and 2007. The COPCs identified in the investigation report (LANL 2008, 102093) include TAL metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, VOCs, cesium-137, plutonium-239/240, strontium-90, tritium, and uranium-235.

A total of 20 locations were sampled previously, as shown on Plate 2 and in Figure 3.1-1 (locations 02-600255–02-600258). Data from the four boreholes on the periphery of the site were compared with the data from the 16 central locations for evaluation of lateral extent. The identification of COPCs and evaluation of nature and extent of contamination are discussed in the investigation report (LANL 2008, 102093, Appendix F, section F-2.12). Figures F-2.12-1 through F-2.12-3 show concentrations of COPCs detected or detected above BVs or FVs with data presented in Tables F-2.12-1 through F-2.12-3.

The extent of inorganic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-2.12.1, Figure F-2.12-1, and Table F-2.12-1).

- The lateral and vertical extent for nitrate are defined, and lateral extent is defined for cyanide (total).
- Lateral extent is not defined for TAL metals (barium, lead, selenium, and zinc), hexavalent chromium, or perchlorate.
- Vertical extent is not defined for cyanide (total) at location 02-600258 but is defined at the central locations.
- Vertical extent is not defined for TAL metals at locations 02-22054 through 02-22059, as described in the investigation report. However, upon reevaluation of the data, the deepest sample at locations 02-22054 through 02-22059 is at 12 ft bgs. Newer samples collected within lateral distances of 10–15 ft (locations 02-600247–02-600254) were as deep as 23.5 ft bgs, and vertical extent is defined for TAL metals at these newer locations. Therefore, vertical extent is defined for TAL metals at SWMU 02-006(a).
- Vertical extent is not defined for hexavalent chromium at the central locations or at locations 02-600256 and 02-600258. Although the vertical extent is not defined at some locations, the concentrations were very low (<0.1 mg/kg), except at location 02-600258 where it was detected at 0.41 mg/kg in the deepest sample. Additional sampling for hexavalent chromium is not warranted except at location 02-600258.
- Vertical extent is not defined for perchlorate at the central locations or at location 02-600255, as described in the investigation report. However, concentrations of perchlorate were generally at or below the EQL, do not appear to be the result of a release from the site, and do not warrant additional sampling to determine its extent.

The extent of organic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-2.12.3, Figure F-2.12-2, and Table F-2.12-2). Few organic chemicals were detected at SWMU 02-006(a), and they do not appear to be the result of a release from the site.

- PCBs were detected at very low concentrations (<0.011 mg/kg). No additional sampling for PCBs is warranted.
- Three VOCs (1,4-dichlorobenzene; trichloroethene; and toluene) were detected. However, these organic chemicals were detected infrequently and at very low concentrations (<0.00033 mg/kg), generally at or below the EQLs. No additional sampling for VOCs is warranted.

The extent of radionuclide contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-2.12.4, Figure F-2.12-3, and Table F-2.12-3).

- The lateral and vertical extent for tritium are not defined.
- Lateral extent is not defined for uranium-235; however, it was detected above BV at only five locations and at concentrations less than 0.15 pCi/g, which is only slightly above its BV. Additional sampling for uranium-235 is not warranted.
- Vertical extent is not defined for cesium-137 and strontium-90 at the central locations that were sampled in 2003. Vertical extent was described as not defined in the investigation report. However, upon reevaluation of the data, the deepest sample at these locations was at 12 ft bgs. Newer samples collected within lateral distances of 10–15 ft (locations 02-600247–02-600254)

were as deep as 23.5 ft bgs, and vertical extent is defined for cesium-137 and strontium-90 at those newer locations. Therefore, vertical extent is defined for cesium-137 and strontium-90 at SWMU 02-006(a).

Based on the data needs described above, the proposed sampling includes a central location and step-out locations. These proposed sampling locations are shown in Figure 3.1-1. Table 3.1-3 provides a summary of the proposed sampling locations, depths, the objectives each sample addresses, and the proposed analytical suites.

- Proposed location 1 will be in the central area of the site. It will be drilled to a TD of 50 ft bgs and sampled at depths of 5.0–6.0, 15.0–16.0, 25.0–26.0, 35.0–36.0, and 49.0–50.0 ft bgs. Samples will be analyzed for tritium.
- Proposed location 2 will be 5 ft downgradient from previous location 02-600258. Vertical extent is not defined for cyanide (total), hexavalent chromium, and tritium at 21.7 ft bgs at location 02-600258. Location 2 will be drilled to a TD of 50 ft bgs and sampled at depths of 25.0–26.0, 35.0–36.0, and 49.0–50.0 ft bgs. Samples will be analyzed for cyanide (total), hexavalent chromium, and tritium.
- A total of 11 locations will step out from previous sampling locations (locations 3–13). The 11 locations will be drilled to a TD of 50 ft bgs and sampled at depths of 0–0.5, 5.0–6.0, 15.0–16.0, 25.0–26.0, 35.0–36.0, and 49.0–50.0 ft bgs. These samples will be analyzed for TAL metals and tritium.

3.2 Phase II Investigation at TA-21

3.2.1 Plutonium Contamination at Consolidated Unit 21-006(e)-99

The concentration of plutonium-239/240 exceeds the construction worker SAL of 36 pCi/g at two locations within Consolidated Unit 21-006(e)-99 (21-602919 and 21-602925) but is below the industrial SAL of 210 pCi/g. The site is adjacent to sites that are under investigation as part of the DP Site Aggregate Area. As the regulating authority for radionuclides, DOE will determine any corrective action that may be warranted once all DP Site Aggregate Area investigations are complete. If intrusive construction activities are conducted at this site, appropriate controls will be established to ensure that DOE radiological protection standards are met.

3.2.2 Extent of Contamination and Proposed Sampling at Consolidated Unit 21-006(e)-99

Sampling was conducted at Consolidated Unit 21-006(e)-99 in 2007. The COPCs identified in the investigation report (LANL 2008, 102093) included TAL metals, cyanide (total), nitrate, PCBs, SVOCs, VOCs, americium-241, cesium-134, cesium-137, plutonium-238, plutonium-239/240, tritium, uranium-234, and uranium-235.

A total of 15 locations were sampled in 2007, as shown in Figure 2.2-1. The identification of COPCs and evaluation of nature and extent of contamination are discussed in Appendix F of the investigation report, section F-3.1 (LANL 2008, 102093). Figures F-3.1-1 through F-3.1-3 show concentrations of COPCs detected or detected above BVs or FVs with data presented in Tables F-3.1-1 through F-3.1-3. Appendix C of this work plan provides examples of three-dimensional figures used to help assess the extent of contamination at Consolidated Unit 21-006(e)-99.

The extent of inorganic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.1.1, Figure F-3.1-1, and Table F-3.1-1).

- The lateral and vertical extent for cyanide (total) and perchlorate are defined.
- Lateral extent is not defined for TAL metals (barium, chromium, magnesium, manganese, and mercury to the south and east; lead and zinc to the northwest).
- Lateral extent is not defined for nitrate to the west. However, the concentrations of nitrate are low (<5 mg/kg) and within the expected range of naturally occurring nitrate. Further sampling for nitrate is not warranted.
- Vertical extent is not defined for TAL metals.

The extent of organic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.1.3, Figure F-3.1-2, and Table F-3.1-2).

- The lateral and vertical extent are not defined for PCBs (Aroclor-1254 and Aroclor-1260). PCBs were analyzed in only one sample at 12.0–13.0 ft at location 21-602919 and were detected.
- As presented in the investigation report, lateral and vertical extent are not defined for PAHs and VOCs at some locations because they did not show clear decreasing trends with depth or were detected only in the deepest sample at a location. However, the PAHs and VOCs were detected at very low concentrations (most concentrations were <0.5 mg/kg). Most of the sampling results for PAHs and VOCs are at or below the EQL. These concentrations do not indicate a release from the site and do not warrant additional sampling for PAHs or VOCs.

The extent of radionuclide contamination is summarized below (see investigation report, LANL 2008, 102093, Appendix F, section F-3.1.4, Figure F-3.1-3, and Table F-3.1-3).

- Lateral extent is not defined for americium-241, isotopic plutonium, or isotopic uranium to the east of locations 21-602923 and 21-602927 and north of location 21-602919. Lateral extent is defined for these radionuclides to the west and south.
- Tritium was detected only at locations 21-602919 and 21-602921. Concentrations increased with depth at location 21-602921 (maximum concentration of 2.39 pCi/g at 12–13 ft bgs). Vertical and lateral extent are not defined for tritium at this localized area.
- Vertical extent is not defined for isotopic plutonium and isotopic uranium.

Based on the data needs described above, the proposed sampling locations include the following.

- Proposed locations 1 and 2 will be in the northwest and southeast portions of the area previously sampled to define vertical extent (Figure 3.2-1). They will be drilled to a TD of 25 ft and sampled at 5.0–6.0, 15.0–16.0, and 24.0–25.0 ft. Samples will be analyzed for TAL metals, PCBs, isotopic plutonium, isotopic uranium, and tritium.
- A total of five locations (3–7) will step out from previous sampling locations to define lateral extent of TAL metals, americium-241, isotopic plutonium, and isotopic uranium, and to define the vertical extent of TAL metals, isotopic plutonium, and isotopic uranium. They will be drilled to a TD of 25 ft and sampled at 5.0–6.0, 15.0–16.0, and 24.0–25.0 ft. Samples will be analyzed for TAL metals, PCBs, americium-241, isotopic plutonium, and isotopic uranium.

The proposed sampling locations are shown in Figure 3.2-1. Table 3.2-1 provides a summary of the proposed sampling locations and depths, the objectives each sample addresses, and the proposed analytical suites.

3.2.3 Extent of Contamination and Proposed Sampling at AOC 21-028(c)

Sampling was conducted at AOC 21-028(c) in 2007. The COPCs identified in the investigation report (LANL 2008, 102093) include metals, cyanide (total), nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, plutonium-238, plutonium-239/240, tritium, uranium-234, and uranium-235.

A total of 17 locations were sampled in 2007 (LANL 2008, 102093). Figure 2.2-1 shows that five locations are on the north side, which were designed for extent of one storage area; seven locations are on the east side, which were designed for extent of another storage area; and five locations are on the southeast side, which were designed for extent of two closely located storage areas.

The extent of contamination is summarized, based on the three clusters of previous sampling locations. The identification of COPCs and evaluation of nature and extent of contamination are discussed in the investigation report, Appendix F, section F-3.2 (LANL 2008, 102093). Figures F-3.2-1 through F-3.2-3 show concentrations of COPCs detected or detected above BVs or FVs with data presented in Tables F-3.2-1 through F-3.2-3. Appendix C of this work plan provides examples of three-dimensional figures used to help assess the extent of contamination at AOC 21-028(c).

North Side

Locations 21-601066 through 21-601070 are on the north side of the site (Figure 2.2-1).

The extent of inorganic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.1, Figure F-3.2-1, and Table F-3.2-1).

- The lateral and vertical extent are defined for cyanide (total).
- Lateral extent is not defined for TAL metals, nitrate, and perchlorate. Vertical extent is not defined for nitrate because there are no clear trends in concentration with depth. However, nitrate falls within the expected range of naturally occurring nitrate (<5 mg/kg), and perchlorate was detected at or below the EQL in this area. No additional sampling for nitrate or perchlorate is proposed.
- Vertical extent is not defined for TAL metals because concentrations of some metals increase (antimony) or show no clear decreasing trend (barium, chromium) with depth.

The extent of organic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.3, Figure F-3.2-2, and Table F-3.2-2).

- Lateral and vertical extent are not defined for PCBs (Aroclor-1254 and Aroclor-1260), which were analyzed only in one sample at location 21-601070 and were detected.
- As presented in the investigation report, lateral and vertical extent of PAHs and VOCs are not defined. However, PAHs and VOCs were detected at very low concentrations (PAHs <0.2 mg/kg; VOCs <0.005 mg/kg) at or near their EQLs. These concentrations do not indicate a release from the site, and no additional sampling for PAHs or VOCs is proposed.

The extent of radionuclide contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.4, Figure F-3.2-3, and Table F-3.2-3).

- The lateral and vertical extent for cesium-137, isotopic uranium, and tritium are defined.
- Lateral extent is not defined for americium-241 or isotopic plutonium. Vertical extent is defined for americium-241.
- Vertical extent is not defined for isotopic plutonium at location 21-601066.

Based on the data needs described above, the following sampling is proposed for the north side of AOC 21-028(c).

- Proposed location 1 (Figure 3.2-2) will be 5 ft away from previous location 21-601066. It will be drilled to a TD of 25 ft bgs and sampled at 5.0–6.0, 15.0–16.0, and 24.0–25.0 ft bgs. Samples will be analyzed for TAL metals, PCBs, and isotopic plutonium.
- Proposed locations 2 through 5 (Figure 3.2-2) will step out from previous sampling locations. They will be drilled to a TD of 25 ft bgs and sampled at 5.0–6.0, 15.0–16.0, and 24.0–25.0 ft bgs. Samples will be analyzed for TAL metals, PCBs, americium-241, and isotopic plutonium.

The proposed sampling locations are shown in Figure 3.2-2. Table 3.2-2 provides a summary of the proposed sampling locations and depths, the objectives each sample addresses, and the proposed analytical suites.

East Side

Locations 21-601071 through 21-601077 are on the east side of the site (Figure 2.2-1).

The extent of inorganic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.1, Figure F-3.2-1, and Table F-3.2-1).

- The lateral and vertical extent for cyanide (total) and perchlorate are defined.
- Lateral and vertical extent are not defined for TAL metals or nitrate. Nitrate, however, was detected only at low concentrations (< 0.4 mg/kg) at this area. No additional sampling for nitrate is warranted.

The extent of organic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.3, Figure F-3.2-2, and Table F-3.2-2).

- Lateral and vertical extent of PAHs and VOCs are not defined. However, PAHs and VOCs were detected only at very low concentrations (PAHs <0.1 mg/kg; VOCs <0.001 mg/kg) at or below the EQLs. These concentrations do not indicate a release, and no additional sampling for PAHs or VOCs is proposed.
- Lateral and vertical extent of PCBs are not defined because no samples in this area were analyzed for PCBs.

The extent of radionuclide contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.4, Figure F-3.2-3, and Table F-3.2-3 in the).

- The lateral and vertical extent for cesium-137, isotopic uranium, and tritium are defined.

- Lateral extent is not defined for americium-241 and isotopic plutonium to the north, west, east, and southeast. However, lateral extent of americium-241 and isotopic plutonium to the northwest, southwest, and south is defined by DP Site Aggregate Area locations 21-601120, 21-601117, 21-601129, and 21-601116 of Consolidated Unit 21-023(a)-99. Data for DP site locations are presented in Figure 6.5-12 in the "Delta Prime Site Aggregate Area Investigation Report, Revision 1" (LANL 2008, 102760).
- Vertical extent is not defined for americium-241 at location 21-601072.
- Vertical extent is not defined for plutonium-239/240 at location 21-601073.

Based on the data needs described above, the following sampling is proposed for the east side of AOC 21-028(c).

- Proposed locations 6 through 9 and 14 (Figure 3.2-2) will be drilled to a TD of 25 ft bgs and sampled at 5.0–6.0, 15.0–16.0, and 24.0–25.0 ft bgs. Samples will be analyzed for TAL metals, PCBs, americium-241, and isotopic plutonium.

The proposed sampling locations are shown in Figure 3.2-2. Table 3.2-2 provides a summary of the proposed sampling locations and depths, the objectives each sample addresses, and the proposed analytical suites.

Southeast Side

Locations 21-601078 through 21-601082 are on the southeast side of the site (Figure 2.2-1).

The extent of inorganic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.1, Figure F-3.2-1, and Table F-3.2-1).

- The lateral and vertical extent for cyanide (total) and perchlorate are defined.
- Lateral and vertical extent are not defined for TAL metals or nitrate. Nitrate, however, was detected only at low concentrations (<1 mg/kg) within the expected range for naturally occurring nitrate. No additional sampling for nitrate is warranted.
- Lateral extent is not defined for perchlorate to the west. However, perchlorate was detected only at very low concentrations (<0.007 mg/kg). These concentrations do not indicate a release, and no additional sampling for perchlorate is warranted.

The extent of organic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.3, Figure F-3.2-2, and Table F-3.2-2 in the 2007).

- Lateral and vertical extent of PAHs and VOCs are not defined. However, PAHs and VOCs were detected only at very low concentrations (PAHs <0.1 mg/kg, J-qualified; VOCs <0.02 mg/kg, J-qualified) at or near their EQLs. These concentrations do not indicate a release, and no additional sampling for PAHs or VOCs is warranted.
- Lateral and vertical extent of PCBs are not defined because no samples in this area were analyzed for PCBs.

The extent of radionuclide contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-3.2.4, Figure F-3.2-3, and Table F-3.2-3).

- The lateral and vertical extent for cesium-137 are defined.

- Lateral extent of americium-241 and isotopic plutonium is not defined to the west, south, and southeast. However, lateral extent of americium-241 and isotopic plutonium to the north and northeast are defined by DP site aggregate area locations 21-603015, 21-601118, 21-601130, 21-601117, 21-601129, and 21-601116 of Consolidated Unit 21-023(a)-99. Data for DP site locations are presented in Figure 6.5-12 of the revised DP site investigation report (LANL 2008, 102760).
- Vertical extent is not defined for americium-241 and isotopic plutonium.
- Lateral and vertical extent of isotopic uranium are not defined. However, the uranium isotopes were detected only slightly above their respective BVs and were nowhere greater than twice the BV. Uranium isotopes are naturally occurring, and these concentrations do not indicate a release. No additional sampling for uranium isotopes is warranted.
- Lateral and vertical extent of tritium are not defined to the south. However, tritium was detected infrequently and only at low concentrations (< 0.3 pCi/g). No additional sampling for tritium is warranted.

Based on the data needs described above, the following sampling is proposed for the southeast side of AOC 21-028(c).

- Proposed location 10 (Figure 3.2-2) will be in the center of the site. It will be drilled to a TD of 25 ft bgs and sampled at 5.0–6.0, 15.0–16.0, and 24.0–25.0 ft bgs. Samples will be analyzed for TAL metals, PCBs, americium-241, and isotopic plutonium.
- Proposed locations 11, 12, and 13 (Figure 3.2-2) will step out to the south from previous sampling locations. They will be drilled to a TD of 25 ft bgs and sampled at 5.0–6.0, 15.0–16.0, and 24.0–25.0 ft bgs. Samples will be analyzed for TAL metals, PCBs, americium-241, and isotopic plutonium. Location 7 of the east side sampling locations will be used to define lateral extent to the north of the southeast side sampling locations.

The proposed sampling locations are shown in Figure 3.2-2. Table 3.2-2 provides a summary of the proposed sampling locations and depths, the objectives each sample addresses, and the proposed analytical suites.

3.3 Phase II Investigation at TA-26

3.3.1 Extent of Contamination and Proposed Sampling at TA-26

Sampling was conducted at TA-26 in 2007. The COPCs identified in the investigation report (LANL 2008, 102093) include TAL metals, cyanide (total), nitrate, perchlorate, PCBs, SVOCs, VOCs, cesium-137, plutonium-238, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235, and uranium-238.

A total of 39 locations were sampled previously. Figure 2.3-1 shows that 18 locations are on the mesa top, and the other 21 locations are on the canyon slope or on a bench below the mesa top. The identification of COPCs and evaluation of nature and extent of contamination are discussed in the investigation report (LANL 2008, 102093), Appendix F, section F-4.1. Figures F-4.1-1 through F-4.1-3 show concentrations of COPCs detected or detected above BVs or FVs, with data presented in Tables-F-4.1-1 through F-4.1-3.

Mesa Top

The extent of contamination was evaluated based on results from the 18 locations on mesa top (26-600910–26-600920, 26-600924, 26-600925, 26-600927, 26-600928, 26-600929, 26-600773, and 26-600774).

The extent of inorganic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-4.1.1, Figure F-4.1-1, and Table F-4.1-1).

- The lateral and vertical extent for cyanide (total) are defined on the mesa top.
- Lateral and vertical extent are not defined for TAL metals on the mesa top. At location 26-600916, arsenic, copper, and lead either increase or do not show a clear trend with depth. Lead increases with depth (maximum 94.1 mg/kg) at location 26-600924.
- Nitrate was detected at concentrations mostly less than 5 mg/kg, and perchlorate was detected at very low concentrations with maximum value at 0.00191 mg/kg on mesa top. No additional sampling is warranted for nitrate and perchlorate on the mesa top.

Organic chemicals were detected infrequently and at very low concentrations on the mesa top (see the investigation report, LANL 2008, 102093, Appendix F, section F-4.1.3, Figure F-4.1-2, and Table F-4.1-2). While the vertical and lateral extent are not completely defined, all concentrations are at trace levels (<0.1 mg/kg) and do not indicate a release. No additional sampling is warranted for organic chemicals on the mesa top.

The extent of radionuclide contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-4.1.4, Figure F-4.1-3, and Table F-4.1-3).

- The lateral and vertical extent for americium-241, cesium-137, isotopic plutonium, and strontium-90 are defined on the mesa top.
- Lateral extent is not defined for tritium and isotopic uranium. Vertical extent is not defined for tritium and uranium-235. However, both tritium and isotopic uranium were detected at very low concentrations (maximum value for tritium is 0.507 pCi/g, and concentrations for isotopic uranium are all less than approximately twice the BVs) on the mesa top. No additional sampling is warranted for tritium and isotopic uranium on the mesa top.

Based on the data needs described above, the following sampling is proposed for the mesa top:

- Proposed location 1 (Figure 3.3-1) will be in the central area of previous locations on the mesa top. Locations 2 through 4 will step out from previous sampling locations on the mesa top. Locations 1 through 4 will be drilled to a TD of 25 ft bgs. Samples will be collected at 0–0.5, 5.0–6.0, 15.0–16.0, and 24.0–25.0 ft bgs and analyzed for TAL metals.

The proposed sampling locations are shown in Figure 3.3-1. Table 3.3-1 provides a summary of the proposed sampling locations and depths, the objectives each sample addresses, and the proposed analytical suites.

Canyon Slope

The extent of inorganic chemical contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-4.1.1, Figure F-4.1-1, and Table F-4.1-1).

- Lateral and vertical extent are not defined for TAL metals and nitrate on the canyon slope.

- The lateral extent of cyanide (total) is not defined in the downslope direction, where it was detected at two locations (26-600789 and 26-600790) at the extreme edge of the canyon slope above the cliff that drops into Los Alamos Canyon. However, the concentrations were very near the BV of 0.5 mg/kg, and no cyanide was detected in deeper samples at either location. Therefore, additional sampling for cyanide on the canyon slope is not warranted.
- The vertical extent of perchlorate is not defined at two locations on the canyon slope (locations 26-600277 and 26-600781). The concentrations of perchlorate, however, are at or near the EQL and are not indicative of a release. No additional sampling for perchlorate is proposed on the canyon slope.

Organic chemicals were detected at very low concentrations and infrequently on the canyon slope (see the investigation report, LANL 2008, 102093, Appendix F, section F-4.1.3, Figure F-4.1-2, and Table F-4.1-2). All concentrations are at trace levels (<0.1 mg/kg) and do not indicate a release. No additional sampling is warranted for organic chemicals on canyon slope.

The extent of radionuclide contamination is summarized below (see the investigation report, LANL 2008, 102093, Appendix F, section F-4.1.4, Figure F-4.1-3, and Table F-4.1-3).

- The lateral and vertical extent for americium-241 and strontium-90 are defined on the canyon slope.
- Lateral extent is not defined for cesium-137 on the canyon slope.
- Lateral and vertical extent are not defined for tritium. Although tritium was detected frequently, it was detected at very low concentrations (<1 pCi/g). No additional sampling is warranted on the canyon slope.
- Lateral extent is defined for isotopic uranium. Vertical extent is not defined for uranium-235 at two locations (26-600929 and 26-600791). It was detected less than twice the BV at both locations. Uranium-235 is naturally occurring, and these concentrations do not indicate a release. Therefore, no additional sampling for uranium-235 is warranted on the canyon slope.
- According to the investigation report, the extent of isotopic plutonium is not defined at TA-26. However, plutonium-239/240 was detected at only three locations and plutonium-238 was detected at only one location. All locations are surrounded laterally and vertically by samples with no detected plutonium isotopes. Therefore, further sampling for isotopic plutonium at TA-26 is not proposed.

Based on the data needs described above, the following sampling is proposed for the canyon slope:

- Locations 5 through 10 (Figure 3.3-1) will step out from the previous sampling locations on the canyon slope. Location 11 will be downslope from previous locations 26-600777 and 26-600778 because nitrate was detected (maximum concentration 50.6 mg/kg) at location 26-600778 and increased with depth at location 26-600777 (Table F-4.1-1 and Figure F-4.1-1 [3 of 4] of the investigation report [LANL 2008, 102093]). Locations 12 and 13 will be sampled downslope from locations 26-600789 through 26-600792. All TA-26 samples will be collected at 0–0.5, 5.0–6.0, 9.0–10.0 ft bgs and analyzed for TAL metals, nitrate, and gamma-emitting radionuclides (cesium-137).

The proposed sampling locations are shown in Figure 3.3-1. Table 3.3-1 provides a summary of the proposed sampling locations and depths, the objectives each sample addresses, and the proposed analytical suites.

3.4 Investigation-Derived Waste Management

Investigation-derived waste (IDW) generated as a result of field investigation activities may include, but is not limited to, drill cuttings, excavated soil, contaminated personal protective equipment, and miscellaneous materials used during dry decontamination of sampling equipment (e.g., paper towels and nitrile gloves). IDW generated during the Phase II investigation at these sites will be managed to protect human health and the environment, comply with applicable U.S. Environmental Protection Agency (EPA) and NMED regulations, DOE orders, and Laboratory implementation requirements, and will adhere to Laboratory waste-minimization goals. The management of IDW is described in Appendix B of this work plan.

4.0 INVESTIGATION METHODS

The following sections describe the field methods to be used in implementing this work plan. Table 4.0-1 lists applicable and standard operating procedures (SOPs). The most current versions of all and SOPs will be used. The investigation methods to be used for field activities are summarized in Table 4.0-2.

4.1 Excavation

Excavation will be completed using a standard backhoe. Excavations will be visually logged for evidence of nonnative materials, disturbed bedding horizons, and areas of visible staining. Elevated radiological or organic vapor field-screening results will be documented. Excavation will advance from the ground surface to remove material in lifts until the specified depth is reached.

Excavations will be backfilled with clean fill material obtained from an off-site source. All affected surfaces will be restored to the approximate original grade and condition and reseeded with a native seed mix as appropriate for unpaved areas. Any paved areas will be patched as appropriate after backfilling.

4.2 Geodetic Survey

A geodetic survey will be conducted with a Trimble 5700 (or equivalent) global positioning system to obtain coordinates of all sampling locations. The survey method is described in Table 4.0-2. The surveyed coordinates for all sampling locations will be uploaded into the EP geographic information system database and presented in the investigation report. Geodetic surveying will be performed in accordance with EP-ERSS-SOP-5028, Coordinating and Evaluating Geodetic Surveys (or a technically equivalent subcontractor procedure).

4.3 Collection of Soil and Rock Samples

Surface and shallow subsurface samples will be collected using a stainless-steel hand auger in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler (or technically equivalent subcontractor procedure). A stainless-steel scoop and bowl will be used to homogenize the samples, which will be transferred to sterile sample collection jars or bags for transport to the Sample Management Office (SMO).

Subsurface samples will be 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 (or technically equivalent subcontractor procedure). The drill rig may also be used to collect samples from depths and from areas where the hand-auger method meets refusal or is impractical. However, several of the proposed sampling locations will be inaccessible by drill rig and will

require hand-sampling methods. Regardless of sampling method, at least three attempts will be made to reach target sampling depths at a given location.

If alluvial or shallow groundwater is encountered during drilling of characterization holes, the saturated interval will be sealed (e.g., using a temporary surface casing or other appropriate technique) to allow continuation of the hole without transporting water into the deeper intervals. If possible, the saturated zone will be sampled as planned before placing any casing in the hole. If sampling is not possible because of saturated conditions, the planned samples will be collected at the first practicable depth below the saturated zone. Any deviations from planned sample intervals will be documented in the investigation report.

Quality assurance/quality control samples will include field duplicate samples collected in accordance with EP-ERSS-SOP-5059, Field Quality Control Samples. Field duplicate samples will be collected at a minimum rate of 1 per 10 regular samples. Rinsate blanks will also be collected at a minimum rate of 1 per 10 regular samples to confirm decontamination of sampling equipment. Field trip blank (FTB) samples will be collected with regular samples to be analyzed for VOCs, at a minimum rate of 1 FTB per day when VOC samples are being collected.

4.4 Field Screening of Soil and Rock Samples

Field screening of samples will be used both for health and safety purposes and for identification of conditions indicating potential contamination zones. Screening results may be used to adjust the personal protective equipment requirements for workers. If screening results indicate unexpected areas of radionuclide or VOC contamination, the proposed sample depths may be modified, or additional samples may be collected as appropriate and necessary to characterize the site.

Cores collected by split-spoon core barrel will be screened immediately upon opening the core barrel, and any visibly stained or discolored zones, fractures, or clay-rich weathered zones will be noted. Samples collected by spade-and-scoop or hand-auger methods will be screened in the collection bowl or sample container soon after the sample is collected. Screening values will be recorded in the appropriate spaces on the corresponding sample collection logs at the time of sample collection. If field-screening results are used to change the planned sample interval or to collect additional samples, the modification will be recorded on the appropriate sample collection log. Field-screening instruments will be checked at least daily for proper operation and checked at least daily against calibration standards as appropriate.

Samples will be field screened for gross-alpha radiation using a Model 139 rate meter or equivalent and for beta/gamma radiation using an Eberline Smart Portable-1 or equivalent. Radiological field screening of all samples will be conducted by Laboratory radiological control technicians (RCTs) using appropriately calibrated instruments. Calibration of radiological instruments will be performed and documented by the RCTs or the appropriate Laboratory organization.

Samples will be field screened for VOCs using a MiniRae 2000 (or equivalent) photoionization detector (PID) with an 11.7-electronvolt lamp. Calibration of the PIDs will be performed at least once each day during field activities. Daily calibration will be performed using a standard source of 100 parts per million isobutylene.

Because the concentrations of metals detected in the historical samples at most sites are low (near or below background), the x-ray fluorescence (XRF) instrument is not a useful guide to planned sample-collection activities because of the high XRF detection limits for target metals. Therefore, the XRF instrument will not be used to field screen surface and subsurface soil/rock samples.

4.5 Collection of Geotechnical Data

All characterization borings completed with a hollow-stem auger drill rig will be cored continuously to TD and will be geologically logged in accordance with the following procedures:

- American Society for Testing and Materials (ASTM) D2487, "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)"
- ASTM D2488, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)"

Information to be logged includes the lithologically apparent moisture, structural features, and core recovery compared with the interval drilled. Graphical borehole logs will be recorded as drilling proceeds and will be included in the investigation report.

4.6 Boring Abandonment

All boreholes greater than 20 ft deep will be abandoned by filling the hole with a bentonite/concrete mixture. The holes will be grouted from the bottom of the hole to the surface using a tremie pipe or other appropriate method. Shallow holes (0–20 ft) will be abandoned by placing hydrated bentonite chips in the hole up to 2–3 ft from the ground surface, followed by 2–3 ft of concrete or clean soil placed on top. If saturated zones are encountered during drilling, the abandonment method may be modified using surface casing or other methods as appropriate to prevent transport of water to greater depths. Boring abandonment will be performed in accordance with EP-ERSS-SOP-5034, Monitor Well and RFI Borehole Abandonment (or a technically equivalent subcontractor procedure).

4.7 Equipment Decontamination

Project personnel will decontaminate all sampling equipment before each sample is collected to avoid cross-contamination of samples. Residual material adhering to the equipment will be removed using dry decontamination methods, including wire-brushing and scraping (EP-ERSS-SOP-5061, Field Decontamination of Equipment). If equipment cannot be free-released following dry decontamination, wet decontamination methods will be used. If wet decontamination is required, the equipment will be pressure-washed on a temporary wash pad covered with a high-density polyethylene liner. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination solutions will be sampled and analyzed to determine final disposition of the wastewater and the effectiveness of the decontamination procedures. Equipment ready for demobilization will be surveyed by an RCT before it is released from the site.

5.0 MONITORING AND SAMPLING PROGRAM

Groundwater monitoring is currently performed downgradient of TA-02 as part of the integrated sitewide groundwater monitoring program (LANL 2008, 101897). No groundwater monitoring is proposed as part of the activities included in this work plan. No monitoring is proposed for sites at TA-21 and TA-26.

6.0 SCHEDULE

The date for submitting the "Phase II Investigation Work Plan for Middle Los Alamos Canyon Aggregate Area, Revision 1" to NMED is February 27, 2009. Administrative activities, including contract award, will begin after NMED has approved the Phase II work plan. Administrative activities are anticipated to take

approximately 120 d. Field-activity preparation and implementation will begin once a contract is in place. Field preparation is anticipated to require approximately 90 d. Implementation of this work plan is anticipated to require 180 d, including confirmation sampling and waste management. Investigation results from analytical laboratories are expected to be received 60 d after final site demobilization, at which time report preparation will begin. Based on this schedule, the Middle Los Alamos Canyon Aggregate Area Phase II investigation report will be submitted 24 mo after NMED approves this work plan.

7.0 REFERENCES AND MAP DATA SOURCES

7.1 References

The following list includes all documents cited in this work plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

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7.2 Map Data Sources

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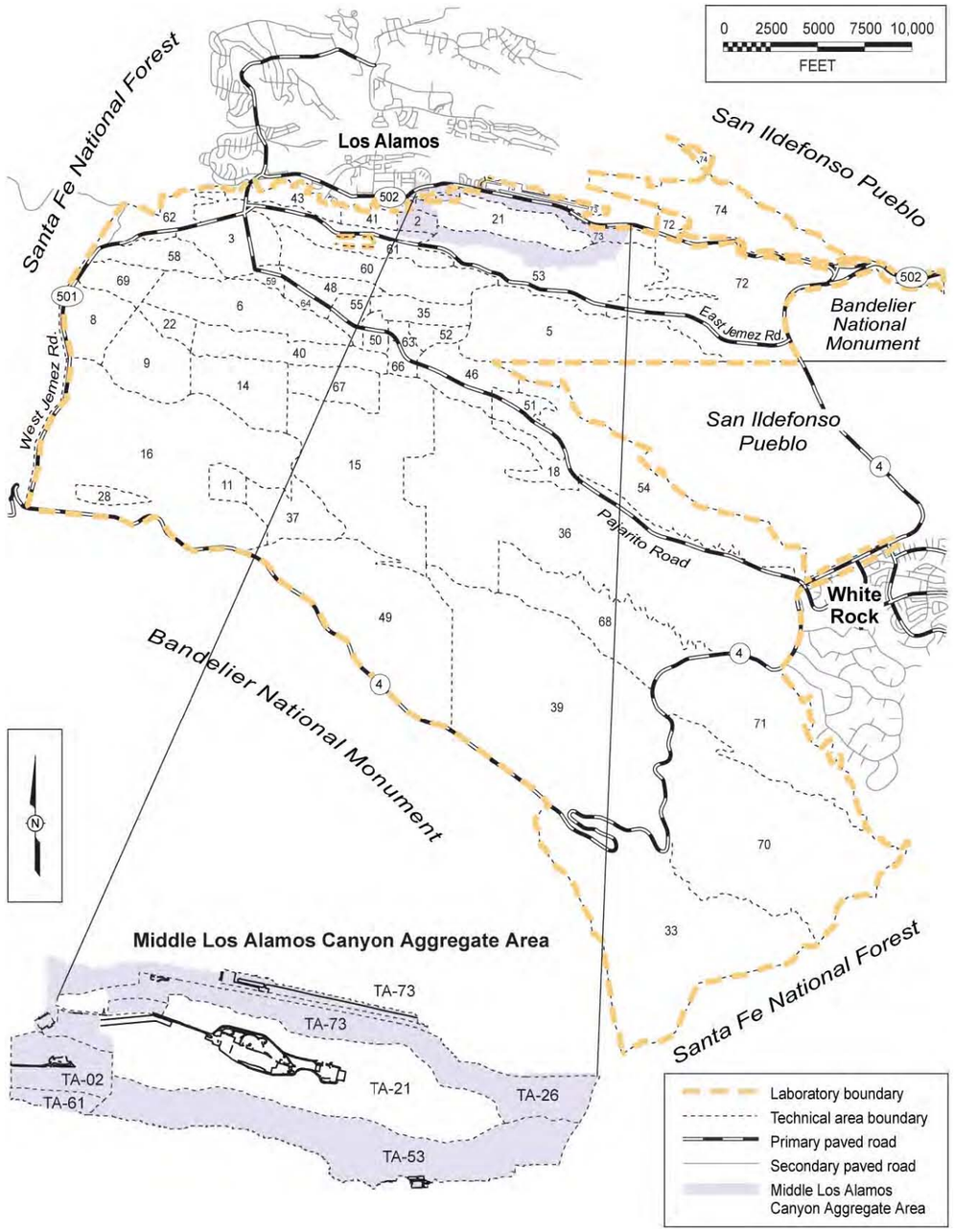


Figure 1.0-1 Locations of TA-02, TA-21, and TA-26 within the Middle Los Alamos Canyon Aggregate Area

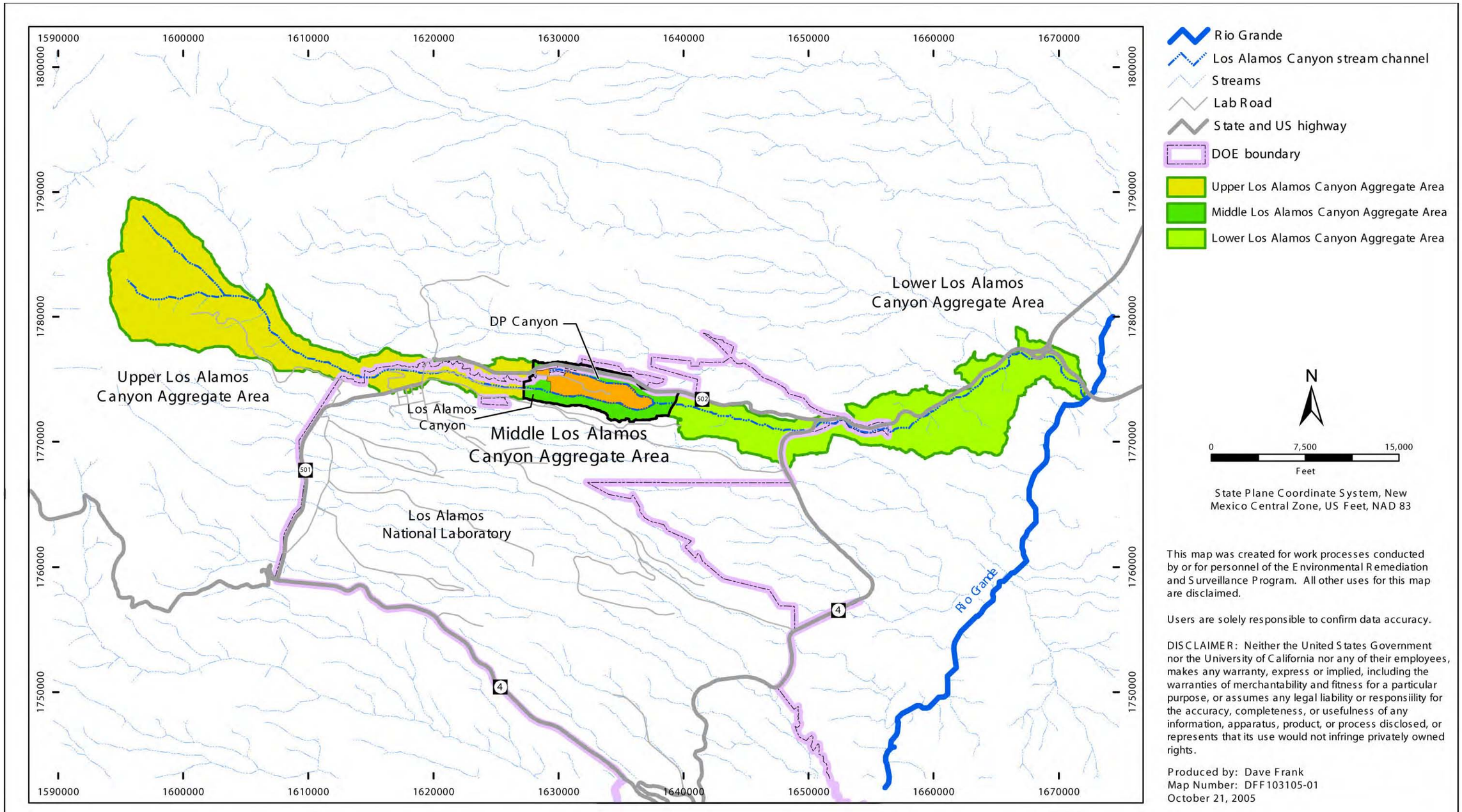


Figure 1.0-2 Los Alamos Canyon Watershed and Middle Los Alamos Canyon Aggregate Area

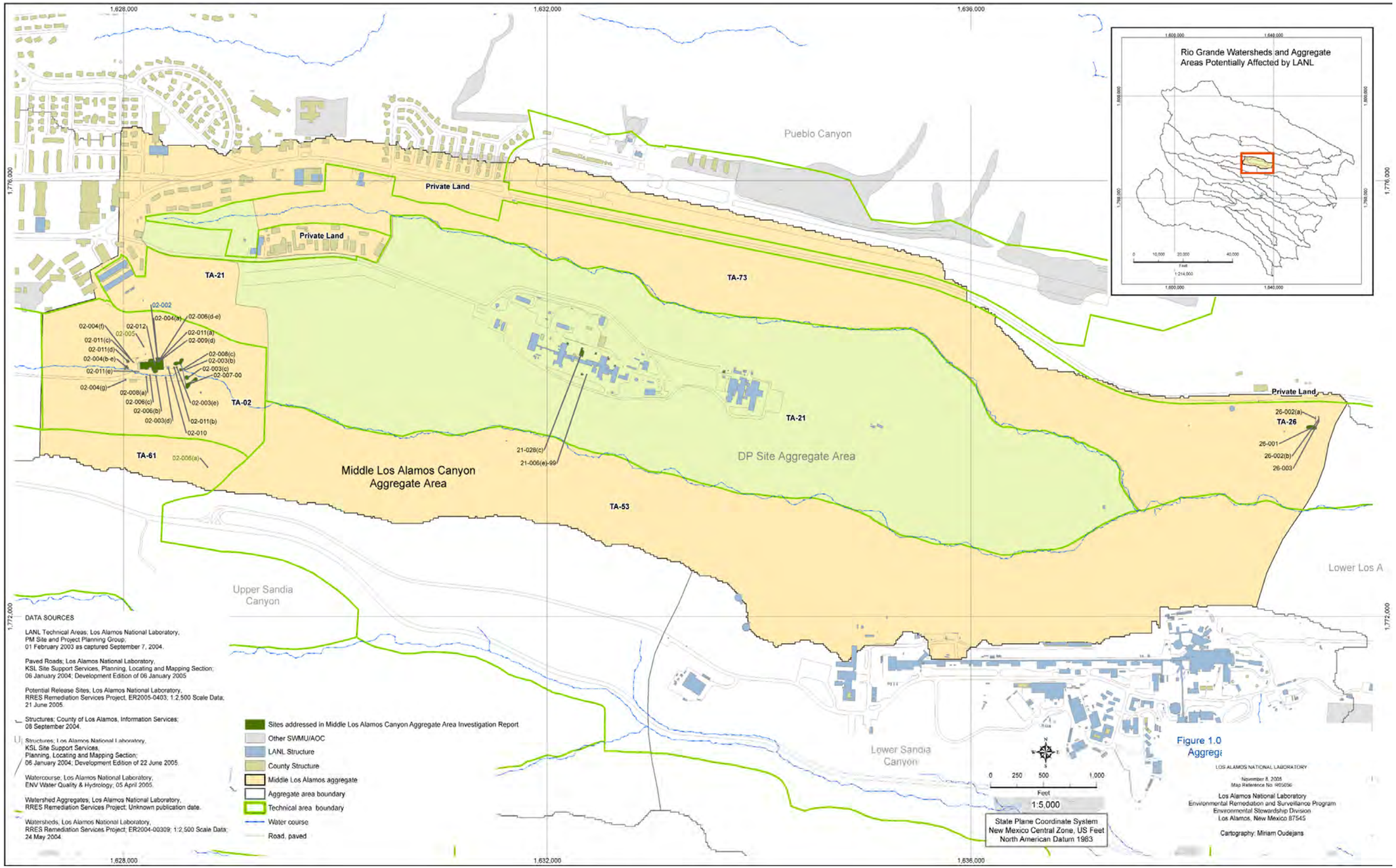


Figure 1.1-1 Middle Los Alamos Canyon Aggregate Area SWMUs, AOCs, and consolidated units under investigation

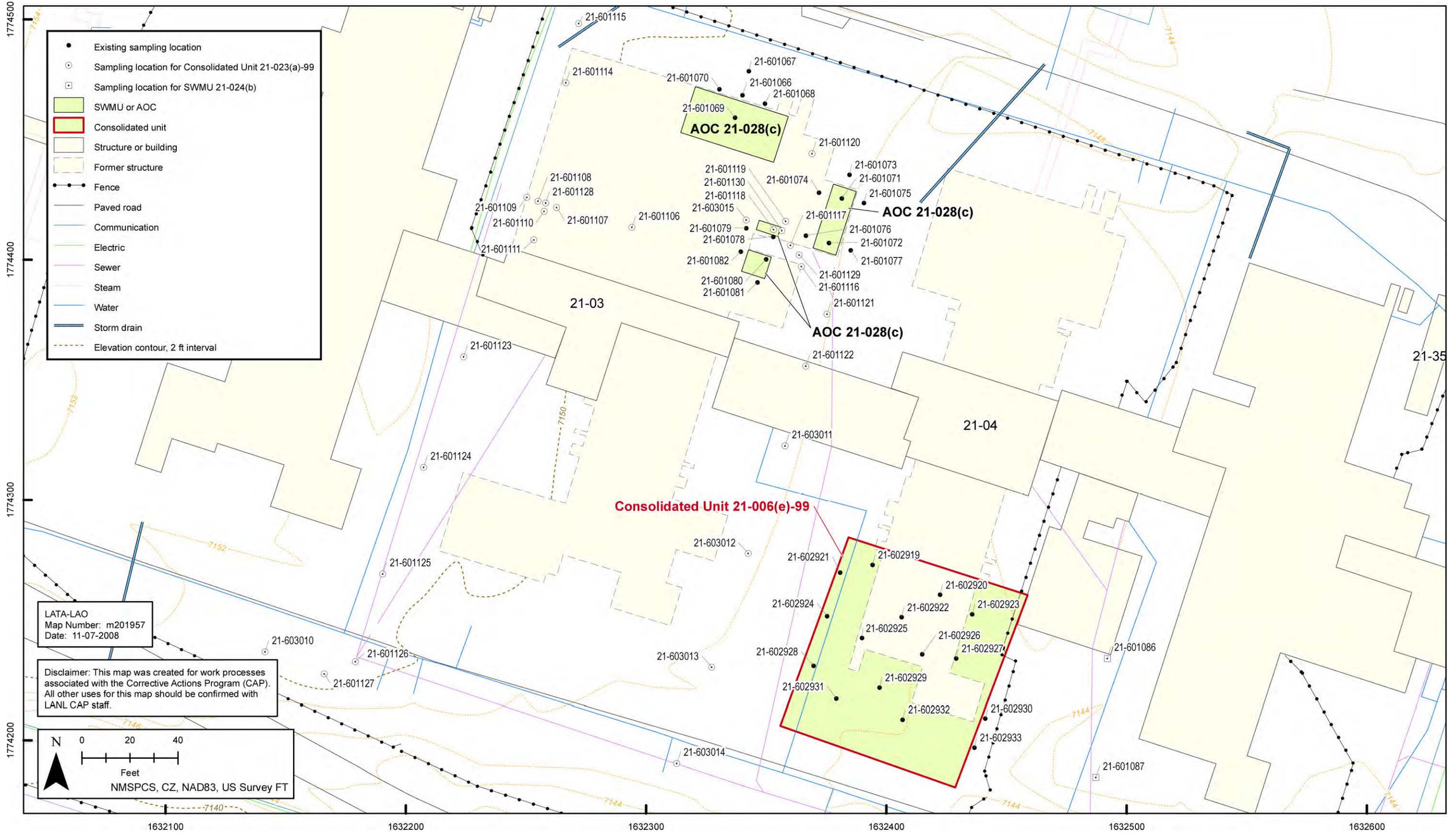


Figure 2.2-1 Site map of Consolidated Unit 21-006(e)-99 and AOC 21-028(c)

Figure 2.3-1 Site map of TA-26

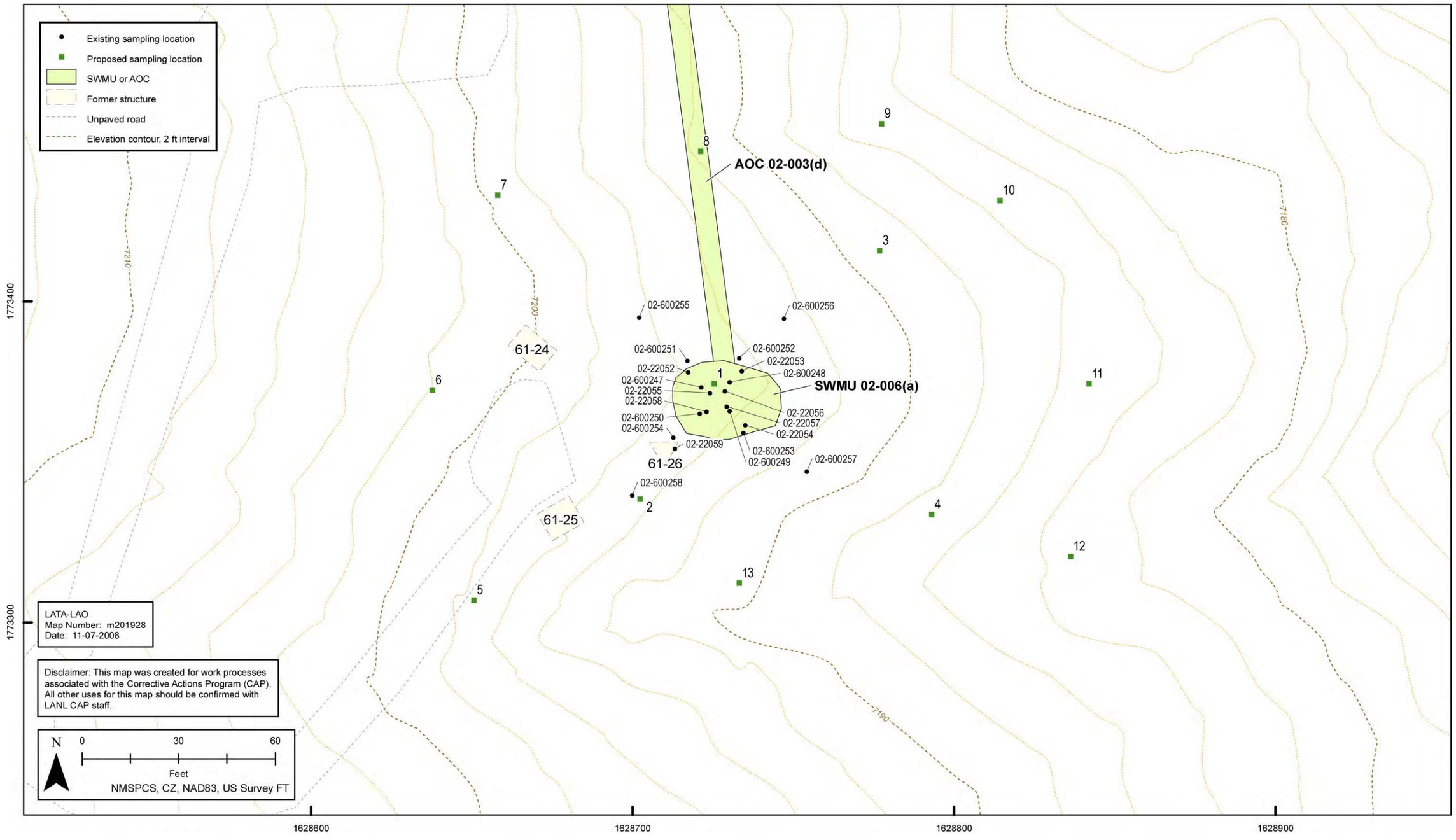


Figure 3.1-1 Proposed sampling locations at SWMU 02-006(a)

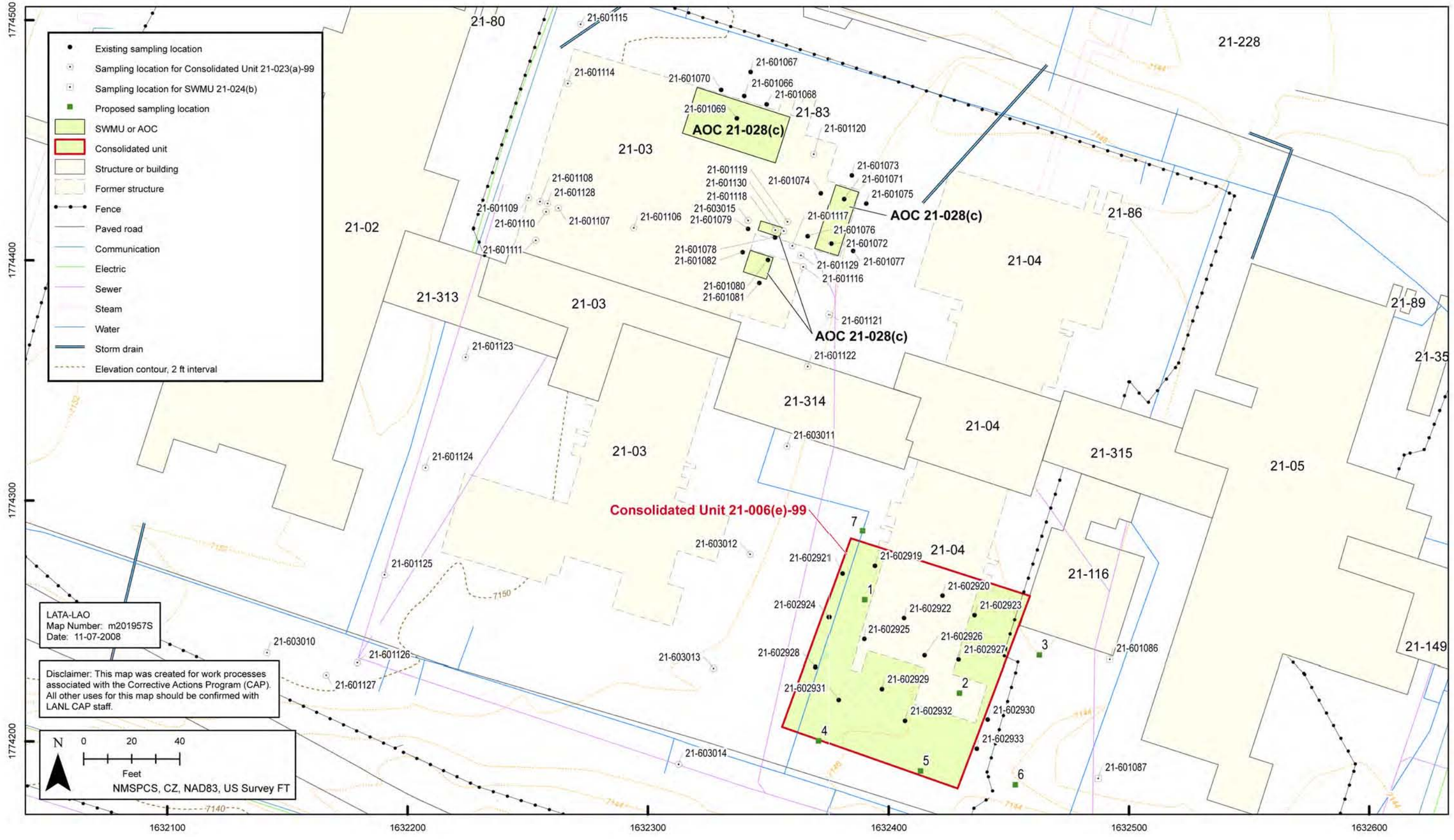


Figure 3.2-1 Proposed sampling locations at Consolidated Unit 21-006(e)-99

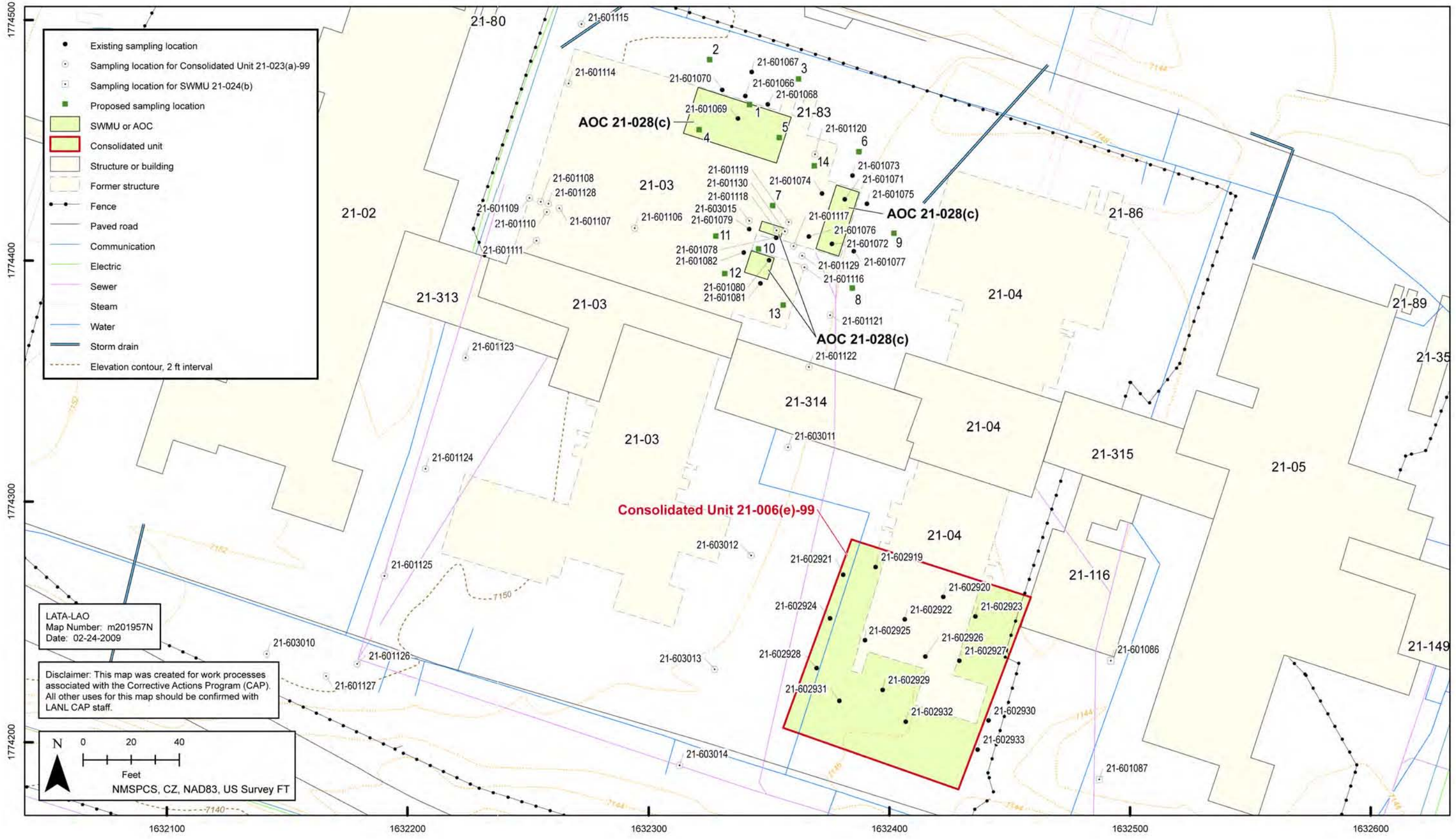


Figure 3.2-2 Proposed sampling locations at AOC 21-028(c)

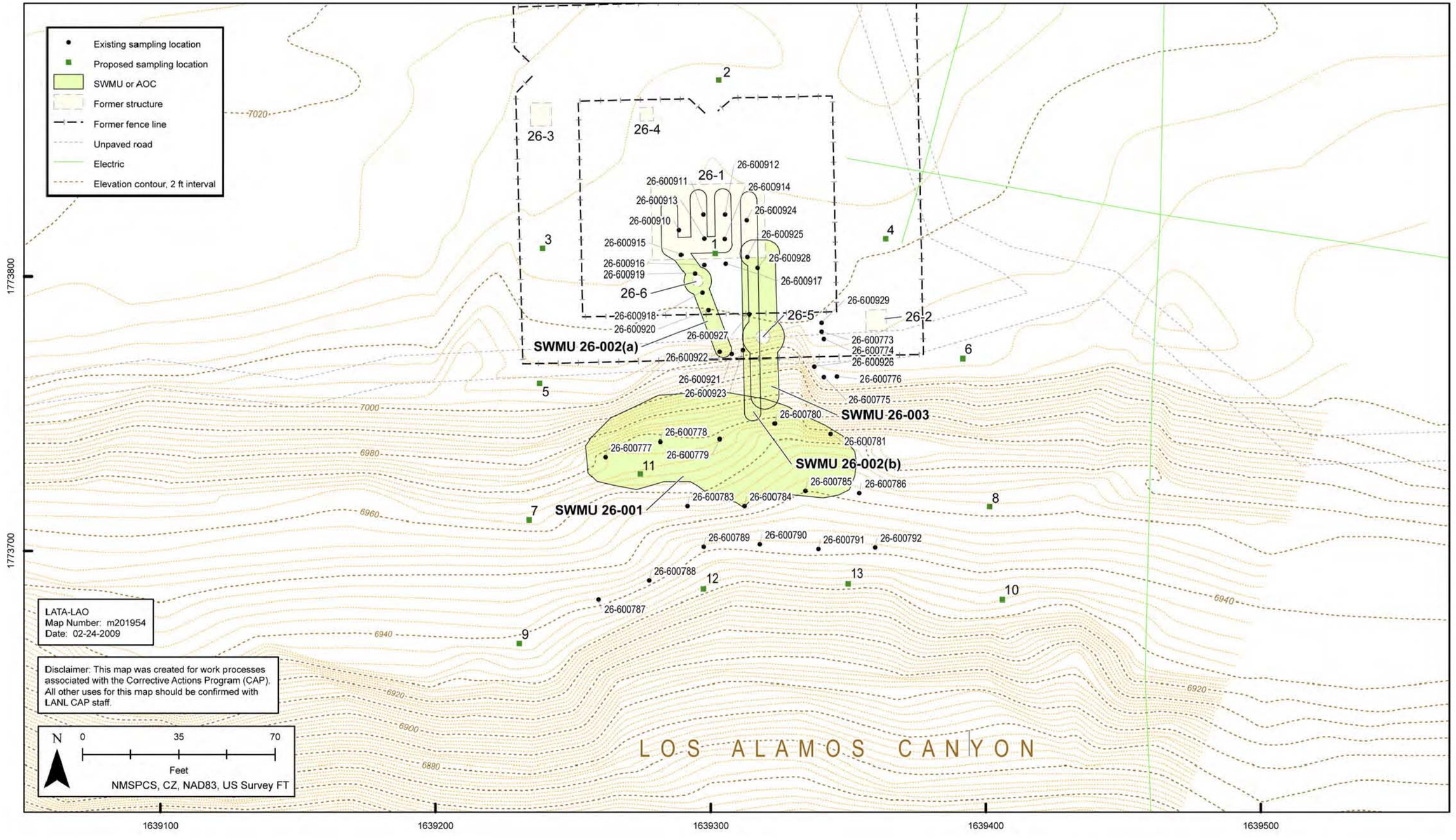


Figure 3.3-1 Proposed sampling locations at TA-26

Table 1.1-1
Sites under Phase II Investigation in Middle Los Alamos Canyon Aggregate Area

Consolidated Unit	SWMU/AOC	Site Description	Associated Structure or Facility	Previous Investigation	COPCs
TA-02					
	AOC 02-003(a)	Soil contamination from stack-gas valve house and gaseous effluent line	WBR, stack-gas valve house 02-19	1985 WBR Decommissioning Project, Phase I 1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2007 Sampling	Metals, nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, plutonium-239/240, strontium-90, tritium
	AOC 02-003(b)	Soil contamination at condensate trap and line 119	WBR condensate trap 02-48, line 119	1985 WBR Decommissioning Project, Phase I 1995 RFI 2007 Sampling	Metals, nitrate, PCBs, SVOCs, VOCs, cesium-137, plutonium-239/240, strontium-90, tritium
	AOC 02-003(c)	Soil contamination at gaseous effluent delay tanks	WBR	1985 WBR Decommissioning Project, Phase I 1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2007 Sampling	Metals, nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, cobalt-60, plutonium-239/240, strontium-90, tritium, uranium-235, uranium-238
	AOC 02-003(d)	Soil contamination at site of upper part of line 119 and temporary vent line	WBR	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2007 Sampling	Metals, nitrate, perchlorate, PCBs, SVOCs, VOC, americium-241, cesium-137, cobalt-60, plutonium-239/240, tritium, uranium-234, uranium-235, uranium-238
	AOC 02-003(e)	Soil contamination	WBR, holding tank 02-62	1985 WBR Decommissioning Project, Phase I 2000 Post-Cerro Grande Fire Recovery Work 2007 Sampling	Metals, nitrate, perchlorate, PCBs, SVOCs, VOC, americium-241, cesium-137, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-238

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Associated Structure or Facility	Previous Investigation	COPCs
	AOC 02-004(a)	Former reactor facility	OWR building 02-1	2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, TPH-DRO, VOCs, americium-241, cesium-137, cobalt-60, plutonium-239/240, strontium-90, tritium, uranium-235
	AOC 02-004(b) AOC 02-004(c) AOC 02-004(d)	Former storage tanks for effluent from OWR and equipment building	OWR 02-1, equipment building 02-44	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, cyanide (total), nitrate, perchlorate, PCBs, SVOCs, cobalt-60, plutonium-239/240, tritium, uranium-235
	AOC 02-004(e)	Former acid pit/ transfer sump	OWR building 02-1	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, nitrate, perchlorate, PCBs, SVOCs, cesium-137, plutonium-239/240, tritium
	AOC 02-004(f)	Former equipment building and acid waste line to TA-50	Equipment building 02-44	2003 Omega West Decommissioning Project 2007 Sampling	Metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOCs, cesium-137, cobalt-60, plutonium-239/240, strontium-90, tritium, uranium-235
	AOC 02-004(g)	Soil contamination	Portable aboveground tank	2003 Omega West Decommissioning Project 2007 Sampling	Metals, hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, cobalt-60, plutonium-239/240, strontium-90, tritium
	SWMU 02-005	Soil contamination	Cooling tower 02-49	1995 RFI 2007 Sampling	Metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOC, americium-241, cesium-137, plutonium-239/240, tritium

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Associated Structure or Facility	Previous Investigation	COPCs
	SWMU 02-006(a)	Former French drain	WBR	2003 Omega West Decommissioning Project 2007 Sampling	Metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, VOCs, cesium-137, plutonium-239/240, strontium-90, tritium, uranium-235
	SWMU 02-006(b)	Former acid waste line, laboratory effluent	OWR building 02-1	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, TPH-DRO, VOCs, cesium-137, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235
	AOC 02-006(c)	Former drainline from offices, restrooms, control room	OWR building 02-1	2003 Omega West Decommissioning Project 2007 Sampling	Metals, hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, TPH-DRO, VOCs, cesium-137, plutonium-239/240, strontium-90, tritium
	AOC 02-006(d)	Duplicate of AOC 02-006(c)	OWR building 02-1	Same as AOC 02-006(c)	Same as AOC 02-006(c)
	AOC 02-006(e)	Former sump for reactor room floor drains and mezzanine	OWR building 02-1	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOCs, cesium-137, cobalt-60, plutonium-239/240, tritium, uranium-235
02-007-00	SWMU 02-007	Septic system for floor drains in OWR building and chemical shack	OWR building 02-1	1985 WBR Decommissioning Project, Phase I 2007 Sampling	Metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, plutonium-238, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235, uranium-238
	SWMU 02-009(a) SWMU 02-009(b) SWMU 02-009(c)	Soil contamination Soil contamination Soil contamination	Storage building 02-50 Stack-gas valve house 02-19 Leach field, Condensate trap 02-48	1985 WBR Decommissioning Project, Phase I 1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2007 Sampling	

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Associated Structure or Facility	Previous Investigation	COPCs
	SWMU 02-008(a)	Outfall	Cooling tower 02-49	2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, cyanide (total), hexavalent chromium, nitrate, PCBs, SVOCs, VOCs, cesium-137, plutonium-239/240, tritium, uranium-235
	AOC 02-008(c)	Outfall for seepage into basement of OWR building	OWR building 02-1	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, nitrate, perchlorate, PCBs, SVOCs, VOCs, cesium-137, plutonium-239/240, strontium-90, tritium, uranium-235
	AOC 02-009(d)	Soil contamination	OWR building 02-1	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2007 Sampling	Metals, hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, cobalt-60, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235
	AOC 02-009(e)	Duplicate of SWMU 02-009(c)	Leach field, conden-sate trap 02-48	Same as SWMU 02-009(c), part of Consolidated Unit 02-007-00	Same as SWMU 02-009(c), part of Consolidated Unit 02-007-00
	AOC 02-010	Soil contamination	Chemical shack 02-3, underground chamber 02-32	2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235, uranium-238
	AOC 02-011(a)	Storm drains, outfalls	OWR building 02-1, equipment building 02-44, chemical shack 02-3	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, cyanide (total), hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, TPH-DRO, VOCs, americium-241, cesium-134, cesium-137, cobalt-60, plutonium-239/240, tritium, uranium-234, uranium-235

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Associated Structure or Facility	Previous Investigation	COPCs
	AOC 02-011(b)	Former drainlines from stack-gas valve house	WBR, stack-gas valve house 02-19	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2007 Sampling	Metals, hexavalent chromium, nitrate, PCBs, SVOCs, americium-241, cesium-137, plutonium-238, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235, uranium-238
	AOC 02-011(c)	Storm drain	Equipment building 02-44	2003 Omega West Decommissioning Project 2007 Sampling	Metals, nitrate, perchlorate, PCBs, SVOCs, VOC, strontium-90, tritium
	AOC 02-011(d)	Outfall from equipment building	Equipment building 02-44	1995 RFI 2000 Post-Cerro Grande Fire Recovery Work 2003 Omega West Decommissioning Project 2007 Sampling	Metals, hexavalent chromium, nitrate, perchlorate, PCBs, SVOCs, cesium-137, cobalt-60, plutonium-239/240, tritium, uranium-234
	AOC 02-011(e)	Duplicate of SWMU 02-008(a)	Cooling tower 02-49	Same as SWMU 02-008(a)	Same as SWMU 02-008(a)
	AOC 02-012	Soil contamination	Underground storage tanks (UST) 02-29 and 02-67, OWR building 02-1	1998 UST Removal 2000 Post-Cerro Grande Fire Recovery Work 2007 Sampling	Metals, cyanide (total), nitrate, perchlorate, SVOCs, TPH-DRO, VOCs, americium-241, plutonium-239/240, tritium, uranium-235
TA-21					
21-006(e)-99	SWMU 21-006(e) AOC 21-006(f)	Seepage pit Seepage pit	Building 21-4	1995 Buildings 21-3 & 21-4 RFI Phase I Project 2007 Sampling	Metals, cyanide (total), nitrate, PCBs, SVOCs, VOCs, americium-241, cesium-134, cesium-137, plutonium-238, plutonium-239/240, tritium, uranium-234, uranium-235
	SWMU 21-011(b)	Sump	Building 21-4	Investigation will be delayed until buildings, processes, or utilities are out of service.	

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Associated Structure or Facility	Previous Investigation	COPCs
	AOC 21-028(c)	Storage areas	Building 21-3	1996 Buildings TA-3 & -4 RFI Phase I Project 2007 Sampling	Metals, cyanide (total), nitrate, perchlorate, PCBs, SVOCs, VOCs, americium-241, cesium-137, plutonium-238, plutonium-239/240, tritium, uranium-234, uranium-235
TA-26					
	SWMU 26-001 SWMU 26-002(a) SWMU 26-002(b) SWMU 26-003	Surface disposal site Soil contamination Drainline Septic tank	East Gate vault 26-1 Sump 26-6 East Gate vault 26-1 Septic tank 26-5	1965 Radiological Survey 1985 Phoswich Radioactivity Survey 1986 Comprehensive Environmental Assessment and Response Program Field survey 2007 Sampling	Metals, cyanide (total), nitrate, perchlorate, PCBs, SVOCs, VOCs, cesium-137, plutonium-238, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235, uranium-238

Note: Shading denotes consolidated unit.

Table 2.1-1
Sites Sampled during 2007 Investigation Activities at TA-02, TA-21, and TA-26

Site	Number of Locations Sampled	Maximum Depth Sampled (ft bgs)
AOC 02-003(a)	7	21.0
AOC 02-003(b)	5	16.7
AOC 02-003(c)	10	24.5
AOC 02-003(d)	16	5.7
AOC 02-003(e)	4	23.4
AOC 02-004(a)	34	24.5
AOC 02-004(b,c,d)	9	23.0
AOC 02-004(e)	3	19.5
AOC 02-004(f)	21	25.0
AOC 02-004(g)	9	22.0
SWMU 02-005	16	7.0
SWMU 02-006(a)	12	23.5
SWMU 02-006(b)	17	22.5
AOC 02-006(c)	7	19.0
AOC 02-006(e)	11	25.0
Consolidated Unit 02-007-00	64	24.5
SWMU 02-008(a)	4	16.0
AOC 02-008(c)	4	21.0
AOC 02-009(d)	11	19.2
AOC 02-010	14	32.0
AOC 02-011(a)	40	30.0
AOC 02-011(b)	5	16.7
AOC 02-011(c)	1	19.5
AOC 02-011(d)	1	2.5
AOC 02-012	11	21.0
Consolidated Unit 21-006(e)-99	15	13.0
AOC 21-028(c)	17	13.0
SWMU 26-001 SWMU 26-002(a) SWMU 26-002(b) SWMU 26-003	39	13.5

Table 3.1-1
Proposed Sampling within the TA-02 Core Area in Los Alamos Canyon

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Confirmation Sampling																
Determine vertical extent of PAHs	1	Previous location 02-600580 at AOC 02-004(a)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	—[a] —	— —	— —	— —	X[b] X	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	2	Previous location 02-600469 at AOC 02-004(f)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	3	Previous location 02-600470 at AOC 02-004(f)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	4	Previous location 02-600474 at AOC 02-004(f)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	5	Previous location 02-600567 at AOC 02-004(f)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of cesium-137	6	Previous location 02-600636 at AOC 02-010	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —
Determine vertical extent of cesium-137	7	Previous location 02-600640 at AOC 02-010	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	8	Previous location 02-600385 at AOC 02-011(a)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine vertical extent of PCBs	9	Previous location 02-600386 at AOC 02-011(a)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	10	Previous location 02-600406 at AOC 02-011(a)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	11	Previous location 02-600449 at AOC 02-011(a)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	12	Previous location 02-600450 at AOC 02-011(a)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PCBs	13	Previous location 02-600664 at AOC 02-011(a)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —	— —
Determine vertical extent of PAHs	14	Previous location 02-600532 at AOC 02-011(a)	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	— —	— —	— —	— —	X X	— —	— —	— —	— —	— —	— —	— —	— —
Vertical Extent near Former TA-02 Structures																
Determine vertical extent of contamination for AOCs 02-004(f) and 02-011(c)	15	Northwest corner of the TA-02 structures	5–6 15–16 25–26 35–36 49–50	X X X X X	— — — — —	X X X X X	X X X X X	X X X X X	— — — — —	X X X X X	X X X X X	X X X X X	— — — — —	X X X X X	X X X X X	— — — — —

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine vertical extent of contamination for AOCs 02-004(b–e) and 02-011(d)	16	At the area of AOCs 02-004(b–e) and 02-011(d)	5–6	X	—	X	X	—	—	X	X	X	—	X	X	—
			15–16	X	—	X	X	—	—	X	X	X	—	X	X	—
			25–26	X	—	X	X	—	—	X	X	X	—	X	X	—
			35–36	X	—	X	X	—	—	X	X	X	—	X	X	—
			49–50	X	—	X	X	—	—	X	X	X	—	X	X	—
Determine vertical extent of contamination for AOC 02-004(g)	17	At the area of AOC 02-004(g)	5–6	X	—	—	X	X	X	X	X	—	X	X	X	—
			15–16	X	—	—	X	X	X	X	X	—	X	X	X	—
			25–26	X	—	—	X	X	X	X	X	—	X	X	X	—
			35–36	X	—	—	X	X	X	X	X	—	X	X	X	—
			49–50	X	—	—	X	X	X	X	X	—	X	X	X	—
Determine vertical extent of contamination for AOC 02-011(a)(i,ii,iii,v)	18	At the area of AOC 02-011(a)(i–iii,v)	5–6	X	—	X	X	X	—	X	X	X	—	X	X	—
			15–16	X	—	X	X	X	—	X	X	X	—	X	X	—
			25–26	X	—	X	X	X	—	X	X	X	—	X	X	—
			35–36	X	—	X	X	X	—	X	X	X	—	X	X	—
			49–50	X	—	X	X	X	—	X	X	X	—	X	X	—
Determine vertical extent of contamination for AOCs 02-011(a)(iv) and 02-004(a,f)	19	West of the former main reactor building (02-1) footprint	5–6	X	—	X	X	X	—	X	X	X	—	X	X	—
			15–16	X	—	X	X	X	—	X	X	X	—	X	X	—
			25–26	X	—	X	X	X	—	X	X	X	—	X	X	—
			35–36	X	—	X	X	X	—	X	X	X	—	X	X	—
			49–50	X	—	X	X	X	—	X	X	X	—	X	X	—
Determine vertical extent of contamination of AOCs 02-006(e) and 02-011(a)(vii,viii)	20	At AOC 02-006(e)	5–6	X	—	X	X	X	—	X	X	—	—	X	X	—
			15–16	X	—	X	X	X	—	X	X	—	—	X	X	—
			25–26	X	—	X	X	X	—	X	X	—	—	X	X	—
			35–36	X	—	X	X	X	—	X	X	—	—	X	X	—
			49–50	X	—	X	X	X	—	X	X	—	—	X	X	—

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine vertical extent of contamination of AOCs 02-006(b) and 02-012	21	At AOC 02-012	5–6	X	—	—	X	X	—	—	X	X	X	X	X	X
			15–16	X	—	—	X	X	—	—	X	X	X	X	X	X
			25–26	X	—	—	X	X	—	—	X	X	X	X	X	X
			35–36	X	—	—	X	X	—	—	X	X	X	X	X	X
			49–50	X	—	—	X	X	—	—	X	X	X	X	X	X
Determine vertical extent of contamination of AOCs 02-006(c) and 02-011(a)(ix)	22	At the intersection of AOC 02-011(a)(ix) and 02-006(c)	5–6	X	—	X	X	X	—	X	X	X	—	X	X	—
			15–16	X	—	X	X	X	—	X	X	X	—	X	X	—
			25–26	X	—	X	X	X	—	X	X	X	—	X	X	—
			35–36	X	—	X	X	X	—	X	X	X	—	X	X	—
			49–50	X	—	X	X	X	—	X	X	X	—	X	X	—
Determine vertical extent of contamination for AOC 02-004(a)	23	At the west of the main reactor building (02-1) footprint	5–6	X	—	—	—	—	—	X	X	X	—	X	X	—
			15–16	X	—	—	—	—	—	X	X	X	—	X	X	—
			25–26	X	—	—	—	—	—	X	X	X	—	X	X	—
			35–36	X	—	—	—	—	—	X	X	X	—	X	X	—
			49–50	X	—	—	—	—	—	X	X	X	—	X	X	—
Determine vertical extent of contamination for AOC 02-004(a)	24	At the middle of the main reactor building (02-1) footprint	5–6	X	—	—	—	—	—	X	X	X	—	X	X	—
			15–16	X	—	—	—	—	—	X	X	X	—	X	X	—
			25–26	X	—	—	—	—	—	X	X	X	—	X	X	—
			35–36	X	—	—	—	—	—	X	X	X	—	X	X	—
			49–50	X	—	—	—	—	—	X	X	X	—	X	X	—
Determine vertical extent of contamination for AOC 02-004(a)	25	At the northeast of the main reactor building (02-1) footprint	5–6	X	—	—	—	—	—	X	X	X	—	X	X	—
			15–16	X	—	—	—	—	—	X	X	X	—	X	X	—
			25–26	X	—	—	—	—	—	X	X	X	—	X	X	—
			35–36	X	—	—	—	—	—	X	X	X	—	X	X	—
			49–50	X	—	—	—	—	—	X	X	X	—	X	X	—

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine vertical extent of contamination for AOC 02-004(a)	26	At the southeast of the main reactor building (02-1) footprint	5–6	X	—	—	—	—	—	X	X	X	—	X	X	—
			15–16	X	—	—	—	—	—	X	X	X	—	X	X	—
			25–26	X	—	—	—	—	—	X	X	X	—	X	X	—
			35–36	X	—	—	—	—	—	X	X	X	—	X	X	—
			49–50	X	—	—	—	—	—	X	X	X	—	X	X	—
Determine vertical extent of contamination for AOCs 02-009(d), 02-003(a), and 02-011(a)(x)	27	At AOC 02-009(d)	5–6	X	—	X	X	X	—	X	X	X	X	X	X	—
			15–16	X	—	X	X	X	—	X	X	X	X	X	X	—
			25–26	X	—	X	X	X	—	X	X	X	X	X	X	—
			35–36	X	—	X	X	X	—	X	X	X	X	X	X	—
			49–50	X	—	X	X	X	—	X	X	X	X	X	X	—
Determine vertical extent of contamination for AOCs 02-010 and 02-006(c)	28	At AOC 02-010	5–6	X	—	X	X	—	X	X	—	X	X	X	X	—
			15–16	X	—	X	X	—	X	X	—	X	X	X	X	—
			25–26	X	—	X	X	—	X	X	—	X	X	X	X	—
			35–36	X	—	X	X	—	X	X	—	X	X	X	X	—
			49–50	X	—	X	X	—	X	X	—	X	X	X	X	—
Determine vertical extent of contamination for AOCs 02-008(c)(ii) and 02-011(a)(x)	29	Between AOCs 02-008(c)(ii) and 02-011(a)(x)	5–6	X	—	X	X	X	—	X	X	X	—	X	X	—
			15–16	X	—	X	X	X	—	X	X	X	—	X	X	—
			25–26	X	—	X	X	X	—	X	X	X	—	X	X	—
			35–36	X	—	X	X	X	—	X	X	X	—	X	X	—
			49–50	X	—	X	X	X	—	X	X	X	—	X	X	—
Determine vertical extent of contamination for SWMU 02-009(b)	30	At SWMU 02-009(b)	5–6	X	—	—	X	X	X	X	X	X	X	X	X	—
			15–16	X	—	—	X	X	X	X	X	X	X	X	X	—
			25–26	X	—	—	X	X	X	X	X	X	X	X	X	—
			35–36	X	—	—	X	X	X	X	X	X	X	X	X	—
			49–50	X	—	—	X	X	X	X	X	X	X	X	X	—

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine vertical extent of contamination for AOCs 02-003(a,e) and 02-011(b)	31	At the former stack house (02-19)	5–6	X	—	—	X	X	X	X	X	X	X	X	X	—
			15–16	X	—	—	X	X	X	X	X	X	X	X	X	—
			25–26	X	—	—	X	X	X	X	X	X	X	X	X	—
			35–36	X	—	—	X	X	X	X	X	X	X	X	X	—
			49–50	X	—	—	X	X	X	X	X	X	X	X	X	—
Determine vertical extent of contamination for AOCs 02-008(c)(i), 02-003(b), 02-011(b), and SWMU 02-007	32	Near AOC 02-008(c)(i)	5–6	X	—	—	X	X	X	X	X	X	X	X	X	—
			15–16	X	—	—	X	X	X	X	X	X	X	X	X	—
			25–26	X	—	—	X	X	X	X	X	X	X	X	X	—
			35–36	X	—	—	X	X	X	X	X	X	X	X	X	—
			49–50	X	—	—	X	X	X	X	X	X	X	X	X	—
Determine vertical extent of contamination for SWMU 02-009(c)	33	At the western portion of SWMU 02-009(c)	5–6	X	—	—	X	X	X	X	X	X	X	X	X	—
			15–16	X	—	—	X	X	X	X	X	X	X	X	X	—
			25–26	X	—	—	X	X	X	X	X	X	X	X	X	—
			35–36	X	—	—	X	X	X	X	X	X	X	X	X	—
			49–50	X	—	—	X	X	X	X	X	X	X	X	X	—
Determine vertical extent of contamination for SWMU 02-009(c)	34	At the central portion of SWMU 02-009(c)	5–6	X	—	—	X	X	X	X	X	X	X	X	X	—
			15–16	X	—	—	X	X	X	X	X	X	X	X	X	—
			25–26	X	—	—	X	X	X	X	X	X	X	X	X	—
			35–36	X	—	—	X	X	X	X	X	X	X	X	X	—
			49–50	X	—	—	X	X	X	X	X	X	X	X	X	—
Determine vertical extent of contamination for SWMU 02-009(c)	35	At the eastern portion of SWMU 02-009(c)	5–6	X	—	—	X	X	X	X	X	X	X	X	X	—
			15–16	X	—	—	X	X	X	X	X	X	X	X	X	—
			25–26	X	—	—	X	X	X	X	X	X	X	X	X	—
			35–36	X	—	—	X	X	X	X	X	X	X	X	X	—
			49–50	X	—	—	X	X	X	X	X	X	X	X	X	—

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine vertical extent of contamination for AOCs 02-003(b,c) and south part of SWMU 02-009(c)	36	Between AOC 02-003(c) and the southern part of SWMU 02-009(c)	5–6 15–16 25–26 35–36 49–50	X X X X X	— — — — —	— — — — —	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	— — — — —
Determine vertical extent of contamination for SWMU 02-009(a)	37	At the northwest portion of SWMU 02-009(a)	5–6 15–16 25–26 35–36 49–50	X X X X X	— — — — —	— — — — —	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	— — — — —
Determine vertical extent of contamination for SWMU 02-009(a)	38	At the southeast portion of SWMU 02-009(a)	5–6 15–16 25–26 35–36 49–50	X X X X X	— — — — —	— — — — —	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	— — — — —
Lateral Extent for TA-02 Core Area																
Determine lateral extent of contamination	39	West-most from TA-02 main structures and close to TA-41 boundary	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination and vertical extent of PCBs and plutonium-239/240	40	Near previous location 02-600559 at SWMU 02-005	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	41	Between previous location 02-600560 and west boundary of TA-02 main structures	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine lateral extent of contamination	42	North of former OWR equipment building	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	43	North of the northwest corner of OWR building (02-1)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	44	North of the central part of the OWR building (02-1)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	45	North of AOC 02-009(d)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	46	Near previous location 02-600218	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	47	North of SWMU 02-009(c)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	48	North of SWMU 02-009(c)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	49	East of SWMU 02-009(c)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	50	Southeast of location 49	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine lateral extent of contamination	51	East-most from TA-02 main structures	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	52	East of SWMU 02-009(a)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	53	South of SWMU 02-009(a)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	54	South of SWMU 02-009(a)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	55	100 ft northwest of location 54	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	56	150 ft west of location 55	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	57	150 ft west of location 56	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	58	150 ft west of location 57	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —
Determine lateral extent of contamination	59	South of AOC 02-004(g)	0–0.5 4–5 9–10	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	— — —

Table 3.1-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	PCBs	SVOCs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium and Moisture	pH	TPH-DRO
Determine lateral extent of contamination	68	140 ft west of AOC 02-004(g)	0–0.5	X	X	X	X	X	X	X	X	X	X	X	X	—
			4–5	X	X	X	X	X	X	X	X	X	X	X	X	—
			9–10	X	X	X	X	X	X	X	X	X	X	X	X	—
Determine lateral extent of contamination	69	Between locations 40 and 68	0–0.5	X	X	X	X	X	X	X	X	X	X	X	X	—
			4–5	X	X	X	X	X	X	X	X	X	X	X	X	—
			9–10	X	X	X	X	X	X	X	X	X	X	X	X	—
Determine lateral extent of contamination	70	Between locations 41 and 42	0–0.5	X	X	X	X	X	X	X	X	X	X	X	X	—
			4–5	X	X	X	X	X	X	X	X	X	X	X	X	—
			9–10	X	X	X	X	X	X	X	X	X	X	X	X	—

Note: Zero depth is defined as ground surface.

[a] — = This sample analysis will not be requested.

[b] X = This sample analysis will be requested.

Table 3.1-2
Proposed Sampling at SWMU 02-005

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	PCBs	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Tritium and Moisture	pH
Determine vertical extent of PCBs	60	Previous location 02-600561 at SWMU 02-005	Minimum of 5 locations: 0–0.5/base of excavation 2 ft deeper	X[a,b] X	X X	X[b] X	X[b] X	X[b] X	X[b] X	X[b] X
Determine lateral extent of radionuclide contamination	61	On north slope, northwest of previous location 02-600562	0–0.5 1.5–2.5	X X	—[c] —	X X	X X	X X	X X	X X
Determine lateral extent of radionuclide contamination	62	On north slope, northeast of previous location 02-600562	0–0.5 1.5–2.5	X X	— —	X X	X X	X X	X X	X X
Determine lateral extent of radionuclide contamination	63	On north slope, northeast of previous location 02-600547	0–0.5 1.5–2.5	X X	— —	X X	X X	X X	X X	X X
Determine lateral extent of radionuclide contamination	64	On north slope, northeast of previous location 02-600548	0–0.5 1.5–2.5	X X	— —	X X	X X	X X	X X	X X
Determine lateral extent of radionuclide contamination	65	On north slope, northeast of previous location 02-600549	0–0.5 1.5–2.5	X X	— —	X X	X X	X X	X X	X X
Determine lateral extent of radionuclide contamination	66	On north slope, northeast of previous location 02-600550	0–0.5 1.5–2.5	X X	— —	X X	X X	X X	X X	X X
Determine lateral extent of radionuclide contamination	67	On north slope, southeast of previous location 02-600551	0–0.5 1.5–2.5	X X	— —	X X	X X	X X	X X	X X

Note: Zero depth is defined as ground surface.

[a] X = This sample analysis will be requested.

[b] All samples from this location will be analyzed for PCBs. Only one location, two depths, will be analyzed for the full SWMU 02-005 analytical suite.

[c] — = This sample analysis will not be requested.

Table 3.1-3
Proposed Sampling at SWMU 02-006(a)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	Tritium	Moisture	pH
Determine vertical extent of tritium	1	In the central area of previous sample locations	5–6	—[a]	—	—	X[b]	X	X
			15–16	—	—	—	X	X	X
			25–26	—	—	—	X	X	X
			35–36	—	—	—	X	X	X
			49–50	—	—	—	X	X	X
Determine vertical extent of cyanide (total), hexavalent chromium, and tritium	2	5 ft downgradient from previous location 02-600258	25–26	—	X	X	X	X	X
			35–36	—	X	X	X	X	X
			49–50	—	X	X	X	X	X
Determine lateral extent of metals and tritium	3	40 ft northeast of previous location 02-600256	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	4	40 ft southeast of previous location 02-600257	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	5	60 ft southwest of previous location 02-600258	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	6	80 ft west of location 1	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	7	60 ft northwest of previous location 02-600255	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	8	70 ft north of location 1	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X

Table 3.1-3 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Cyanide (total)	Hexavalent Chromium	Tritium	Moisture	pH
Determine lateral extent of metals and tritium	9	40 ft north of location 4	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	10	40 ft northeast of location 4	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	11	120 ft west of location 1	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	12	50 ft south of location 11	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X
Determine lateral extent of metals and tritium	13	40 ft southeast of location 2	0–0.5	X	—	—	X	X	X
			5–6	X	—	—	X	X	X
			15–16	X	—	—	X	X	X
			25–26	X	—	—	X	X	X
			35–36	X	—	—	X	X	X
			49–50	X	—	—	X	X	X

Note: Zero depth is defined as ground surface.

[a] — = This sample analysis will not be requested.

[b] X = This sample analysis will be requested.

Table 3.2-1
Proposed Sampling at Consolidated Unit 21-006(e)-99

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	PCBs	Americium-241	Isotopic Plutonium	Isotopic Uranium	Tritium	Moisture	pH
Determine vertical extent of contamination	1	In the northwest area of previous sample locations	5–6 15–16 24–25	X[a] X X	X X X	—[b] — —	X X X	X X X	X X X	X X X	X X X
Determine vertical extent of contamination	2	In the southwest area of previous sample locations	5–6 15–16 24–25	X X X	X X X	— — —	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	3	40 ft east of previous locations 21-602923 and 602927	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X	— — —	— — —	X X X
Determine vertical and lateral extent of contamination	4	25 ft southwest of previous location 21-602931	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X	— — —	— — —	X X X
Determine vertical and lateral extent of contamination	5	25 ft south of previous location 21-602932	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X	— — —	— — —	X X X
Determine vertical and lateral extent of contamination	6	25 ft southeast of previous location 21-602933	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X	— — —	— — —	X X X
Determine vertical and lateral extent of contamination	7	15 ft north of previous location 21-602919	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X	— — —	— — —	X X X

Note: Zero depth is defined as ground surface.

[a] X = This sample analysis will be requested.

[b] — = This sample analysis will not be requested.

Table 3.2-2
Proposed Sampling at AOC 21-028(c)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	PCBs	Americium-241	Isotopic Plutonium	pH
North Side								
Determine vertical extent of contamination	1	5 ft away from previous location 21-601066	5–6 15–16 24–25	X[a] X X	X X X	—[b] — —	X X X	X X X
Determine vertical and lateral extent of contamination	2	25 ft northwest of location 1	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	3	25 ft northeast of location 1	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	4	25 ft southwest of location 1	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	5	25 ft southeast of location 1	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
East Side								
Determine vertical and lateral extent of contamination	6	10 ft north of previous location 21-601073	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	7	15 ft west of previous locations 21-601074 and 21-601076	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	8	20 ft southeast of previous location 21-601072	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	9	15 ft east of previous locations 21-601075 and 21-601077	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	14	5 ft south of previous location 21-601120	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Southeast Side								
Determine vertical extent of contamination	10	In the central area of previous sampling locations	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	11	15 ft west of previous locations 21-601079 and 21-601082	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X

Table 3.2-2 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	PCBs	Americium-241	Isotopic Plutonium	pH
Determine vertical and lateral extent of contamination	12	20 ft southwest of location 10	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination	13	15 ft southeast of previous location 21-602081	5–6 15–16 24–25	X X X	X X X	X X X	X X X	X X X

Note: Zero depth is defined as ground surface.

[a] X = This sample analysis will be requested.

[b] — = This sample analysis will not be requested.

Table 3.3-1
Proposed Sampling at TA-26

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Nitrate	Gamma-Emitting Radionuclides	pH
Mesa Top							
Determine vertical extent of metals on mesa top	1	In the central area of previous sample locations	0–0.5 5–6 15–16 24–25	X[a] X X X	—[b] — — —	— — — —	X X X X
Determine vertical and lateral extent of metals on mesa top	2	60 ft north of location 1	0–0.5 5–6 15–16 24–25	X X X X	— — — —	— — — —	X X X X
Determine vertical and lateral extent of metals on mesa top	3	60 ft west of location 1	0–0.5 5–6 15–16 24–25	X X X X	— — — —	— — — —	X X X X
Determine vertical and lateral extent of metals on mesa top	4	60 ft east of location 1	0–0.5 5–6 15–16 24–25	X X X X	— — — —	— — — —	X X X X
Canyon Slope							
Determine vertical and lateral extent of contamination on canyon slope	5	70 ft west of previous location 26-600922	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination on canyon slope	6	40 ft east of previous location 26-600776	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination on canyon slope	7	60 ft west of previous location 26-600783	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination on canyon slope	8	50 ft east of previous location 26-600786	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination on canyon slope	9	40 ft downgradient from location 7 and 35 ft southwest of previous location 26-600787	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination on canyon slope	10	30 ft downgradient from location 8 and 50 ft southeast of previous location 26-600792	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination on canyon slope	11	15 ft southeast and 15 ft southwest of previous locations 26-600777 and 26-600778, respectively	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X

Table 3.3-1 (continued)

Objective Addressed	Location Number	Location	Sample Depth (ft)	TAL Metals	Nitrate	Gamma-Emitting Radionuclides	pH
Determine vertical and lateral extent of contamination on canyon slope	12	15 ft south of previous location 26-600789	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X
Determine vertical and lateral extent of contamination on canyon slope	13	15 ft southeast of previous location 26-600791	0–0.5 5–6 9–10	X X X	X X X	X X X	X X X

Note: Zero depth is defined as ground surface.

[a] X = This sample analysis will be requested.

[b] — = This sample analysis will not be requested.

Table 4.0-1
Quality Procedures and Standard Operating Procedures

EP-DIR-QAP-0001, Quality Assurance Plan for the Environmental Programs
EP-DIR-SOP-2011, Personnel Training and Qualification
EP-DIR-SOP-4001, Document Control
EP-DIR-SOP-4002, Document Development
EP-DIR-SOP-4003, Records Management
EP-DIR-SOP-4004, Records Transmittal and Retrieval Processes
EP-DIR-SOP-5006, Control of Measurement and Test Equipment
EP-ERSS-SOP-5022, Characterization and Management of Environmental Restoration (ER) Project Waste
EP-ERSS-SOP-5028, Coordinating and Evaluating Geodetic Surveys
EP-ERSS-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
EP-ERSS-SOP-5061, Field Decontamination of Equipment
EP-ERSS-SOP-5181, Notebook Documentation for WES Technical Field Activities
SOP-01.12, Field Site Closeout Checklist
SOP-01.13, Initiating and Managing Data Set Requests
SOP-5211, Surface Water Site Assessments
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-12.01, Field Logging, Handling, and Documentation of Borehole Materials

Notes: These procedures are available at http://www.lanl.gov/environment/all/qa/adep.shtml. Technically equivalent subcontractor procedures may be used if required by subcontract.

Table 4.0-2
Summary of Investigation Methods

Method	Summary
Spade and Scoop Collection of Soil Samples	This method is typically used for collection of shallow (i.e., approximately 0-1 ft) soil or sediment samples. The "spade-and-scoop" method involves digging a hole to the desired depth, as prescribed in the sampling and analysis plan, and collecting a discrete grab sample. The sample is typically placed in a clean stainless-steel bowl for transfer into various sample containers.
Hand Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10-15 ft, but may in some cases be used for collecting samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in.-inside diameter [I.D.]), creating a vertical hole which can be advanced to the desired sample depth. When the desired depth is reached, the auger is decontaminated before advancing the hole through the sample depth. The sample material is transferred from the auger bucket to a stainless-steel sampling bowl before filling the various required sample containers.
Split-Spoon Core-Barrel Sampling	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 which can be examined as a unit. The split-spoon core barrel is a cylindrical barrel split lengthwise so that the two halves can be separated to expose the core sample. Once extracted, the section of core is typically screened for radioactivity and organic vapors, photographed, and described in a geologic log. A portion of the core may then be collected as a discrete sample from the desired depth.
Handling, Packaging, and Shipping of Samples	Field team members label samples before packing and ensure that the sample containers and the containers used for transport are free of external contamination. Field team members package all samples to minimize the possibility of breakage during transportation. After all environmental samples are collected, packaged, and preserved, a field team member transports them to the SMO. The SMO arranges for shipping the samples to analytical laboratories. The field team member must inform the SMO when levels of radioactivity are in the action-level or limited-quantity ranges.
Sample Control and Field Documentation	The collection, screening, and transport of samples are documented on standard forms generated by the SMO. These include sample collection logs (SCLs), chain-of-custody (COC) forms, and sample container labels. SCLs are completed at the time of sample collection and are signed by the sampler and a reviewer who verifies the logs for completeness and accuracy. Corresponding labels are applied to each sample container. COC forms are completed and assigned to verify that the samples are not left unattended.
Field Quality Control Samples	Field Quality Control samples are collected as directed in the Consent Order as follows: Field Duplicate: At a frequency of 10%; collected at the same time as a regular sample and submitted for the same analyses. Equipment Rinsate Blank: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which is collected in a sample container and submitted for laboratory analysis. Trip Blanks: Required for all field events that include the collection of samples for VOC analysis. For soil/tuff/sediment sampling, trip blank containers of certified clean sand are opened and kept with the other sample containers during the sampling process. For vapor sampling, trip blanks are nitrogen samples run through sample tables into SUMMA canisters.

Table 4.0-2 (continued)

Method	Summary
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination is the preferred method to minimize the generation of liquid waste. Dry decontamination may include the use of a wire brush or other tool for removal of soil or other material adhering to the sampling equipment, followed by use of Fantastik and paper wipes. Dry decontamination may be followed by wet decontamination if necessary. Wet decontamination may include washing with a nonphosphate detergent and water, followed by a water rinse and a second rinse with deionized water. Alternatively, steam cleaning may be used.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample are printed on the sample collection logs provided by the SMO (size and type of container, i.e., glass, amber glass, polyethylene, preservative). Soil/tuff/sediment samples are preserved by placing in insulated containers with ice to maintain a temperature of 4°C. Other requirements such as nitric acid or other preservatives may apply to different media or analytical requests.

Appendix A

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

A-1.0 ACRONYMS AND ABBREVIATIONS

AK	acceptable knowledge
AOC	area of concern
ASTM	American Society for Testing and Materials
bgs	below ground surface
BH	borehole
BV	background value
COC	chain of custody
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
D&D	decontamination and decommissioning
DOE	Department of Energy (U.S.)
DP	Delta Prime
EP	Environmental Programs (Directorate)
EPA	Environmental Protection Agency (U.S.)
EQL	estimated quantitation limit
ER	Environmental Restoration
ER ID	Environmental Remediation and Surveillance Program identification number
ERSS	Environment and Remediation Support Services
FTB	field trip blank
FV	fallout value
ID	identification
I.D.	inside diameter
IDW	investigation-derived waste
LANL	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory
LLW	low-level waste
MDA	material disposal area
NMED	New Mexico Environment Department
NOI	notice of intent
OU	operable unit
OWR	Omega West Reactor
PAH	polycyclic aromatic hydrocarbon

PCB	polychlorinated biphenyl
PID	photoionization detector
RCT	radiological control technician
RFI	Resource Conservation and Recovery Act facility investigation
RLWTF	Radioactive Liquid Waste Treatment Facility
RPF	Records Processing Facility
SAL	screening action level
SCL	sample collection log
SMO	Sample Management Office
SOP	standard operating procedure
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list (EPA)
TD	total depth
TPH	total petroleum hydrocarbons
TSD	treatment, storage, and disposal
VOC	volatile organic compound
WAC	waste acceptance criteria
WBR	water boiler reactor
WCSF	waste characterization strategy form
XRF	x-ray fluorescence

A-2.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain U.S. Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (µm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (µg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

A-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

Appendix B

Investigation-Derived Waste Management

B-1.0 INTRODUCTION

This appendix describes the management of the investigation-derived waste (IDW) and excavated media/debris generated during the investigation and remediation of sites located in the Middle Los Alamos Canyon Aggregate Area at Technical Area 02 (TA-02), TA-21, and TA-26 of Los Alamos National Laboratory (LANL or the Laboratory).

All IDW generated during the field investigation will be managed in accordance with standard operating procedure (SOP) EP-ERSS-SOP-5022, Characterization and Management of Environmental Restoration (ER) Project Waste (http://www.lanl.gov/environment/all/qa/adep.shtml). This SOP incorporates the requirements of all applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy (DOE) orders, and Laboratory implementation requirements.

Consistent with Laboratory procedures, a waste characterization strategy form (WCSF) will be prepared for the waste streams anticipated to be generated. The WCSF will provide information on the wastes expected to be generated, their respective waste characterization approaches, and applicable on-site storage and final disposition. Information from the 2007 investigation wastes and analytical data and/or acceptable knowledge (AK) will be used to help complete the WCSF.

The selection of waste containers will be based on appropriate U.S. Department of Transportation requirements, waste types, and estimated volumes of IDW to be generated. Immediately following containerization, each waste container will be individually labeled with a unique identification number and with information regarding waste classification, contents, radioactivity, and date generated.

The initial management of waste will rely on the data from the 2007 investigation of Middle Los Alamos Aggregate Area (LANL 2008, 102093). Waste will be managed in secure, designated areas appropriate to the type of waste. If new analytical data change the expected waste category, the waste will be managed in accumulation areas appropriate to the final waste determination. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the type and classification of waste.

Investigation activities will be conducted in a manner that minimizes the generation of waste. Waste minimization will be accomplished by implementing the most recent version of the “Los Alamos National Laboratory Hazardous Waste Minimization Report.”

B-2.0 WASTE STREAMS

The waste streams that may be generated and managed during the field investigation and removal actions at Middle Los Alamos Aggregate Area are described below and summarized in Table B-2.0-1. The types of waste streams are expected to be the same as those generated during the previous investigation.

B-2.1 Municipal Solid Waste

Municipal solid waste, including all noncontact trash and debris and empty sample preservation containers, will be managed as nonhazardous, nonradioactive waste. All municipal solid waste will be stored in plastic-lined trash cans and disposed of at an off-site sanitary waste landfill. The approximate volume of waste generated is expected to be 1.5 yd^3.

B-2.2 Contact Waste

The contact waste stream includes spent personal protective equipment, contaminated sampling supplies, and dry decontamination waste that may have come in contact with contaminated media. Characterization of the waste will be conducted using acceptable knowledge (AK) of the waste material, the extent of contamination of the contact waste, the methods of generation, as well as existing analytical data available for the media with which it came into contact. Contact waste generated will be stored on-site in plastic-lined 30-gal. or 55-gal. drums or other appropriate containers The approximate volume of waste generated is expected to be 3 yd^3. The Laboratory expects most of the contact waste to be designated as industrial waste or low-level waste (LLW). LLW will be disposed of at TA-54, Area G, or an authorized off-site radioactive waste landfill. Industrial waste will be disposed of at an off-site industrial waste landfill.

B-2.3 Drill Cuttings

This waste stream consists of soil and rock cuttings generated from the drilling of boreholes. Drill cuttings will be containerized in 20-yd^3 rolloff containers, 55-gal. drums, B-12 containers, or other appropriate containers at the point of generation. The drill cuttings will be characterized using the analytical results from core samples and/or direct sampling of the cuttings. If directly sampled, the following analyses will be performed as needed to supplement existing data: volatile organic compounds (VOC), semivolatile organic compounds (SVOCs), radionuclides, total metals, and toxicity characteristic metals. Other constituents may be analyzed as necessary to meet the waste acceptance criteria (WAC) for a receiving facility. If process knowledge, odors, or staining indicate that the cuttings may be contaminated with petroleum products, the materials will also be analyzed for total petroleum hydrocarbons (TPHs) and polychlorinated biphenyls (PCBs).

The cuttings may be land-applied if they meet the criteria in the NMED-approved notice of intent (NOI) decision tree for land application of investigation-derived waste solids from construction of wells and boreholes. If they cannot be land-applied, they will be disposed of at an authorized facility. Based on existing data, the Laboratory expects drill cuttings that cannot be land-applied to be designated as industrial waste or LLW. The LLW will be disposed of or used as cover material at TA-54, Area G, or sent to an authorized off-site radioactive waste facility. The industrial waste is expected to be disposed of at an authorized off-site industrial waste landfill. The approximate volume of waste generated is expected to be 50 yd^3.

B-2.4 Excavated Environmental Media and Debris

Overburden soil and rock will be excavated at several locations to reduce the risk from SVOCs and PCBs. Manmade debris is not expected but could be encountered. The excavated overburden and debris will be placed in containers (e.g., rolloff bins), and representative samples will be collected and composited as the debris is excavated. The environmental media may be directly sampled as needed to supplement existing data for PCBs, VOCs, SVOCs, radionuclides, total metals, and toxicity characteristic metals. Other constituents may be analyzed as necessary to meet the WAC for the receiving facility. If process knowledge, odors, or staining indicate that soils may be contaminated with petroleum products, the materials will also be analyzed for TPHs. If debris is encountered, a determination will be made whether data for environmental media should be used to characterize the debris or whether it should be sampled separately. The Laboratory expects the media/debris to be designated as industrial waste or LLW and used as cover soil at TA-54 or Area G, or the media/debris may be disposed of at TA-54, Area G, or at an authorized off-site facility. The approximate volume of this waste stream is expected to be 20 yd^3.

B-2.5 Decontamination Fluids

The decontamination fluids waste stream will consist of liquid wastes from decontamination activities (e.g., decontamination solutions and rinse waters). Consistent with waste minimization practices, the Laboratory employs dry decontamination methods to the extent possible. If dry decontamination cannot be performed, liquid decontamination wastes will be collected in containers at the point of generation. The decontamination fluids will be characterized using AK of the waste materials and analytical results from the media with which it came into contact or from direct sampling of the containerized waste. If directly sampled, the decontamination fluids will be analyzed for VOCs, SVOCs, radionuclides, total metals, and toxicity characteristic metals, as needed to supplement the existing data. The Laboratory expects these wastes to be designated as industrial waste or LLW that will be treated at the Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50. The approximate volume of this waste stream is expected to be less than 55 gal.

B-3.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

LANL (Los Alamos National Laboratory), January 2008. "Investigation Report for Middle Los Alamos Canyon Aggregate Area," Los Alamos National Laboratory document LA-UR-08-0179, Los Alamos, New Mexico. (LANL 2008, 102093)

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

Waste Stream	Expected Waste Type*	Estimated Volume	Characterization Method	On-Site Management	Disposition
Municipal Solid Waste	Nonhazardous	1.5 yd^3	AK and data for environmental media	55-gal. drums or other appropriate containers	Sanitary waste landfill
Contact Waste	Industrial or LLW	3 yd^3	AK and data for environmental media	30- and 55-gal. drums or other appropriate containers	On-site (TA-54, Area G) or off-site authorized facilities (radioactive waste landfill or industrial landfill)
Drill Cuttings	Industrial or LLW	50 yd^3	Data for environmental media or direct sampling	55-gal. drums, B-12, and 20 yd^3 rolloff containers or other appropriate containers	Land application or disposal on-site (TA-54, Area G) or off-site authorized facilities (radioactive waste landfill or industrial landfill)
Excavated Environmental Media and Debris	Industrial or LLW	20 yd^3	Data for environmental media or direct sampling	55-gal. drums, B-12, and 20 yd^3 rolloff containers or other appropriate containers	Reuse or disposal on-site (TA-54, Area G) or off-site authorized facilities (radioactive waste landfill or industrial landfill)
Decontamination Fluids	Industrial or LLW	Less than 55 gal.	AK, data for environmental media, or direct sampling	55-gal. drums or other appropriate containers	RLWTF at TA-50

*Anticipated possible waste types.

Appendix C

Examples of Three-Dimensional Data Visualization Figures

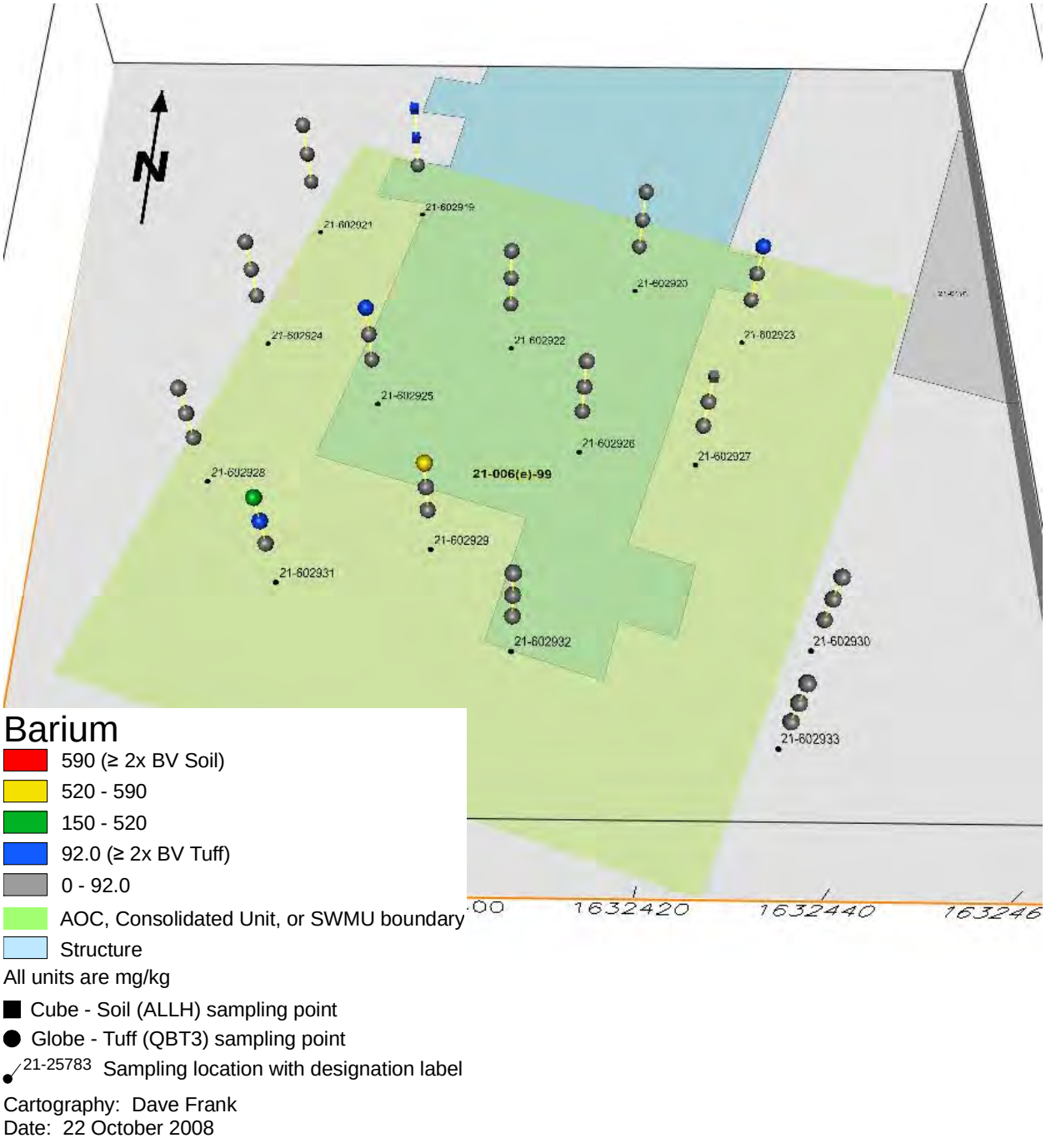
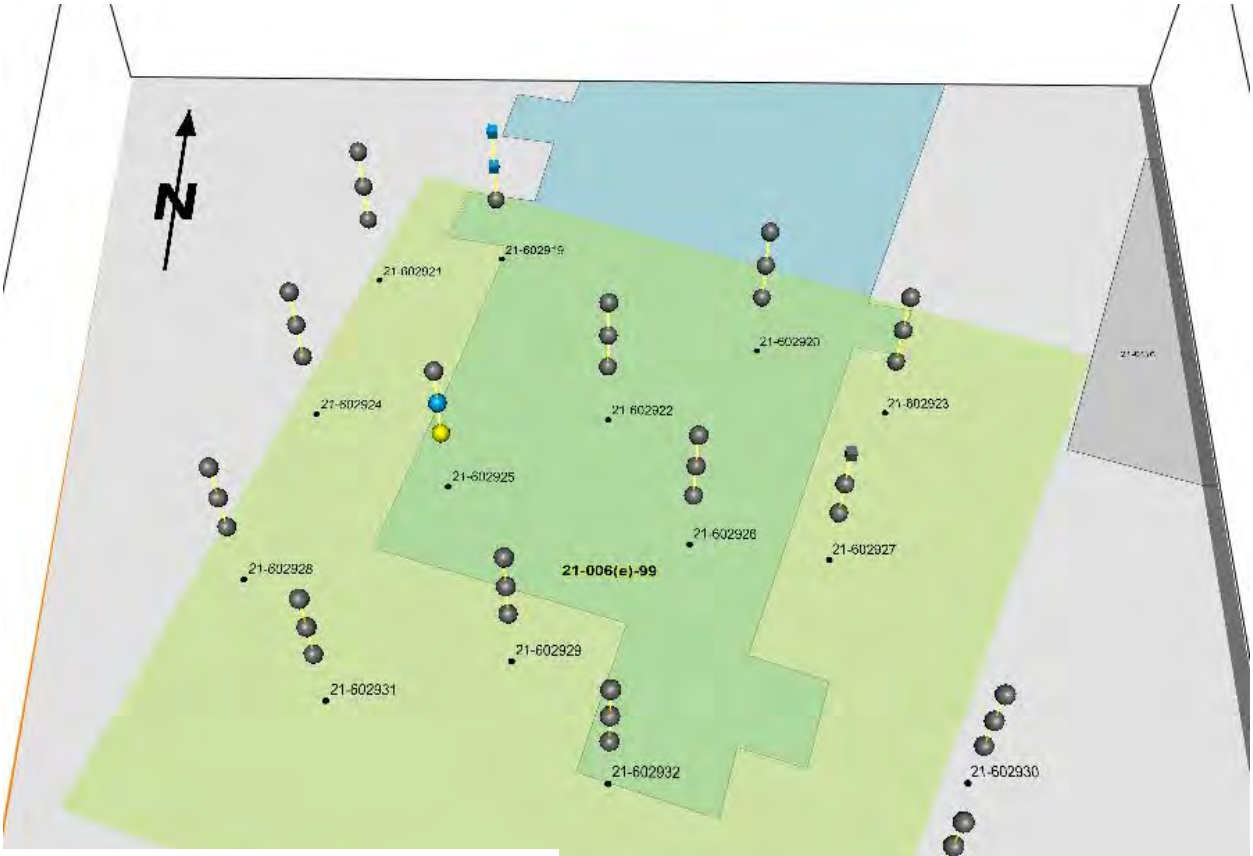


Figure C-1 Distribution of barium at Consolidated Unit 21-006(e)-99



Lead

- 44.6 (≥ 2x BV Soil)
- 33.0 - 44.6
- 22.4 (≥ 2x BV Tuff)
- 0 - 22.4
- AOC, Consolidated Unit, or SWMU boundary
- Structure

All units are mg/kg

- Cube - Soil (ALLH) sampling point
- Globe - Tuff (QBT3) sampling point
- 21-25783 Sampling location with designation label

Cartography: Dave Frank
Date: 22 October 2008

Figure C-2 Distribution of lead at Consolidated Unit 21-006(e)-99

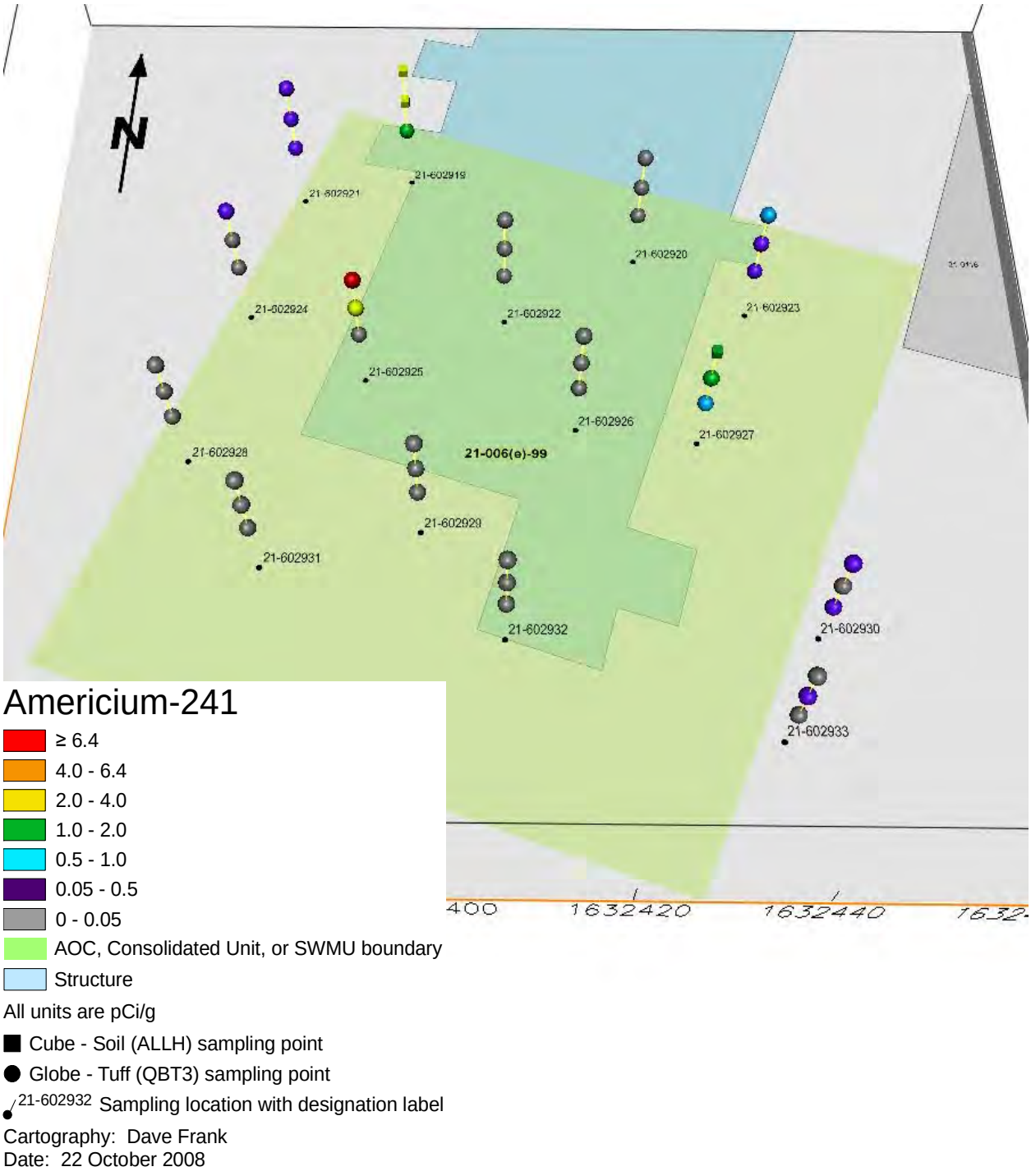


Figure C-3 Distribution of americium-241 at Consolidated Unit 21-006(e)-99

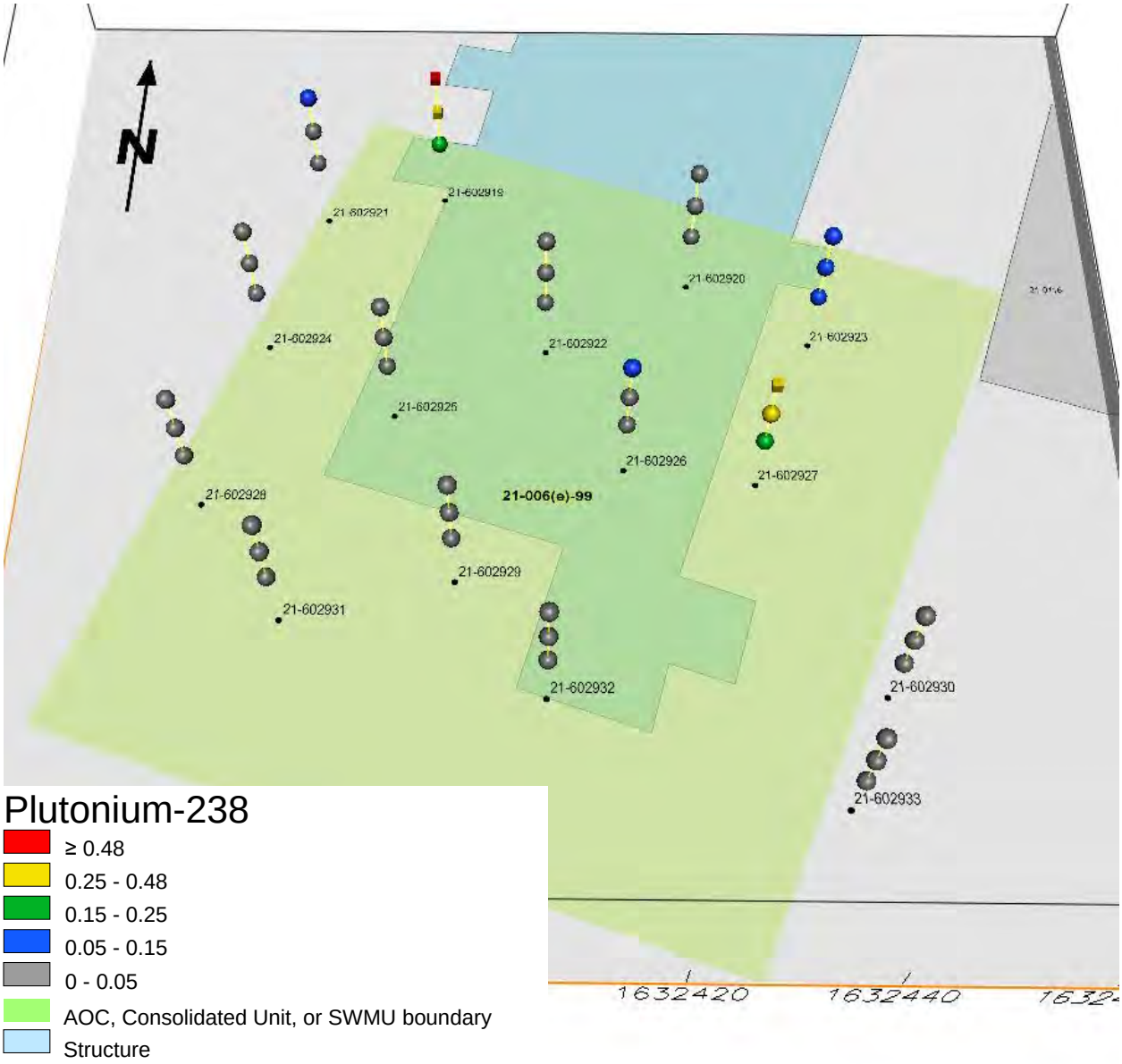
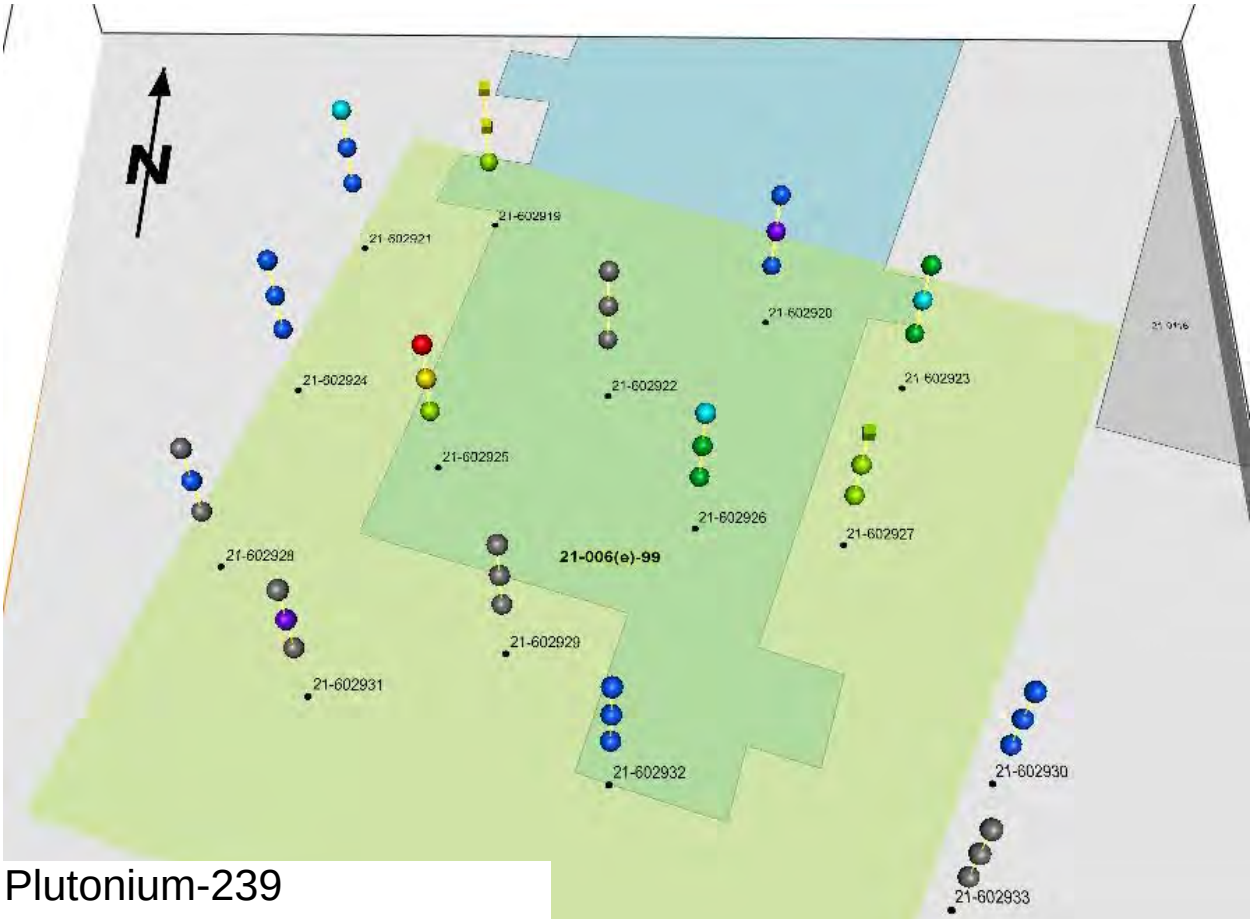


Figure C-4 Distribution of plutonium-238 at Consolidated Unit 21-006(e)-99



Plutonium-239

- ≥ 132
- 100 - 132
- 50.0 - 100
- 25.0 - 50.0
- 10.0 - 25.0
- 5.0 - 10.0
- 1.0 - 5.0
- 0.5 - 1.0
- 0 - 0.5
- AOC, Consolidated Unit, or SWMU boundary
- Structure

All units are pCi/g

■ Cube - Soil (ALLH) sampling point

● Globe - Tuff (QBT3) sampling point

21-602932 Sampling location with designation label

Cartography: Dave Frank
Date: 22 October 2008

Figure C-5 Distribution of plutonium-239 at Consolidated Unit 21-006(e)-99

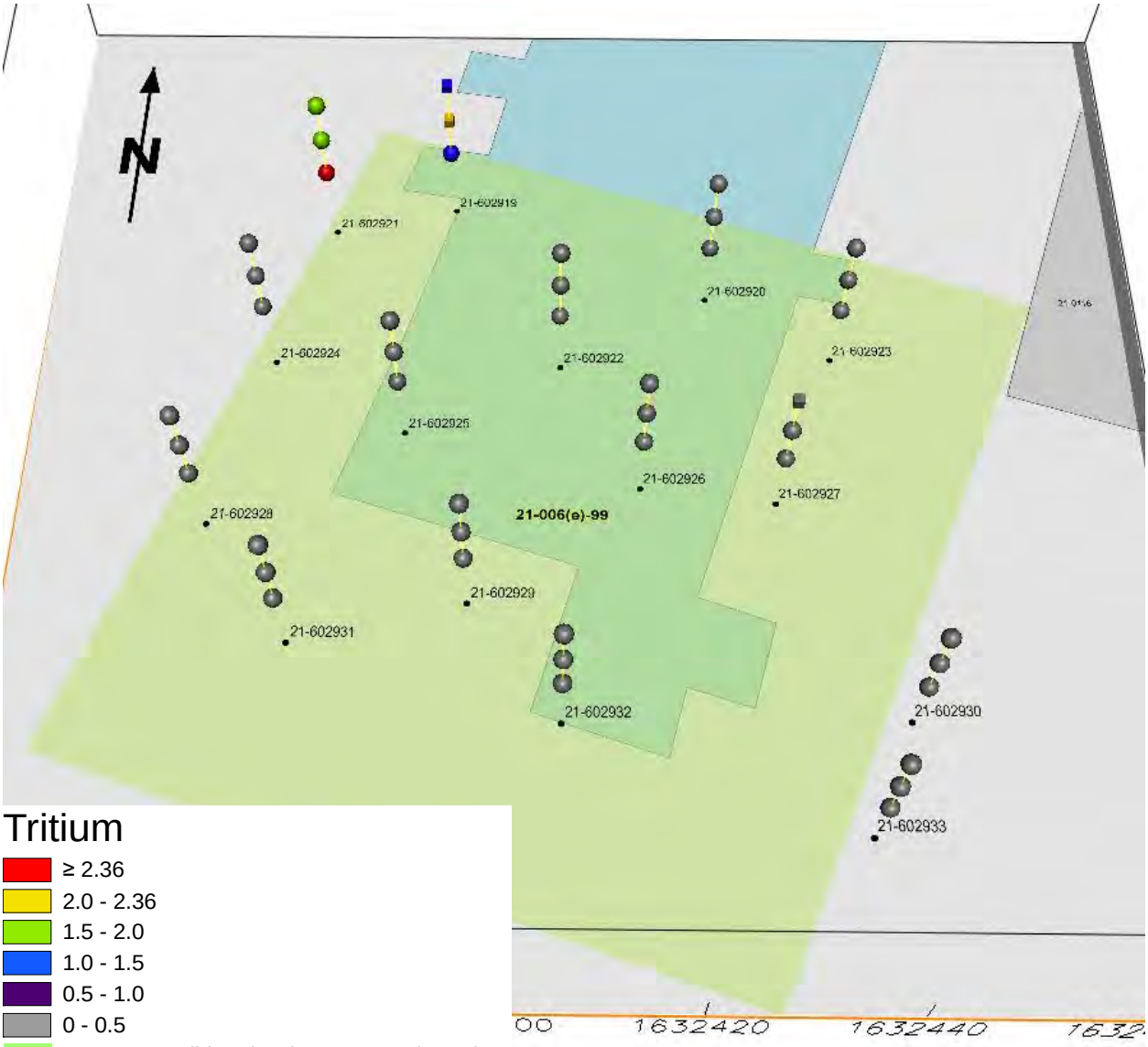
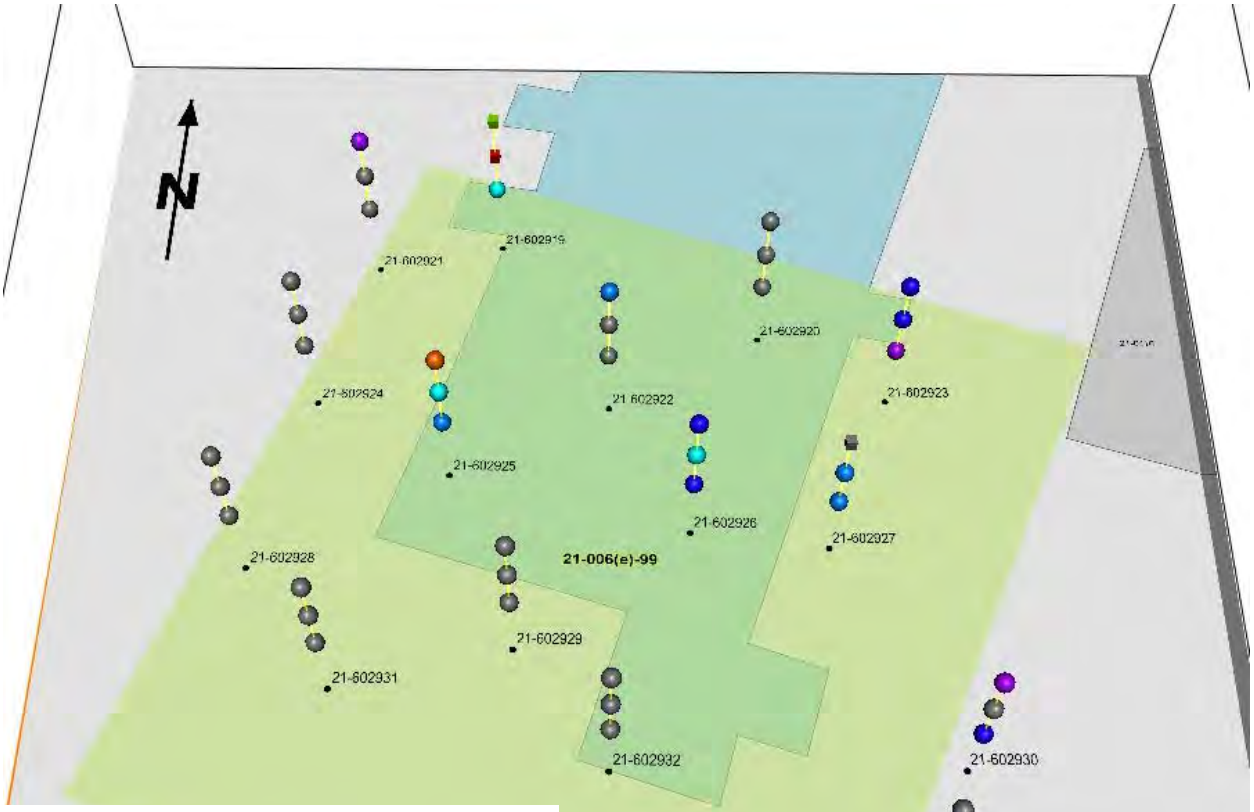


Figure C-6 Distribution of tritium at Consolidated Unit 21-006(e)-99



Uranium-234

- ≥ 86.0
- 70.0 - 86.0
- 60.0 - 70.0
- 50.0 - 60.0
- 40.0 - 50.0
- 30.0 - 40.0
- 20.0 - 30.0
- 10.0 - 20.0
- 5.18 (≥ 2x BV Soil)
- 3.96 (≥ 2x BV Tuff)
- 0 - 3.96
- AOC, Consolidated Unit, or SWMU boundary
- Structure

All units are pCi/g

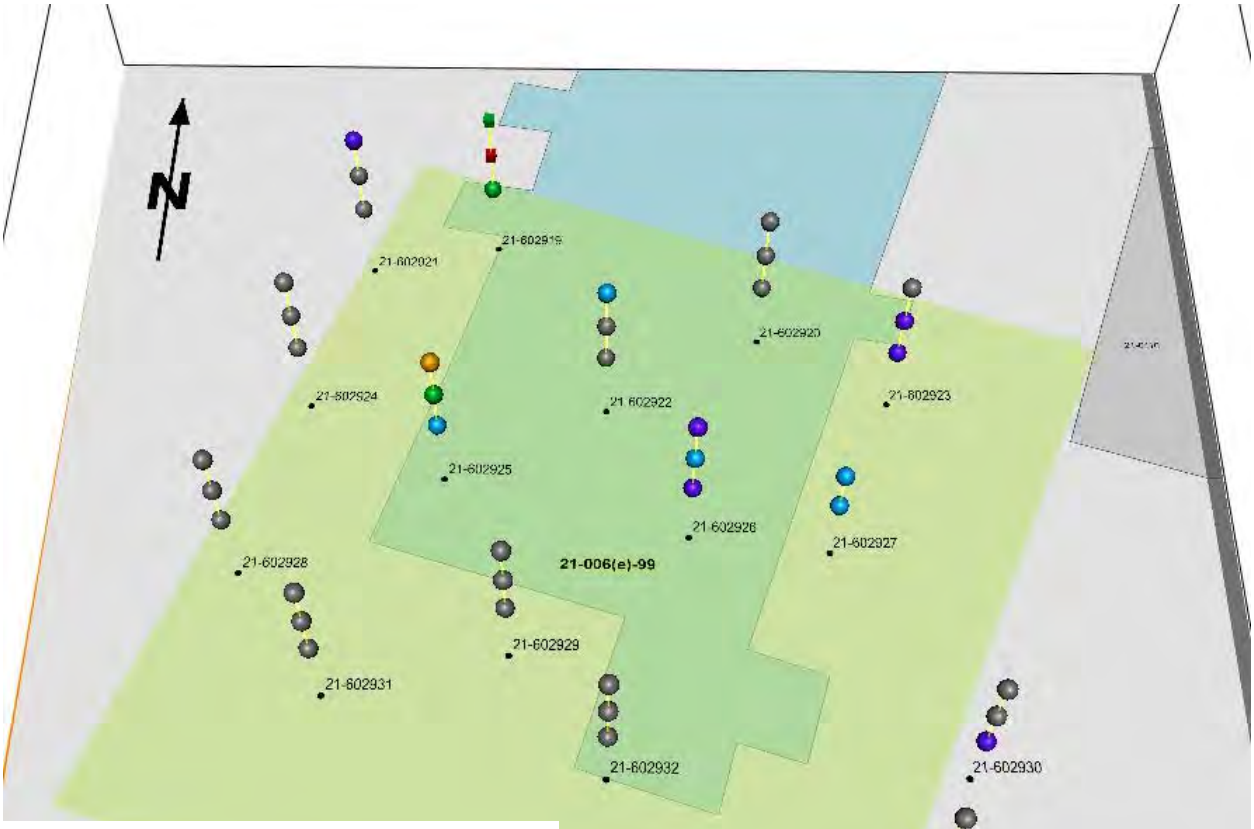
■ Cube - Soil (ALLH) sampling point

● Globe - Tuff (QBT3) sampling point

21-25783 Sampling location with designation label

Cartography: Dave Frank
Date: 22 October 2008

Figure C-7 Distribution of uranium-234 at Consolidated Unit 21-006(e)-99



Uranium-235

- ≥ 3.8
- 3.0 - 3.8
- 2.0 - 3.0
- 1.0 - 2.0
- 0.4 (≥ 2x BV Soil)
- 0.18 (≥ 2x BV Tuff)
- 0 - 0.18
- AOC, Consolidated Unit, or SWMU boundary
- Structure

All units are pCi/g

- Cube - Soil (ALLH) sampling point
- Globe - Tuff (QBT3) sampling point
- 21-25783 Sampling location with designation label

Cartography: Dave Frank
Date: 22 October 2008

Figure C-8 Distribution of uranium-235 at Consolidated Unit 21-006(e)-99

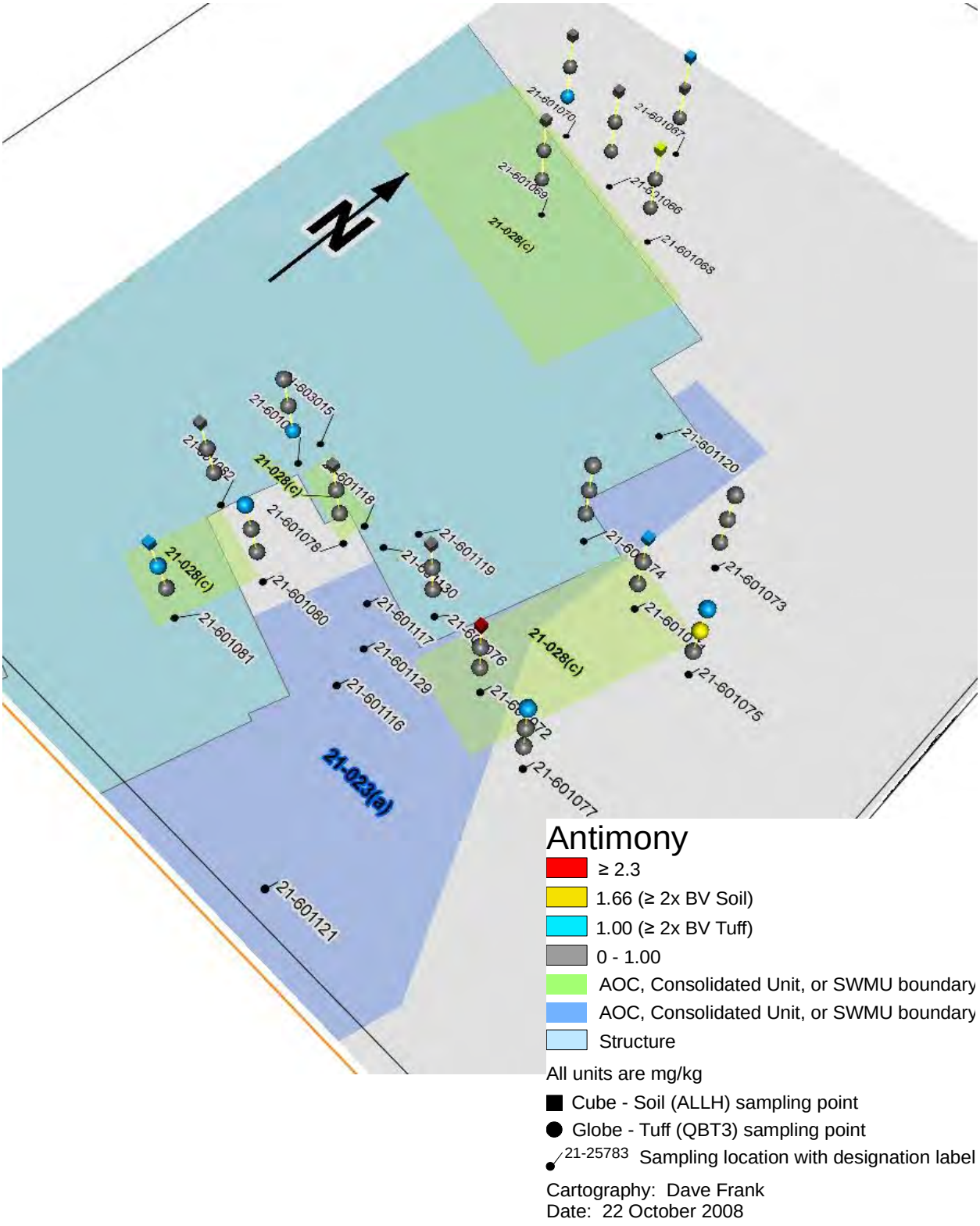


Figure C-9 Distribution of antimony at AOC 21-028(c)

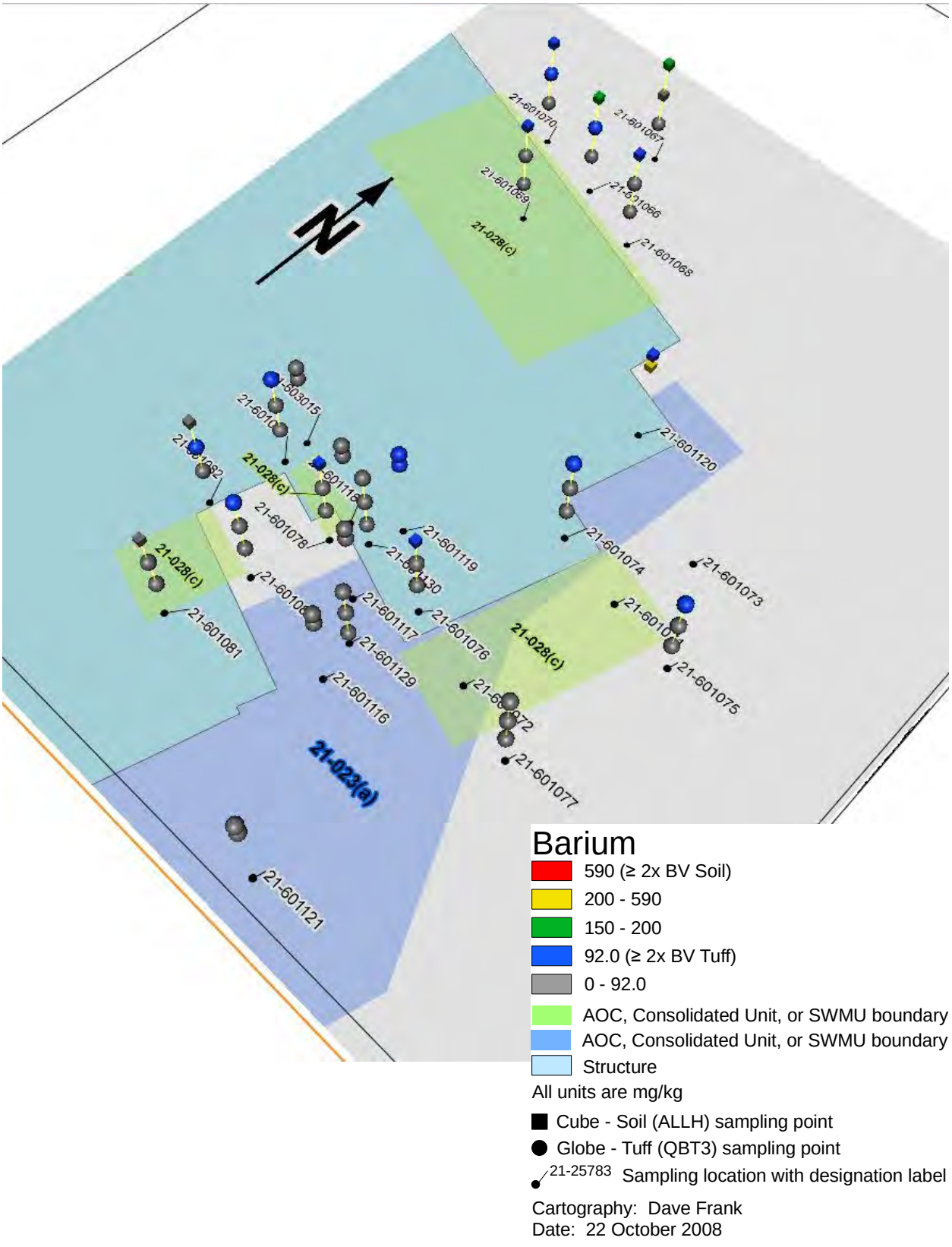


Figure C-10 Distribution of barium at AOC 21-028(c)

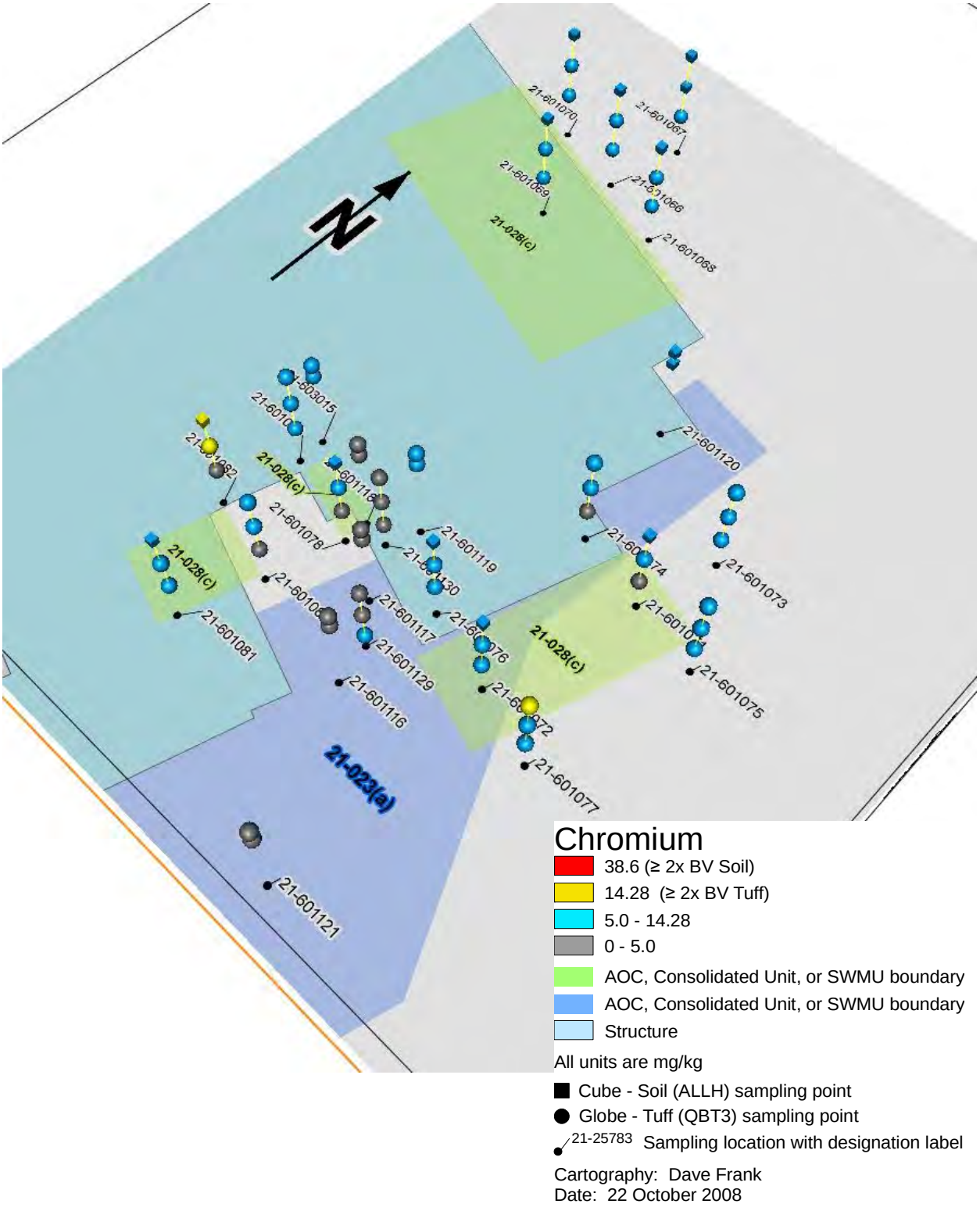


Figure C-11 Distribution of chromium at AOC 21-028(c)

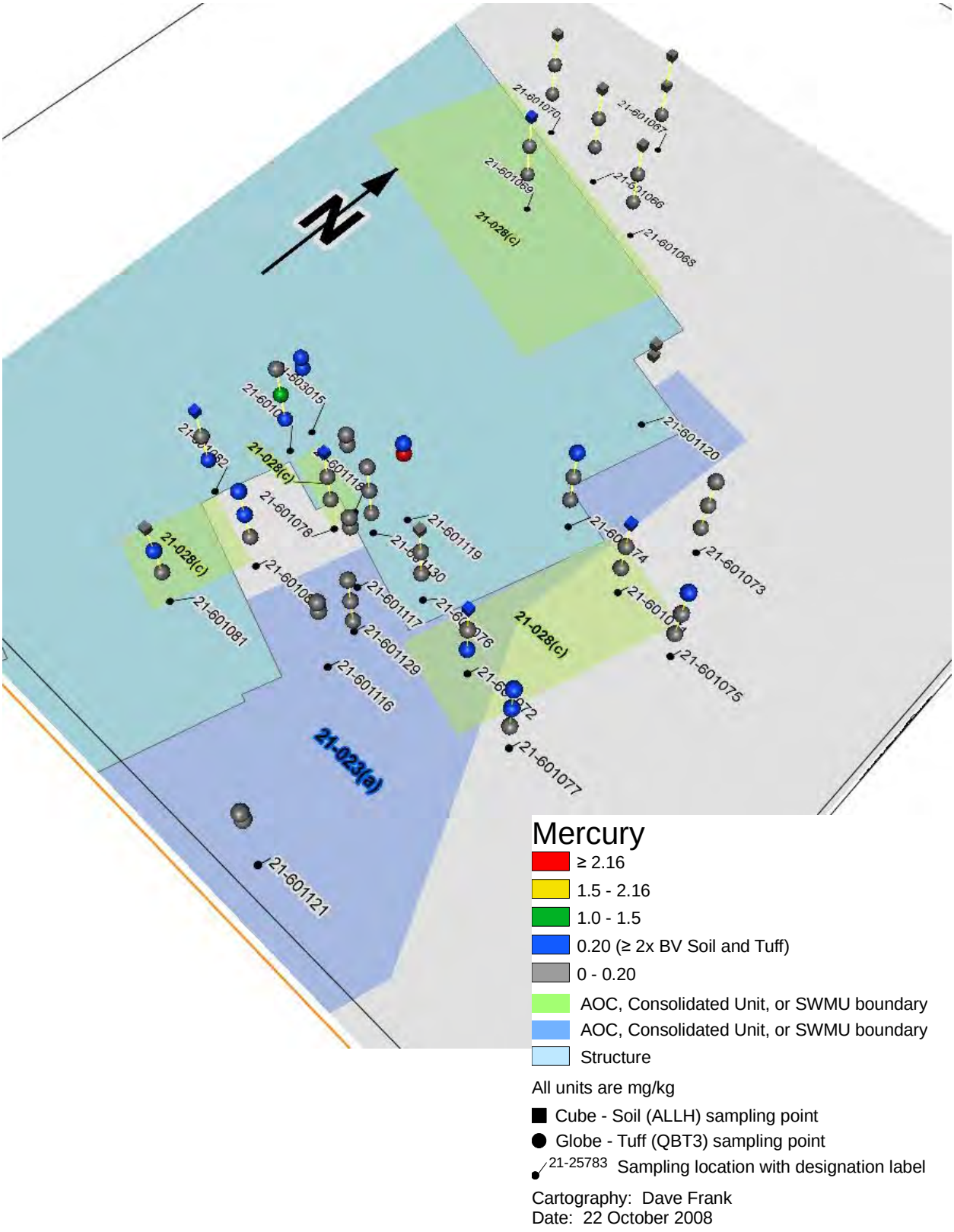


Figure C-12 Distribution of mercury at AOC 21-028(c)

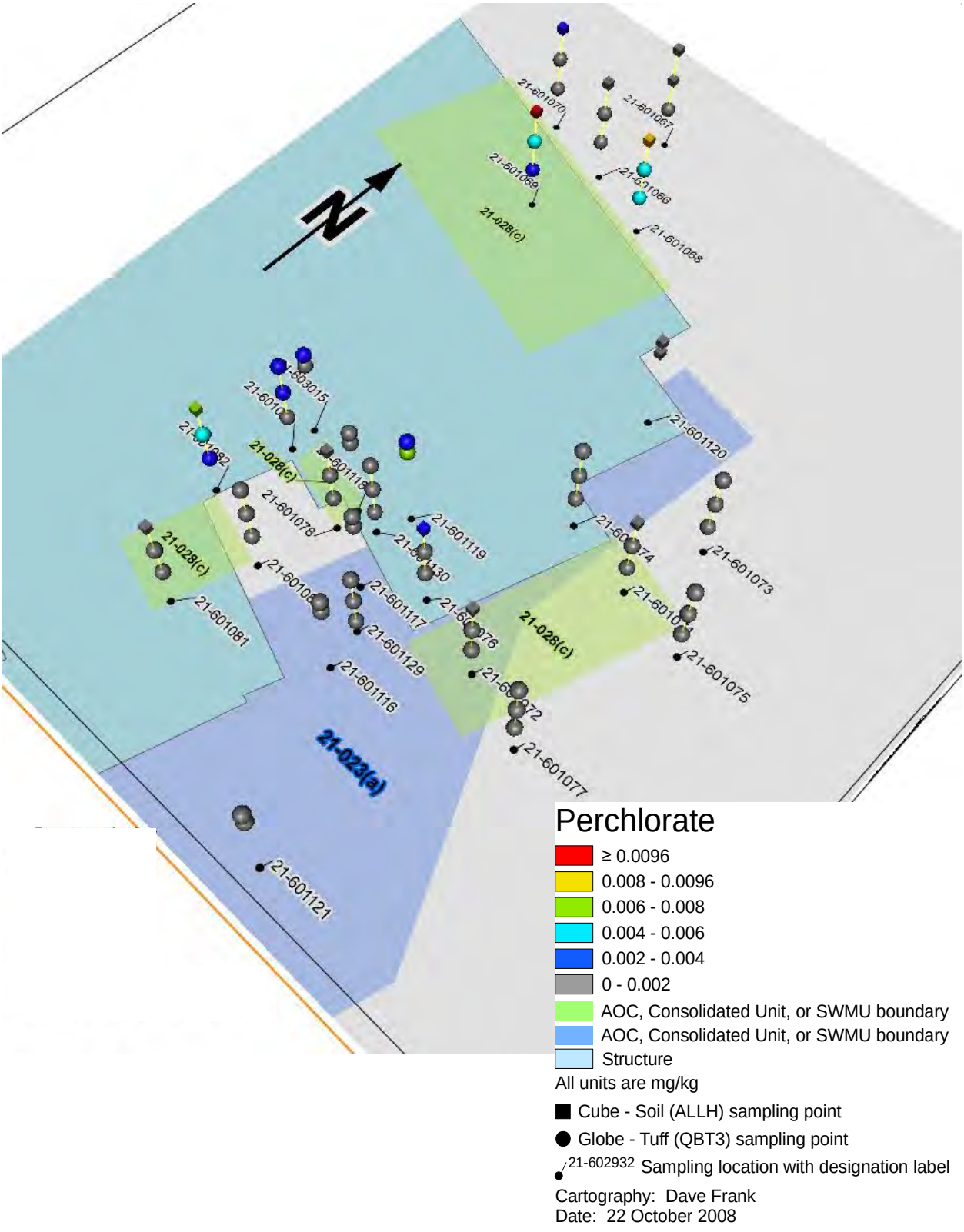


Figure C-13 Distribution of perchlorate at AOC 21-028(c)

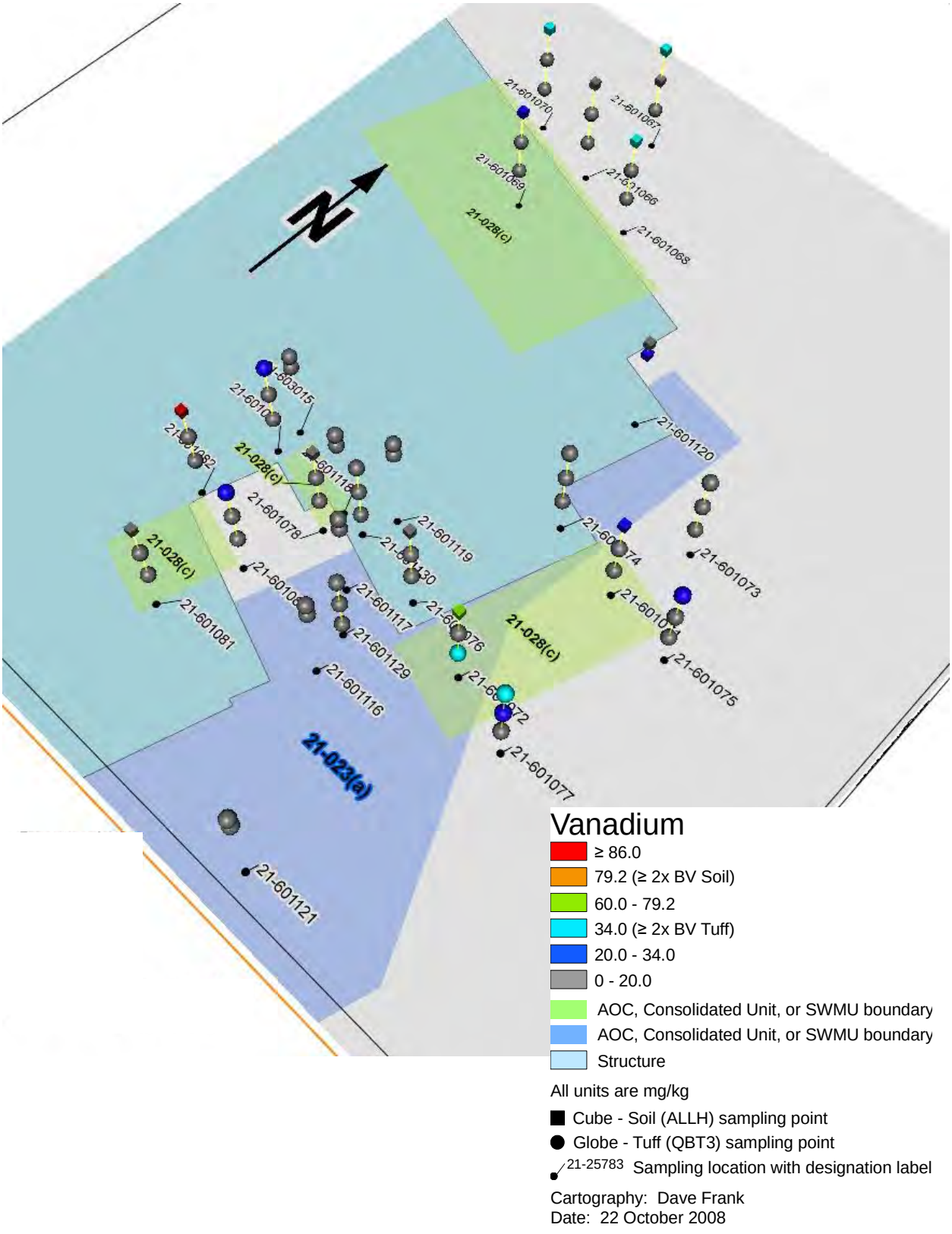


Figure C-14 Distribution of vanadium at AOC 21-028(c)

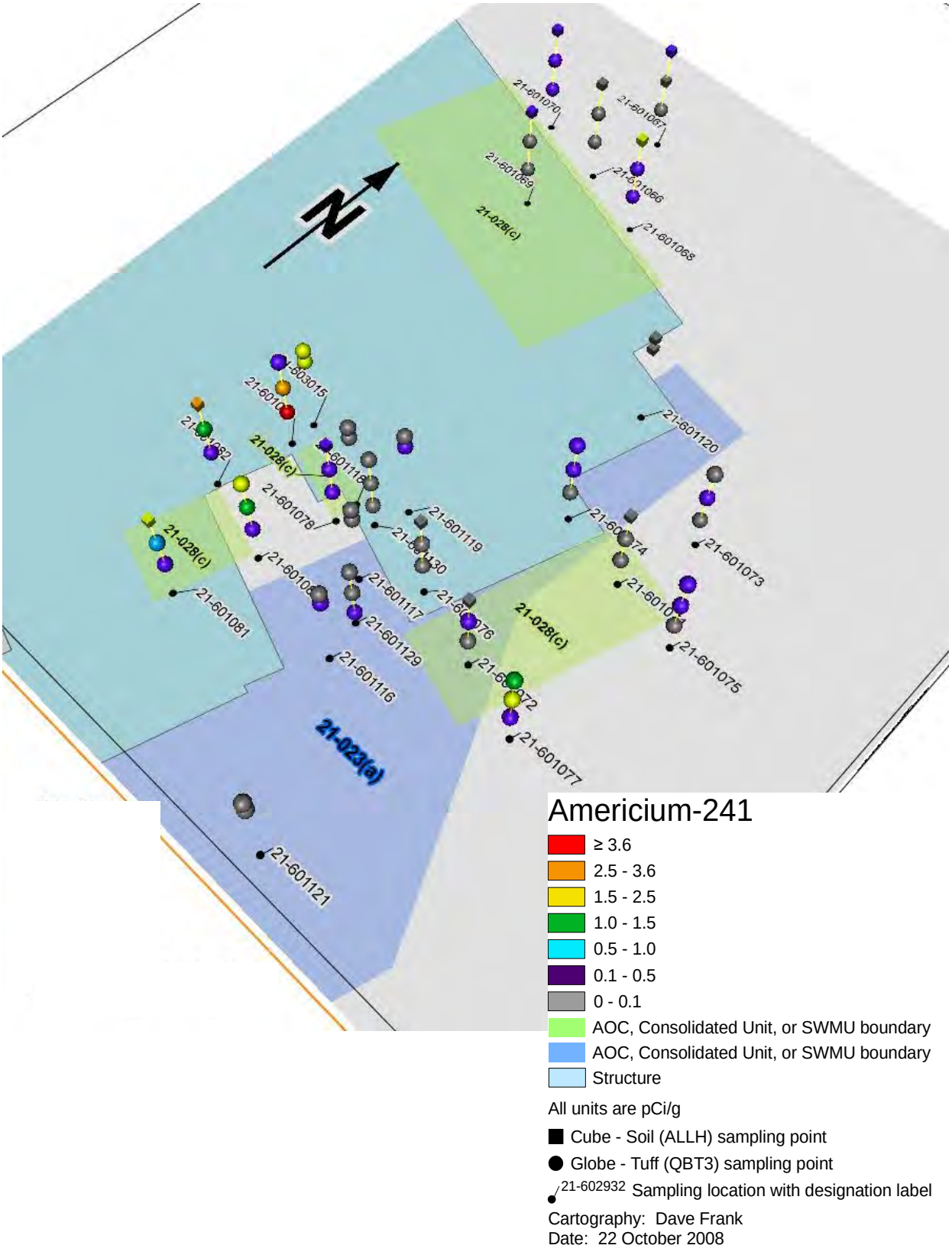


Figure C-15 Distribution of americium-241 at AOC 21-028(c)

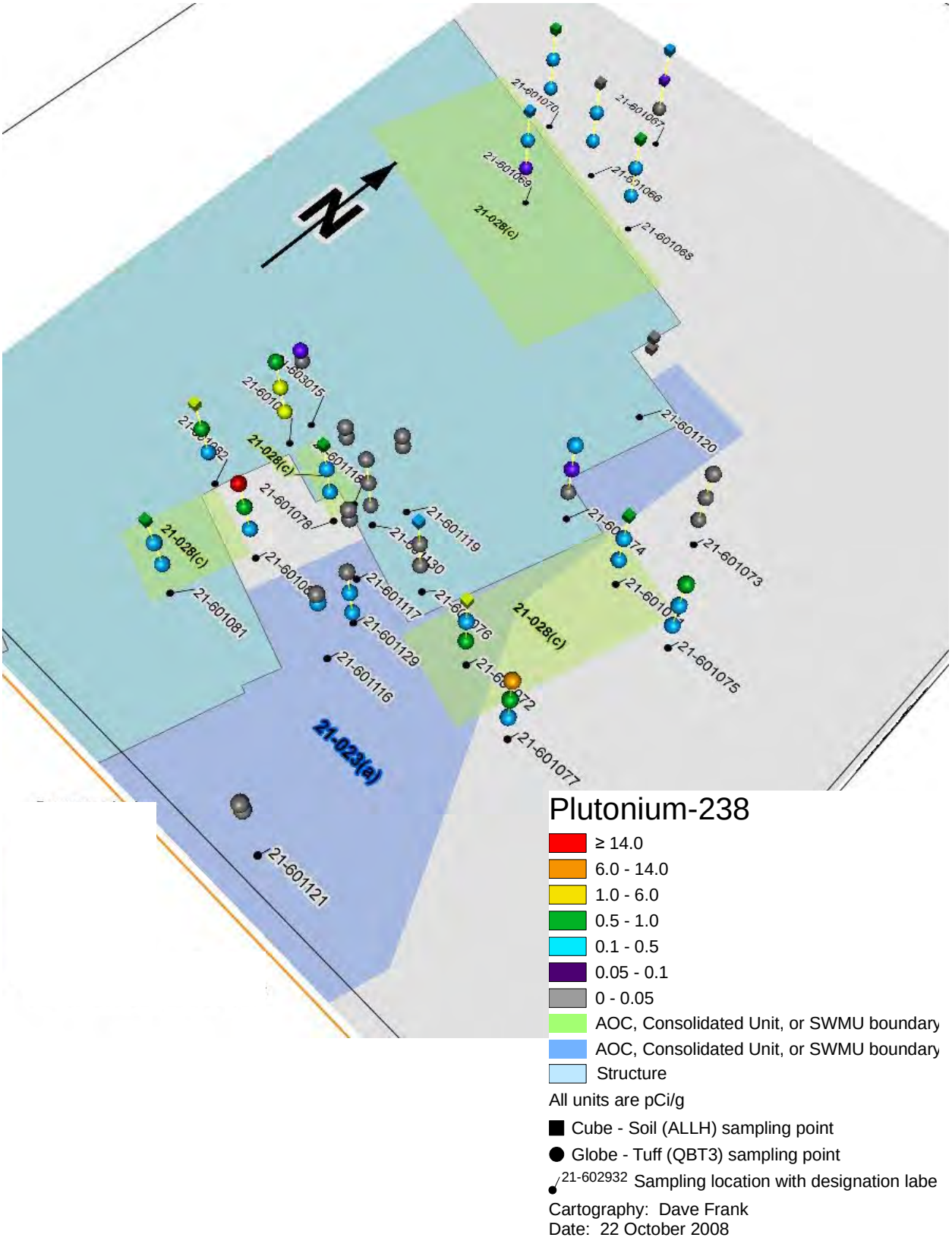


Figure C-16 Distribution of plutonium-238 at AOC 21-028(c)

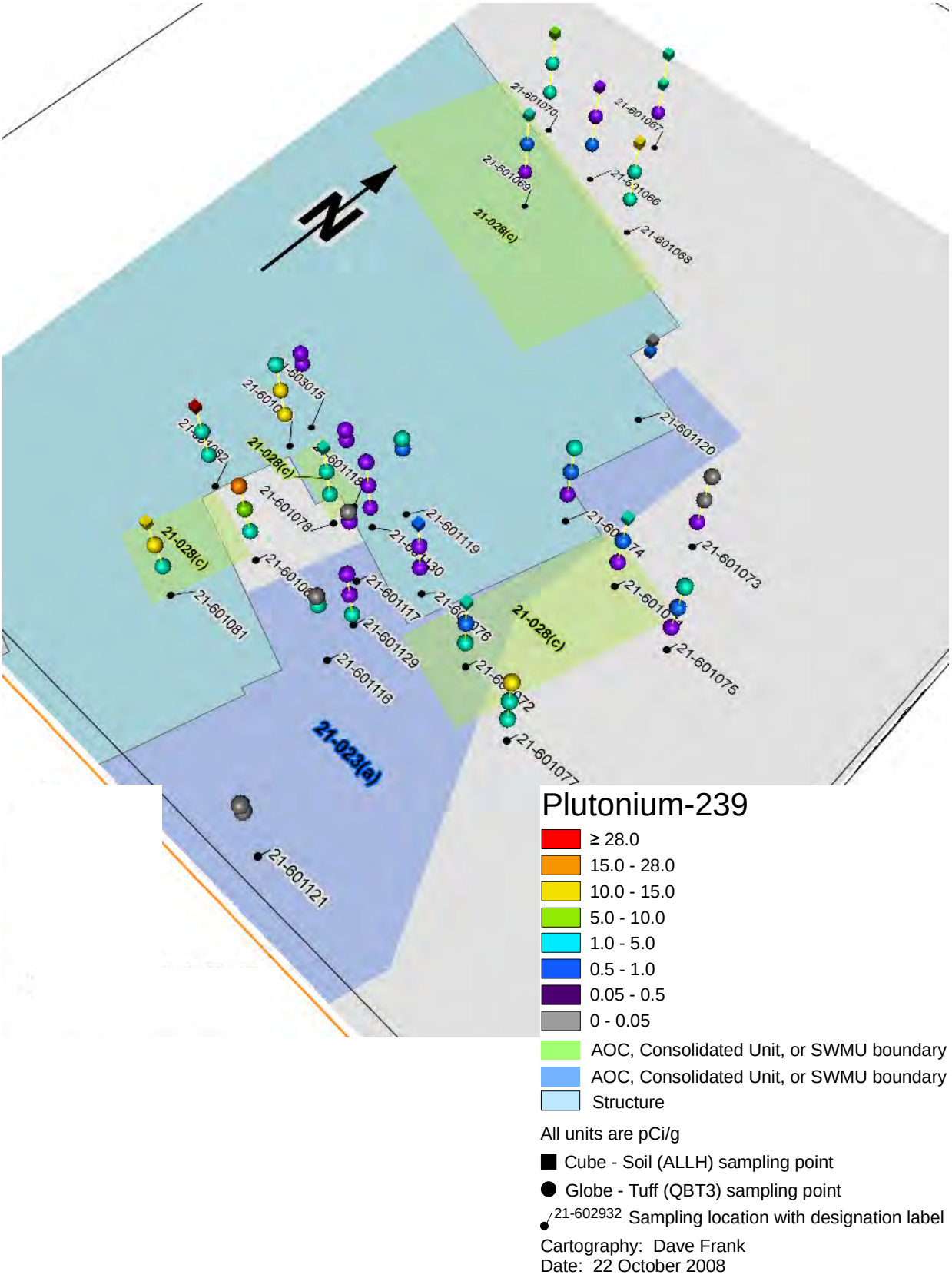


Figure C-17 Distribution of plutonium-239 at AOC 21-028(c)