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Date: January 19, 2006
Refer To: ER2005-0949

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NMED Hazardous Waste Bureau

Mr. John Young
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NMED – Hazardous Waste Bureau
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SUBJECT: **SUBMITTAL OF THE ACCELERATED CORRECTIVE ACTION WORK PLAN FOR THE INVESTIGATION AND REMEDIATION OF AREA OF CONCERN 16-024(v) AND SOLID WASTE MANAGEMENT UNITS 16-026(r) AND 16-031(f)**

Dear Mr. Young:

Enclosed are two copies of the Los Alamos National Laboratory (LANL) Environmental Stewardship–Environmental Remediation and Surveillance (ENV-ERS) Program "Accelerated Corrective Action Work Plan for the Investigation and Remediation of Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f)." Sarnpling activities are expected to begin the end of February 2006.

This accelerated corrective action work plan describes fieldwork to be accomplished by subcontractor and Laboratory personnel in support of characterization and remediation activities for areas of concern and solid waste management units in the planned path of the Technical Area 16 utilities project. Once the utilities are completed, our ability to investigate and remediate these sites in the future will be impeded. Therefore, the ENV-ERS Program will conduct these investigations now to ensure that characterization and remediation are completed before the sites are disrupted by the installation of utilities.

If you have any questions, please contact Melanee Shurter at (505) 667-7369 (mshurter@lanl.gov) or Tony Trujillo at (505) 845-5987 (ltrujillo@doeal.gov).

Sincerely,

David McInroy, Deputy Program Director
Environmental Remediation & Surveillance
Los Alamos National Laboratory

Sincerely,

David Gregory, Federal Project Director
Department of Energy
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RB/jk

Enclosure: Two hard copies with electronic files of the Accelerated Corrective Action Work Plan for the Investigation and Remediation of Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f)

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LA-UR-05-3979
January 2006
ER2005-0326

Accelerated Corrective Action Work Plan for Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f) at Technical Area 16

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Prepared by
Environmental Stewardship Division–
Environmental Remediation and Surveillance Program

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LA-UR-05-3979
ER2005-0326

Accelerated Corrective Action Work Plan for Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f) at Technical Area 16

January 2006

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EXECUTIVE SUMMARY

This accelerated corrective action (ACA) work plan presents the approach for the characterization and completion of corrective actions for one area of concern (AOC) and one solid waste management unit (SWMU) within the Upper Water Canyon and Cañon de Valle Aggregate Areas at Los Alamos National Laboratory (the Laboratory). In accordance with the terms of the March 1, 2005, Compliance Order on Consent, the investigation work plans for these aggregate areas are due to the New Mexico Environment Department in August 2010 and September 2006, respectively. The Laboratory plans to investigate and remediate AOC 16-024(v) and SWMU 16-026(r) within the aggregate areas in advance of the work plan deliverable date because these sites are located in areas included in the Technical Area (TA) 16 Weapons Campus Infrastructure Upgrade Project and may not be accessible during and after construction, which is scheduled to begin in January 2006. An additional SWMU [16-031(f)] is also included in this ACA work plan because it will also be impacted by the proposed construction activities. Based on known operations and activities conducted at former Building 16-21 [SWMU 16-031(f)], environmental sampling does not appear to be warranted; therefore, a request for a Certificate of Completion for this site will be submitted with the remedy completion report associated with this ACA work plan.

The purpose of the activities described in this ACA work plan is to complete corrective actions at AOC 16-024(v) and SWMU 16-026(r) while the sites are still accessible. ACA objectives for AOC 16-024(v) and SWMU 16-026(r) include (1) removing potentially contaminated soil from the proposed construction areas; (2) collecting confirmation samples to define the nature and extent of any residual contamination at both sites; and (3) documenting the completion of removal activities to support requests for Certificates of Completion for each site, including SWMU 16-031(f). To meet these objectives, the Laboratory's Environmental Stewardship Division–Environmental Remediation and Surveillance Program will conduct the following activities:

- perform site surveys;
- collect samples to characterize the lateral and vertical extent of any contamination at each site before utility excavations; and
- remediate, as necessary, to reduce any potential risk to human and ecological receptors based on the concentrations of chemicals detected.

No characterization or remediation activities are planned for SWMU 16-031(f). This site was previously recommended for no further action in the 1995 Resource Conservation and Recovery Act facility investigation work plan, but the recommendation was never formally reviewed by an administrative authority.

Upon completion of ACA activities, the sites will be turned over to the TA-16 Weapons Campus Infrastructure Upgrade Project team for construction; best management practices will be implemented as needed. The waste generated during the sampling and removal activities will be managed in accordance with all applicable Laboratory and regulatory waste management requirements.

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1.0 INTRODUCTION

Los Alamos National Laboratory (the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by the University of California (UC). The Laboratory is located in north-central New Mexico approximately 60 miles northeast of Albuquerque and 20 miles northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons. These canyons contain ephemeral and intermittent streams that run west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft. The eastern portion of the plateau stands 300 to 900 ft above the Rio Grande valley.

The Laboratory's Environmental Stewardship Division (ENV)–Environmental Remediation and Surveillance (ERS) Program (formerly the Environmental Stewardship Division–Remediation Services Project) is involved in a national DOE effort to ensure that past DOE operations do not threaten human or environmental health and safety in and around Los Alamos County. To achieve this goal, the ENV-ERS Program is investigating and remediating, as necessary, sites potentially contaminated by past Laboratory operations. The Weapons Campus Infrastructure Upgrade Project plans to excavate areas within some of the solid waste management units (SWMUs) and areas of concern (AOCs) at Technical Area (TA) 16. The ENV-ERS Program will perform the activities in this accelerated corrective action (ACA) work plan to complete an expedited investigation and remediation of AOC 16-024(v) and SWMU 16-026(r). Background information related to SWMU 16-031(f) is also included in this ACA work plan because the site is located in an area that will be disturbed by these activities. Environmental sampling is not proposed for this SWMU.

This ACA work plan presents the approach for the characterization and completion of corrective actions for AOC 16-024(v) and SWMU 16-026(r) within the Upper Water Canyon and Cañon de Valle Aggregate Areas at the Laboratory. In accordance with the terms of the Compliance Order on Consent (the Consent Order), signed by the New Mexico Environment Department (NMED), the U.S. Department of Energy, and the Regents of the University of California on March 1, 2005, the investigation work plans for these aggregate areas are due to NMED in August 2010 and September 2006, respectively. The Laboratory plans to investigate and remediate these sites in advance of the aggregate area work plan deliverable dates because the sites are located in areas that will soon be excavated for the installation of new utilities. Once the utilities have been installed, the AOC/SWMU locations will not be accessible. No characterization or remediation activities are planned for SWMU 16-031(f).

To accommodate the construction schedule, the Laboratory has accelerated the schedule for corrective action at AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f). SWMUs 16-026(r) and 16-031(f) are listed in Module VIII of the Laboratory's Hazardous Waste Facility Permit (EPA 1990, 01585; EPA 1994, 44146). NMED has not approved these sites for no further action (NFA). The Consent Order replaces the corrective action requirements of Module VIII. Under the terms of the Consent Order, NMED may issue Certificates of Completion for corrective actions as either "complete without controls" or "complete with controls." The Laboratory plans to complete corrective actions at AOC 16-024(v) and SWMU 16-026(r) to the levels required for NMED to issue a Certificate of Completion for corrective action complete with controls. A request for a Certificate of Completion with controls will be submitted in the forthcoming remedy completion report for SWMU 16-031(f) based solely on the knowledge of previous activities conducted at the site. In the event that corrective action at any one of these sites receives NMED approval as complete with controls, the Laboratory will assume responsibility for the controls specified for the site by NMED. The Laboratory expects that such controls will be limited to institutional/administrative controls to ensure that land use remains consistent with residual contamination at the site. In the event that NMED will not issue a Certificate of Completion for a site, the Facility Owner will assume long-term responsibility for the site.

1.1 General Site Information

AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) are situated on a mesa top of the Pajarito Plateau in the western portion of TA-16. The area where these sites are located is bounded by Cañon de Valle to the north and Water Canyon to the south (Figure 1). A brief description of the sites is provided in the following sections. There have been no previous environmental investigations conducted at these sites; therefore, no historical analytical data are included in this ACA work plan.

Each of these three sites were previously included in the second addendum to the Operable Unit (OU) 1082 Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan (LANL 1995, 57225), which was submitted to the U.S. Environmental Protection Agency (EPA) in July 1995. In this RFI work plan, surface and subsurface sampling was proposed at AOC 16-024(v) and SWMU 16-026(r). SWMU 16-031(f) was proposed for NFA in the work plan; however, the work plan was never formally reviewed or approved by a regulatory authority.

1.1.1 AOC 16-024(v), Former Magazine

AOC 16-024(v) is the former location of a high explosive (HE) storage magazine (former Building 16-62), constructed in 1944 outside of the S-Site exclusion zone. It is located approximately 100 ft east of the steam plant (Building 16-540) (Figure 2). The structure was used as an HE magazine until 1946 and was then used for general storage until it was removed in 1968; the location remains undeveloped and unpaved. As part of the TA-16 Weapons Campus Infrastructure Upgrade project, a new natural-gas line will be tied into the existing gas line at the approximate location of this AOC.

1.1.2 SWMU 16-026(r), Former Oil-Water Separator Drainline and Outfall

SWMU 16-026(r) is an inactive drainline and outfall from the oil-water separator at fire station Number 5 (Building 16-180) at TA-16 (Figure 2). The oil-water separator was used to skim oil from water discharged to floor drains in the fire house. The fire station was constructed in 1952 and remains in use. The outfall area where the oil overflow line reportedly discharged is an unpaved area approximately 70 ft south of the fire station. Oil stains have never been observed on surface soils at the reported outfall location. Currently, the oil-water separator and discharge line are inactive, and the floor drains in the building were rerouted to discharge into the sanitary sewer. As part of the TA-16 Weapons Campus Infrastructure Upgrade Project, a new potable water line will be tied into the existing water line at the approximate location of this SWMU.

1.1.3 SWMU 16-031(f), Former Chlorination Station Outfall

SWMU 16-031(f) is the former outfall from a decommissioned drinking-water chlorination station (former Building 16-21). The station was used to disinfect potable water using chlorine gas. A concrete trench in the building that received excess chlorinated drinking water and pump condensate discharged to a vitrified clay pipe and then to an outfall area 26 ft southwest of the building. The chlorination station was removed from this location in 1992 to accommodate a new telephone equipment building and parking lot. As part of the TA-16 Weapons Campus Infrastructure Upgrade Project, a new telecommunication duct bank will be installed at the location of this SWMU.

1.2 Investigation Objectives

The purpose of the activities described in this ACA work plan is to complete corrective actions at AOC 16-024(v) and SWMU 16-026(r) before the installation and tie-in of new utilities. Once the new

utilities have been installed, portions of these sites will be inaccessible. The ACA objectives for AOC 16-024(v) and SWMU 16-026(r) include (1) collecting samples to define the nature and extent of any residual contamination; (2) removing any additional contaminated soil as needed; (3) collecting confirmation samples; and (4) submitting a remedy completion report (including a request for a Certificate for Completion) for each site [including SWMU 16-031(f)] to NMED. To meet this objective, the Laboratory's ENV-ERS Program will conduct the following activities:

- perform site surveys;
- collect samples to characterize the lateral and vertical extent of any contamination at each site before utility excavations; and
- remediate, as necessary, to reduce any potential risk to human and ecological receptors based on the concentrations of chemicals detected.

No characterization or remediation activities are planned for SWMU 16-031(f). This site was previously recommended for NFA in second addendum to the OU 1082 RFI work plan (LANL 1995, 57225). The basis for the NFA was that there had been no recorded uses or releases of hazardous waste or hazardous constituents at this facility. The work plan and NFA recommendation were never formally reviewed.

The investigation and remediation of AOC 16-024(v) and SWMU 16-026(r) will be conducted in accordance with the requirements contained in the Consent Order. This ACA work plan outlines the scope of activities for investigation and removal of these facilities and describes the site surface and subsurface conditions. Appendix A includes a list of acronyms and abbreviations and defines the terms used in this report. Appendix B describes how investigation-derived waste will be managed.

2.0 BACKGROUND

2.1 Operational History

TA-16, also known as S-Site, is located in the southwest corner of the Laboratory (Figure 1). TA-16 covers approximately 2410 acres and is on a portion of land acquired by the Department of the Army for the Manhattan Project in 1943. TA-16 is bordered by Bandelier National Monument along State Highway 4 to the south and by Santa Fe National Forest along State Highway 501 to the west. To the north and east, TA-16 is bordered by other TAs. TA-16 has been, and continues to be, used for the production of HE.

SWMU 16-031(f) is located within the administration area of TA-16, outside of the security perimeter fence for the main HE area, but within the fenced portion of the administration area. AOC 16-024(v) and SWMU 16-026(r) are both located in an unfenced and unrestricted portion of TA-16.

2.1.1 AOC 16-024(v), Former Magazine

AOC 16-024(v), the former HE storage magazine (former Building 16-62), was located approximately 100 ft east of the steam plant (Building 16-540) (Figure 2 and Figure 3). The magazine was 6 ft × 6 ft × 7 ft tall. The building was constructed of wood and concrete and had a concrete floor with soil piled against three sides of the building, but not over the top. Building 16-62 was retired from use as a magazine in 1946. Because it was not contaminated, carpenters and plumbers used the building to store equipment between 1946 and 1968. Building 16-62 was removed in 1968 (LANL 1995, 57225).

2.1.2 SWMU 16-026(r), Former Oil-Water Separator Drainline and Outfall

SWMU 16-026(r), the inactive drainline and outfall from the oil-water separator at Fire Station Number 5 (Building 16-180) at TA-16 (Figure 2 and Figure 4) was used to skim oil from water discharged to the floor drains of the fire house (LANL 1995, 57225). The fire station was built in 1952 and is currently active. According to the 1992 Santa Fe Engineering Report (Santa Fe Engineering 1992, 15326), Fire Station Number 5 had only one outfall that discharges to the TA-16 sanitary treatment plant. However, as-built drawings for the fire station indicate that oil from the separator was skimmed from waste water and discharged to the ditch on the south side of the building through a 2-in. pipe. The resulting wastewater from the separator was discharged to the sanitary sewer (LANL 1951, 24052; LANL 1951, 90191). The sanitary sewer outfall receives flow from the sanitary facilities, four roof drains, one floor drain in a shop, and six floor drains in the truck bays. The report recommended the installation of an oil interceptor on the floor drains in the truck bays. The oil-water separator remains in place but is no longer used. The separator, which is not part of the SWMU, is a concrete pit below floor level in a wastewater line that received only oily wastewater from routine washing of the fire station's concrete floor. Oil stains on surface soils at this location are not present, and the discharge line is currently not visible.

2.1.3 SWMU 16-031(f), Former Chlorination Station Outfall

SWMU 16-031(f) is the drainline and outfall from a decommissioned chlorination station (former Building 16-21) (Figure 2). The former building was constructed in 1944 and was a wooden structure, 18 ft square and 10 ft high. The building contained an outfall that received drainage from a concrete trough within the building. Water was discharged at the southeast corner of the building into a vitrified clay pipe that daylighted 26 ft southeast of the building (Figure 5). The trench was designed to drain leakage from potable water inlet and outlet lines. The chlorinator added chlorine to the water as a gas so that any release of chlorine would have been a gas. Any water that may have leaked into the trench would have been chlorinated drinking water or pump condensate water. Building 16-21 was stripped of all usable equipment in 1953 when the new chlorination station (Building 16-560) was brought online (LANL 1995, 57225). According to the Santa Fe Engineering Report (Santa Fe Engineering 1992, 15326), there was no drainline or discharge of any kind from Building 16-21.

The building was subsequently removed in 1992 to make room for a telephone equipment building (Building 16-1374). Currently, it is unknown whether the discharge line was removed. A parking lot now covers the area of the former outfall. Based on this information, SWMU 16-031(f) is being proposed for NFA.

2.2 Contaminant Transport Mechanisms and Potential Receptors

The primary mechanisms of contaminant release at AOC 16-024(v) and SWMU 16-026(r) are from contaminated surface soil that might be suspended by wind or in surface runoff.

The potential pathways for human exposure to surface soil and tuff are dermal contact, inhalation of vapors and particulates, and incidental soil ingestion. Pathways from subsurface contamination to potential human receptors would be complete only if contaminated soil or tuff were excavated and brought to the surface. The potential pathways would then be similar to those of a surface soil release (i.e., dermal contact, inhalation of vapors or fugitive dust, and incidental soil ingestion). Note that the planned construction activities will not take place until after potentially contaminated soil/tuff has been removed from each site.

For ecological receptors, pathways from subsurface contamination to potential surface-dwelling animals would be complete only if contaminated soil or tuff were excavated and brought to the surface. The potential pathways would then be similar to those of a surface soil release, uptake by plants, and food-web transport. Pathways from subsurface releases may be complete for plants and burrowing animals, including the uptake of contaminants by plant roots and the exposure of burrowing animals through dermal contact, inhalation of vapors or dust, incidental ingestion of soil, and food-web transport.

Downward migration of contaminants in the vadose zone is unlikely because of a lack of hydraulic gradient. The lack of saturated conditions in the area restricts vertical migration; however, horizontal migration through storm water runoff is possible. No perched alluvial aquifers have been identified in this portion of TA-16, nor are there springs or seeps nearby that would indicate the presence of perched alluvial aquifers. Therefore, a complete pathway to groundwater, including the regional aquifer, located approximately 1300 ft below ground surface (bgs) from the mesa top, is unlikely.

The historical land use at TA-16 is industrial; the land-use designation will remain industrial (i.e., continued Laboratory use) for the foreseeable future and will be the basis for cleanup. In addition, construction activity for the Weapons Campus Infrastructure Upgrade Project at this site will include the mitigation of contaminant exposure through site-specific health and safety plans and occupational exposure limit requirements (e.g., Occupational Safety and Health Administration [OSHA] and the National Institute for Occupational Safety and Health [NIOSH]). Through the project review process required before any construction activities at the Laboratory, the construction organization will be informed of any contamination found or remaining at the site and the potential for impacts on human health. However, the Laboratory will evaluate the sampling data using construction worker soil screening levels (SSLs) for comparison purposes and will provide contaminant and risk information to construction organizations to evaluate potential worker exposure at the site.

2.3 Historical Releases

Potential releases related to historical activities at the sites include releases to surface and subsurface soil and tuff beneath and surrounding the former building at AOC 16-024(v) and at the outfall area associated with SWMU 16-026(r). Based on the nature of activities conducted at SWMU 16-031(f), no release of hazardous waste or hazardous constituents is known or expected to have occurred.

Although these sites were included in the second addendum to the OU 1082 RFI work plan (LANL 1995, 57225), the plan was never formally reviewed or approved by NMED, and investigation activities have not been initiated.

2.3.1 Summary of Chemicals of Potential Concern

The chemicals of potential concern (COPCs) for AOC 16-024(v) and SWMU 16-026(r) are listed below.

- COPCs at AOC 16-024(v) include inorganic chemicals; volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs); and HE.
- COPCs at SWMU 16-026(r) include inorganic chemicals VOCs, SVOCs, and total petroleum hydrocarbons (TPH).
- The only COPC for 16-031(f) is chlorine gas, which is not persistent in the environment.

3.0 SITE CONDITIONS

AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) are situated on a mesa top of the Pajarito Plateau at an approximate elevation of 7650 ft above mean sea level. The surface of the plateau slopes generally eastward toward Cañon de Valle and Water Canyon. The walls of the canyons cutting the Pajarito Plateau generally consist of vertical ledges alternating with steep slopes. The slopes along the upper reaches of the canyons in small tributaries cutting the areas of TA-16 are gentle and mantled with up to several feet of colluvium and soil. The Pajarito Plateau is drained by several west-to-east-oriented canyons; surface water flows eastward toward the Rio Grande.

The average annual rainfall in the area of TA-16 is estimated to range from 8 to 19 in. Of this total, approximately 40% occurs as brief, intense thunderstorms during July and August. Intermittent stream flow in adjacent canyons can occur as a result of these storms. Spring snowmelt runoff may also induce intermittent stream flow in local canyons (Nyhan et al. 1978, 05702).

Soil in this area and the surrounding mesa top is classified as Hackroy-Rock Complex (Nyhan et al. 1978, 05702). Based on field observations, soils in this area range from 0 to 8 ft deep. Soils may be sandy and contain many pumice pebbles up to 0.5 in. in size. Clay lenses may be intermixed with pulverized tuff. Soils in the drainages are sandy with some clay and many small pebbles. Bedrock is exposed at many areas.

Surface soils and alluvium, locally ranging in thickness from 0 to approximately 15 ft, overlie the bedrock tuff. The subsurface bedrock tuff is composed of cooling unit 4 of the Quaternary Tshirege (upper) Member of the Bandelier Tuff (Qbt), which consists of multiple layers of ash-flow tuffs approximately 300 to 600 ft thick. Portions of the Tshirege Member are highly welded and form vertical cliffs as well as the caprock on the plateau.

The regional water table is approximately 1300 ft bgs from the mesa top on the western side of the Pajarito Plateau (LANL 2003, 77965). The movement of meteoric water and potential migration of contaminants from the surface to the aquifer is very limited because of the considerable thickness of the vadose zone and the minimal amount of precipitation at the site.

The area is bounded on the north by Cañon de Valle and on the south by Water Canyon. The walls of the canyons cutting the Pajarito Plateau generally consist of vertical ledges alternating with steep slopes. The Pajarito Plateau is drained by several west-to-east-oriented canyons; surface water flows eastward toward the Rio Grande.

3.1 Surface Conditions

Surficial deposits on the Pajarito Plateau consist of coarse-grained colluvium on steep hillslopes and along the base of cliffs (generally fine-grained fluvial and colluvial sediments with a thin cover of eolian fine-grained sediments on the flatter parts of mesa surfaces) and alluvial fan deposits at the mouths of drainages cut into the mountain front or escarpments related to post-Bandelier faulting. Well-developed soils generally occur only on the gently sloping surfaces associated with the mesas. These soils usually consist of several subhorizons of the Bandelier Tuff that contain reddish clay. Soils present on top of the mesas and the soils making up the steep hill slopes, drainages, and other areas flanking erosionally stable mesa tops are typically thin and weakly developed, possessing only an A horizon and a C horizon. Erosion of the mesa top is caused primarily by surface runoff on the relatively flat part of the mesas, by runoff in channels cut into mesa surfaces, and by rockfall and colluvial transport on the walls of the canyon.

AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) are located on the top of the mesa. A thin layer of soil is preserved in flat parts of the mesa surface and supports a large area of vegetation. Tuff outcrops in some areas surrounding the three sites but dominates the steep mesa slopes into the surrounding canyons.

3.2 Subsurface Conditions

The regional stratigraphy of the Pajarito Plateau consists of the Bandelier Tuff, the Puye Formation, the Totavi Lentil deposits, the Santa Fe Group, and the Santa Fe basalts. AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) are located on a mesa top, and, therefore, subsurface conditions defining these sites include only the plateau's uppermost stratigraphic unit, the Tshirege Member of the Bandelier Tuff and/or fill material deposited to extend the mesa top. Descriptions of the Bandelier Tuff members associated with the sites are provided in the following subsections.

3.2.1 Bandelier Tuff

With regard to Bandelier Tuff, the term "welding" is used to distinguish between tuffs that are uncompacted and porous (nonwelded) from tuffs that are more compacted and dense (welded). In the field, the degree of welding in tuff is quantified by the degree of flattening of pumice fragments (a higher degree of flattening and elongation equals a higher degree of welding). Petrographically, welded tuffs show adhesion (welding) of grains, but nonwelded tuffs do not. The term devitrified is applied to tuffs whose volcanic glass has crystallized.

3.2.1.1 Tshirege Member

The Tshirege Member of the Bandelier Tuff is a compound cooling unit that resulted from several successive ash-flow deposits separated by periods of inactivity, which allowed for partial cooling of each unit. Properties related to water flow and contaminant migration (e.g., density, porosity, degree of welding, fracture content, and mineralogy) vary both vertically and laterally as a result of localized emplacement temperature, thickness, gas content, and composition.

3.3 Hydrology

The proposed hydrogeologic conceptual model for the Pajarito Plateau (LANL 1998, 59599) predicts that surface conditions such as topography, surface water flow, and microclimate greatly influence the infiltration of water into the subsurface and the subsequent transport of water, vapor, and solutes through the upper regions of the vadose zone. According to model predictions, movement through deeper layers, including the regional aquifer, is influenced only weakly by surface conditions and is influenced more strongly by hydraulic characteristics of aquifer rocks, regional groundwater flow patterns, and stresses induced by water-supply production.

The following sections provide an overview of infiltration rates and groundwater occurrence in the western portion of TA-16.

3.3.1 Surface Water and Infiltration

Surface and near-surface conditions (topography, precipitation, surface runoff) control water infiltration into the subsurface and the transport of contaminants in the shallow subsurface. In this respect, the climate behavior of mesas and canyons forming the plateau differ from one another (LANL 1998, 59599). Mesas are generally dry, both on the surface and within the rock that forms the mesa. Canyons range

from wet to relatively dry; the wettest canyons contain continuous streams and perennial groundwater in the canyon-bottom alluvium, such as in Cañon de Valle. Dry canyons have only occasional stream flow and may lack alluvial groundwater.

The amount of mesa-top recharge along the portion of the Laboratory where AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) are located is minimal. Fractures within mesas do not enhance the movement of dissolved contaminants unless saturated conditions develop. Contaminants in the vapor phase generally migrate in a diffusive manner through mesas (Stauffer et al. 2000, 69794). Most of the surface drainage from the site flows toward either Cañon de Valle or Water Canyon.

3.3.1.1 Groundwater

Groundwater beneath the Pajarito Plateau occurs in three distinct horizons: (1) in the regional aquifer; (2) in shallow perched zones beneath canyons that maintain relatively wet surface conditions (surface flow) for most of the year; and (3) in intermediate perched zones in the vadose zone, between the regional aquifer and the shallow perched zones (Nylander et al. 2003, 76059.49).

The regional aquifer occurs within the Santa Fe Group and the Puye Formation and is the only aquifer capable of large-scale municipal water supply (Purtymun 1984, 06513). The regional aquifer extends throughout the Española Basin (an area of roughly 2317 mi^2) and reaches its maximum thickness beneath the Pajarito Plateau (over 800 ft thick [Cordell 1979, 76049]). Depths to the regional aquifer range between about 1300 ft bgs along the western edge of the plateau to about 600 ft bgs to the east. Beneath the western portion of TA-16, the water table elevation is approximately 1300 ft bgs from the mesa top (LANL 2003, 77965).

Groundwater in the shallow perched zones occurs within the canyon alluvium (i.e., gravel, sand, and finer sediments deposited by surface flow in the canyon bottoms). The alluvial deposits are limited in their geographical extent and very permeable relative to the underlying Bandelier Tuff; therefore, surface water readily infiltrates the alluvium and becomes captured, forming narrow, ribbon-like alluvial aquifers that lie directly beneath the canyon bottoms. These shallow alluvial aquifers generally occur at depths of less than 100 ft and are as much as 100 ft thick in some locations. One of these narrow and shallow aquifers is located in Cañon de Valle located to the north and east of the investigation area.

Groundwater also occurs in intermediate perched water zones. In areas where low-permeability beds impede the downward migration of water, water could pool and collect, forming isolated intermediate-depth aquifers. Evidence of intermediate-depth aquifers has been found beneath Pueblo, Los Alamos, Sandia, Mortandad, Pajarito, Ancho Canyons and Cañon de Valle (Nylander et al. 2003, 76059.49). These perched intermediate aquifers are morphologically similar to the shallow alluvial aquifers, occurring as narrow ribbons that follow the canyons; however, the depths at which these intermediate aquifers occur are highly variable, ranging from less than 100 ft bgs to as much as 900 ft bgs from the canyon bottoms.

3.3.1.2 Vadose Zone

The region beneath the ground surface and above the regional aquifer is called the vadose (unsaturated) zone. The source of moisture in the vadose zone is precipitation, most of which is removed as runoff, evaporation, and transpiration (LANL 1997, 63131). The subsurface movement of the remaining moisture (often referred to as recharge) is predominantly vertical in direction and is influenced by properties and conditions of the vadose zone.

The geologic property of the Bandelier Tuff that most influences fluid flow in the unsaturated zone is the degree of welding. Welded tuffs tend to have less matrix porosity and more fractures than nonwelded tuffs. Fractures in welded tuff may include relatively close-spaced cooling joints as well as tectonic fractures. Although nonwelded tuffs also have fractures, they are generally less abundant than in welded tuffs. Along the western portion of TA-16, the mesa caprock is exposed in several tuff outcroppings (LANL 2005, 89331).

4.0 SCOPE OF ACTIVITIES

The ACA work plan for AOC 16-024(v) and SWMU 16-026(r) includes the following activities:

- develop planning and field documents for implementation of the work plan
- mobilize to and prepare the site
- conduct land surveys (i.e., geophysical and utility) to relocate/confirm AOC/SWMU locations and former building locations before the initiation of excavation activities (including utility locations)
- collect samples in selected locations to determine impacts to surface and subsurface soil
- remove potentially contaminated soil from excavations during the installation of subsurface utilities; additional sampling and utility excavations to be conducted concurrently
- collect additional samples as needed
- conduct a postsampling geodetic survey
- restore site and demobilize from the site
- prepare a remedy completion report for AOC 16-024 and SWMUs 16-026(r) and 16-031(f), including the presentation and analysis of all data collected. A request for a Certificate of Completion from NMED will be included in the remedy completion report for the three sites.

Investigation methods for performing the work described above are provided in Section 5.0. The schedule for the planned activities is provided in Section 7.0.

5.0 INVESTIGATION METHODS

Activities described in this work plan will be performed in accordance with the applicable quality assurance (QA) requirements addressed in the ENV-ERS Program Quality Management Plan and implementing quality procedures (QPs) and standard operating procedures (SOPs), Laboratory requirement documents (e.g., Laboratory Implementation Requirements and Laboratory Performance Requirements), or equivalent Laboratory-approved subcontractor documents (e.g., statements of work, field implementation plans, etc.). The following ENV–Environmental Characterization and Remediation Group (ENV-ECR) SOPs are applicable to the work described in this section:

- SOP-01.01, General Instructions for Field Investigations
- SOP-01.02, Sample Containers and Preservation
- SOP-01.03, Handling, Packaging, and Transporting Field Samples
- SOP-01.04, Sample Control and Field Documentation
- SOP-01.05, Field Quality Control Samples

- SOP-01.06, Management of Environmental Restoration Project Wastes
- SOP-01.07, Operational Guidelines for Taking Soil and Water Samples in Explosive Areas
- SOP-01.08, Field Decontamination of Drilling and Sampling Equipment
- SOP-01.10, Waste Characterization
- SOP-01.12, Field Site Closeout Checklist
- SOP-03.11, Coordinating and Evaluating Geodetic Surveys
- SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples
- SOP-06.10, Hand Auger and Thin-Wall Tube Sampler
- SOP-06.33, Headspace Vapor Screening with a Photoionization Detector

Table 1 presents a summary of the sample collection and analysis methods that are incorporated into these SOPs. Additional procedures may be used as necessary to guide the work-plan activities.

5.1 AOC 16-024(v)

5.1.1 Mobilization and Site Preparation

Mobilization to AOC 16-024(v) will include the delivery and inspection of heavy equipment and the establishment of site work areas using ropes, postings, or construction fencing as appropriate to control access by the public and untrained workers. Erosion-control best management practices (BMPs) (e.g., silt fence and straw wattles) will be installed before any soil-disturbing activities begin. Historic records of the site indicate that radioactive material has never been stored or used at the facility; therefore, field radiation screening will not be performed.

The entire surface surrounding former Building 16-62 will be inspected for staining or other evidence of contaminant releases. Visual inspections will also be conducted during all sampling and excavation activities.

Land surveys will be conducted before the initiation of excavation activities in accordance with SOP-03.11, Geodetic Surveys, to complete utility locates and identify the boundaries of the former building and AOC boundary. These coordinates will be delivered to the ENV-ECR Records Processing Facility (RPF) for migration to the ENV-ECR Geographical Information System (GIS).

5.1.2 Sampling and Excavation Activities

Samples will be collected either using the spade and scoop method described in SOP-06.09 or with the assistance of a backhoe or similar equipment, as appropriate.

Visual inspection of samples will include inspection for staining. HE screening of soil and tuff will be conducted using D-Tech immunoassay test kits. This semiquantitative field-screening method will be used to guide characterization and confirmation sampling activities. The field-analytical method for hexahydro-1,3,5-trinitro-1.3.5-triazine (RDX), (the primary HE compound used at TA-16) is EPA SW-486 (Update III) Method 4051 (EPA 1997, 57589). The detection limit for RDX using this method is 1.0 mg/kg. Field screening for HE using an HE spot-test kit may also be conducted to characterize areas of gross contamination; however, the detection limit for this method is only 100 mg/kg.

Eight samples will be collected from four locations at two depth intervals (0 to 6 in. and at the soil/tuff interface) or from the bottom of the gas-line excavation, whichever is deeper. The four sample locations will correspond to the footprint of former Building 16-62 (Figure 3). Additional samples may be collected based on results of field screening and observations of staining. If there are no field-screening results indicating potential contamination or if there is no evidence of staining, samples will only be collected from the proposed locations and sample depth intervals specified above. In accordance with the Consent Order, headspace vapor screening for VOCs (SOP-06.33) will be conducted using a photoionization detector (PID) capable of measuring concentrations as low as 1 ppm. Screening samples will be sealed in mason jars and allowed to equilibrate in a warm area for not less than ten minutes. The headspace gas will be screened using a PID equipped with an 11.7-eV bulb. To ensure compliance with U.S. Department of Transportation (DOT) regulations, all samples will be screened for gross radiation before they are transported to the analytical laboratory.

Soil-removal-related construction activities at AOC 16-024(v) will involve excavation at the planned tie-in location of the new gas line to the end of the existing gas line approximately 100 ft east of the steam plant (Building 16-540). If initial sample results indicate that soil contamination is present, material will be staged in a designated roll-off bin located within a registered waste storage area pending sample analysis.

5.1.3 Fixed Laboratory Analytical Methods

All samples for AOC 16-024(v) will be submitted for fixed-laboratory analysis of VOCs, SVOCs, explosive compounds, and target analyte list (TAL) metals, with a request for a 30-day turnaround time for the analytical results. Once samples have been collected and screened, they will be transported to the laboratory in accordance with SOP-01.03, Handling, Packaging, and Shipping of Samples. The Sample Management Office (SMO) will ship samples to an off-site analytical laboratory qualified according to QP-7.2, Supplier Evaluation, and listed on the ENV-ECR Qualified Suppliers List. Specific analytical methods are described in the EPA document, “Test Methods for Evaluating Solid Wastes” (SW-846) (EPA 1997, 57589) and are listed in Table 2.

In accordance with SOP-01.05, QA/quality control (QC) samples will include VOC trip blanks at a frequency of 1 per 20 samples or 1 per day, whichever is greater; field duplicates at a rate of 1 per 10 samples or 1 per day per matrix, whichever is greater, to evaluate the reproducibility of the sampling technique; and rinsate blanks for VOCs, SVOCs, TAL metals, and HE analysis to evaluate decontamination procedures.

5.1.4 Site Restoration, Decontamination, and Demobilization Activities

Site restoration will be completed by the excavation subcontractors by adding imported clean fill (if contaminated soil is removed) to bring the site back to its original grade following the tie-in and installation of the new gas line. BMPs will be installed to prevent the erosion of site soils from storm water run-on and runoff. The BMPs will be left in place and upgraded as needed to prevent the erosion of site soils. The Laboratory will inspect these BMPs as part of the existing BMP maintenance and inspection program.

Stainless-steel sampling equipment will be decontaminated daily and between uses at sampling locations. To minimize or eliminate liquid-waste generation, decontamination of equipment will be accomplished using dry methods whenever possible. If required, an alconox/water solution decontamination technique may be used to decontaminate sampling equipment. Wet or dry decontamination techniques will be conducted in accordance with SOP-01.08, Field Decontamination of

Drilling and Sampling Equipment. Any decontamination wastewater generated will be stored on-site in a closed container.

All sampling and decontamination equipment, materials, and investigation-derived wastes will be removed from the site for disposal in accordance with an approved waste characterization strategy form (WCSF) as required by SOP-01.10, Waste Characterization.

The investigation-derived waste-management plan for wastes generated during the ACA field activities is presented in Appendix B.

5.1.5 Postsampling Geodetic Survey

A postinvestigation geodetic survey will be conducted at the site to confirm the exact sample locations and to ensure that any deviations from the proposed sample design are documented. The geodetic survey will be conducted in accordance with SOP-03.11, Geodetic Surveys.

5.2 SWMU 16-026(r)

5.2.1 Site Preparation

Mobilization to SWMU 16-026(r) will include the delivery and inspection of heavy equipment and the establishment of site work areas using ropes, postings, or construction fencing as appropriate to control access by the public and untrained workers. Erosion-control BMPs will be installed before any soil-disturbing activities begin. Historic records of the site indicate that radioactive or explosive materials have never been stored or used at the facility; therefore, field screening for radiation and HE will not be performed.

The surface of the end section of oil overflow line and soil and tuff within the overflow line outfall will be inspected for staining or other evidence of contaminant releases. Visual inspections will also be conducted during all sampling and excavation activities.

Land surveys will be conducted before the initiation of excavation activities in accordance with SOP-03.11, Geodetic Surveys, to locate utilities and to identify the SWMU boundary. These coordinates are delivered to the RPF for migration to the GIS.

5.2.2 Excavation and Confirmation Sampling

Samples will be collected either using the spade and scoop method as described in SOP-06.09 or with the assistance of a backhoe or similar equipment, as appropriate. If soil contamination is encountered in any of the four sample locations, the entire line will be removed. Currently, it is unknown if the overflow pipe was used, or if it even exists.

Eight samples will be collected from two depth intervals (0 to 6 in. and at the soil/tuff interface) at four locations along the oil-water separator oil overflow line and outfall area (Figure 4). Additional samples may be collected based on results of field screening, including the observation of staining or obvious discharge-line leak points. If the former oil overflow line is encountered, additional samples will be collected from the interval immediately below the line. If the line is not encountered, if no field screening results indicate potential contamination, or if no evidence of staining is found, samples will only be collected from the locations and intervals specified above. In accordance with the Consent Order, headspace vapor screening for VOCs (SOP-06.33) will be conducted using a PID capable of measuring concentrations as low as 1 ppm. Screening samples will be sealed in mason jars and allowed to

equilibrate in a warm area for not less than ten minutes. The headspace gas will then be screened using a PID equipped with an 11.7-eV bulb. To ensure compliance with DOT regulations, all samples will be screened for gross radiation before they are transported to the analytical laboratory.

Soil removal related to construction activities at SWMU 16-026(r) will involve excavation at the planned tie-in location of the new water line to the existing water line, approximately 70 ft south of fire station Number 5 (Building 16-180). As part of the excavation activities, it is anticipated that the southern portion of the oil/water separator discharge line will probably require removal. If sample results indicate that contaminated soil is present, excavated material will be staged in a designated roll-off bin located within a registered waste storage area pending sample analysis.

5.2.3 Fixed Laboratory Analytical Methods

All samples will be submitted for fixed-laboratory analysis of VOCs, SVOCs, TAL metals, TPH (gasoline range organics [GRO] and diesel range organics [DRO]) with a request for a 30-day turnaround time for the analytical results. Once samples have been collected and screened, they will be transported to the laboratory in accordance with SOP-01.03, Handling, Packaging, and Shipping of Samples. The SMO will ship samples to an off-site analytical laboratory qualified according to QP-7.2, Supplier Evaluation, and listed on the ENV-ECR Qualified Suppliers List. Specific analytical methods are described in the EPA document, “Test Methods for Evaluating Solid Wastes” (SW-846) (EPA 1997, 57589) and are listed in Table 2.

In accordance with SOP-01.05, QA/QC samples will include VOC trip blanks at a frequency of 1 per 20 samples or 1 per day, whichever is greater; field duplicates at a rate of 1 per 10 samples or 1 per day per matrix, whichever is greater, to evaluate the reproducibility of the sampling technique; and rinsate blanks for TAL metals, VOC, and SVOC analysis to evaluate decontamination procedures.

5.2.4 Site Restoration, Decontamination, and Demobilization Activities

Site restoration will be completed by the TA-16 Weapons Campus Infrastructure Upgrade Project subcontractors by adding imported clean fill (if contaminated soil is removed) to bring the site back to its original grade following the tie-in and installation of the new water line. BMPs will be installed to prevent the erosion of site soils from storm water run-on and runoff. The BMPs will be left in place and upgraded as needed to prevent the erosion of site soils. The Laboratory will inspect these BMPs as part of the existing BMP maintenance and inspection program.

Stainless-steel sampling equipment will be decontaminated daily and between uses at sampling locations. To minimize or eliminate liquid-waste generation, decontamination of equipment will be accomplished using dry methods whenever possible. If required, an alconox/water solution decontamination technique may be used to decontaminate sampling equipment. Wet or dry decontamination techniques will be conducted in accordance with SOP-01.08, Field Decontamination of Drilling and Sampling Equipment. Any decontamination wastewater generated will be collected and stored on-site in a closed container.

All sampling and decontamination equipment, materials, and investigation-derived wastes will be removed from the site for disposal in accordance with an approved WCSF.

The investigation-derived waste-management plan for wastes generated during the ACA field activities is presented in Appendix B.

5.2.5 Postsampling Geodetic Survey

A postinvestigation geodetic survey will be conducted at the site to confirm the exact sample locations and to ensure that any deviations from the proposed sample design are documented. The geodetic survey will be conducted in accordance with SOP-03.11, Geodetic Surveys.

5.3 SWMU 16-031(f)

Environmental sampling is not proposed for SWMU 16-031(f), the outfall from the decommissioned chlorination station (former Building 16-21) (Figure 5). The outfall from the building was located 26 ft southeast of the building and is currently paved over. The chlorinator added chlorine to the water as a gas so that any release of chlorine would have been a gas. Any water that discharged at the outfall would have been chlorinated drinking water or pump condensate water. According to the Santa Fe Engineering Report (Santa Fe Engineering 1992, 15326), there was no drainline or discharge of any kind from Building 16-21.

It is unknown whether the discharge line existed or was removed. A parking lot now covers the area of the former outfall. Based on this information, a request for a Certificate of Completion will be included in the remedy completion report for this ACA work plan.

5.4 Proposed Samples and Analytical Suites

Table 2 presents the number of proposed samples to be collected and the analytical suites the samples will be analyzed for at each site. All activities described in this ACA work plan will be conducted under the applicable subcontractor-approved site-specific health and safety plan. Integrated work documents will be prepared for each activity identified in the site-specific health and safety plan for the fieldwork.

5.5 Photo Documentation

Each phase of the activities outlined in this ACA, including site field work (excavation, sampling, etc.) and restoration will be documented and photographed. A descriptive annotation will be provided for each photograph.

6.0 POSTSAMPLING MONITORING

Currently, there are no monitoring activities being conducted at AOC 16-024(v), SWMU 16-026(r), or SWMU 16-031(f). The ACA activities for the investigation and remediation of these sites will be the final remedy for the site. Therefore, post-ACA sampling or monitoring activities are not planned at any of the sites.

7.0 SCHEDULE

Field activities associated with the implementation of this ACA work plan are expected to begin in January 2006. A remedy completion report for the ACA will be prepared and submitted to the NMED Hazardous Waste Bureau 90 days after ACA activities are completed. The schedule for specific ACA work plan preparation and field activities is summarized in Table 3.

8.0 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 number. This information is also included in text citations. ER ID numbers are assigned by the ENV-ERS Program RPF and are used to locate the document at the RPF and, where applicable, in the ENV-ERS Program master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the ENV-ERS Program. 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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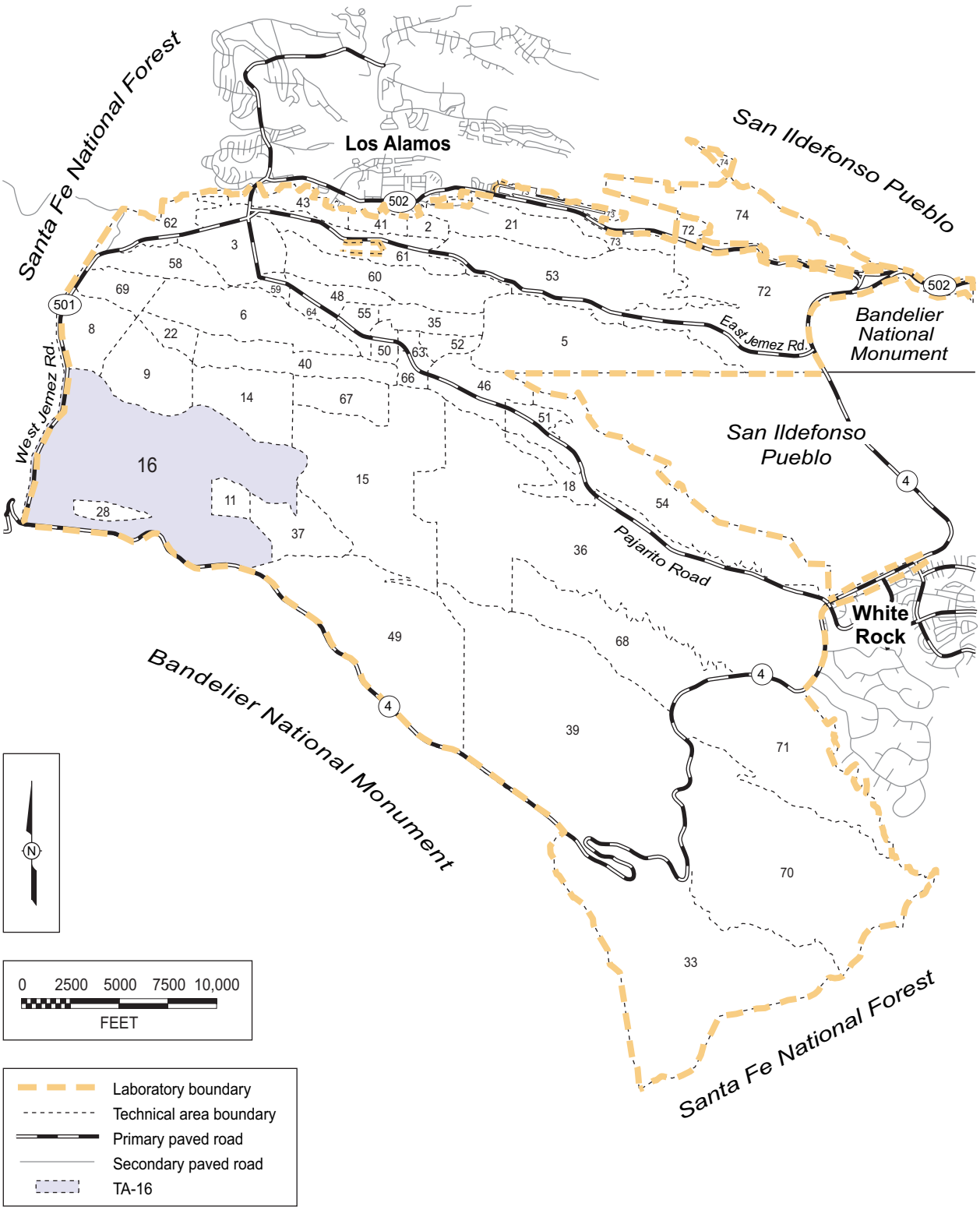
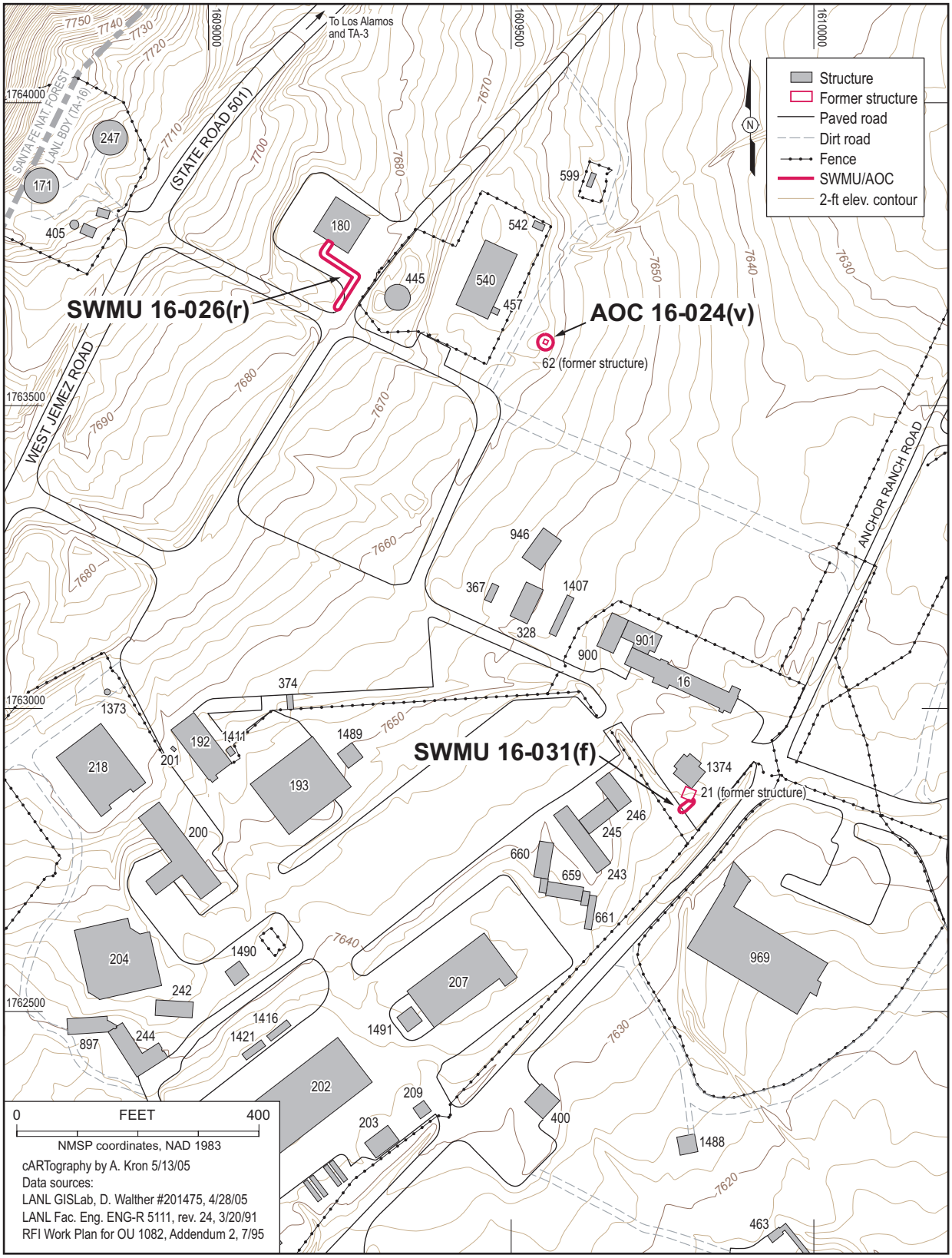


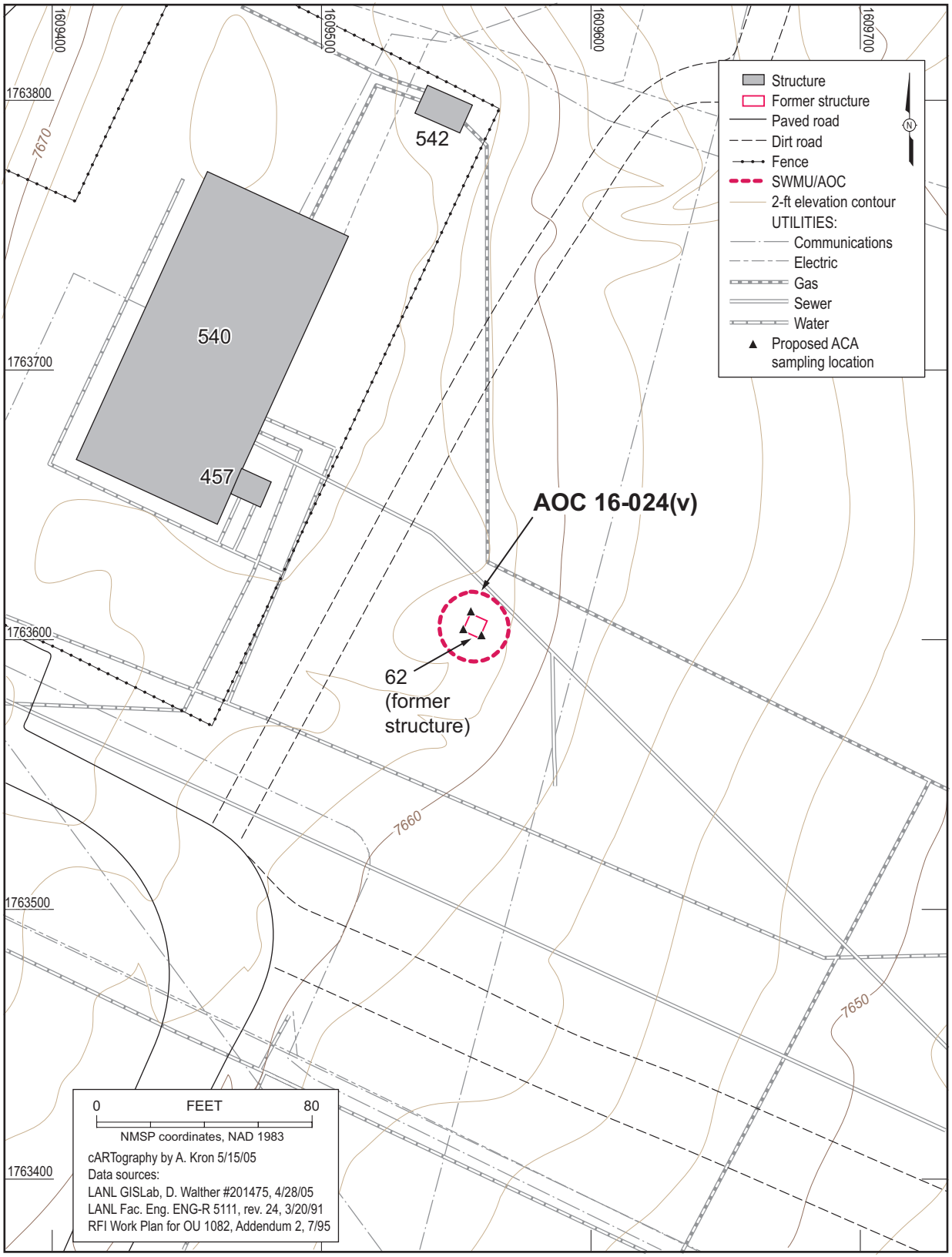
F1, ACA WP TA-16, 011106, ptm

Figure 1. Location of TA-16 with respect to Laboratory TAs and surrounding land holdings



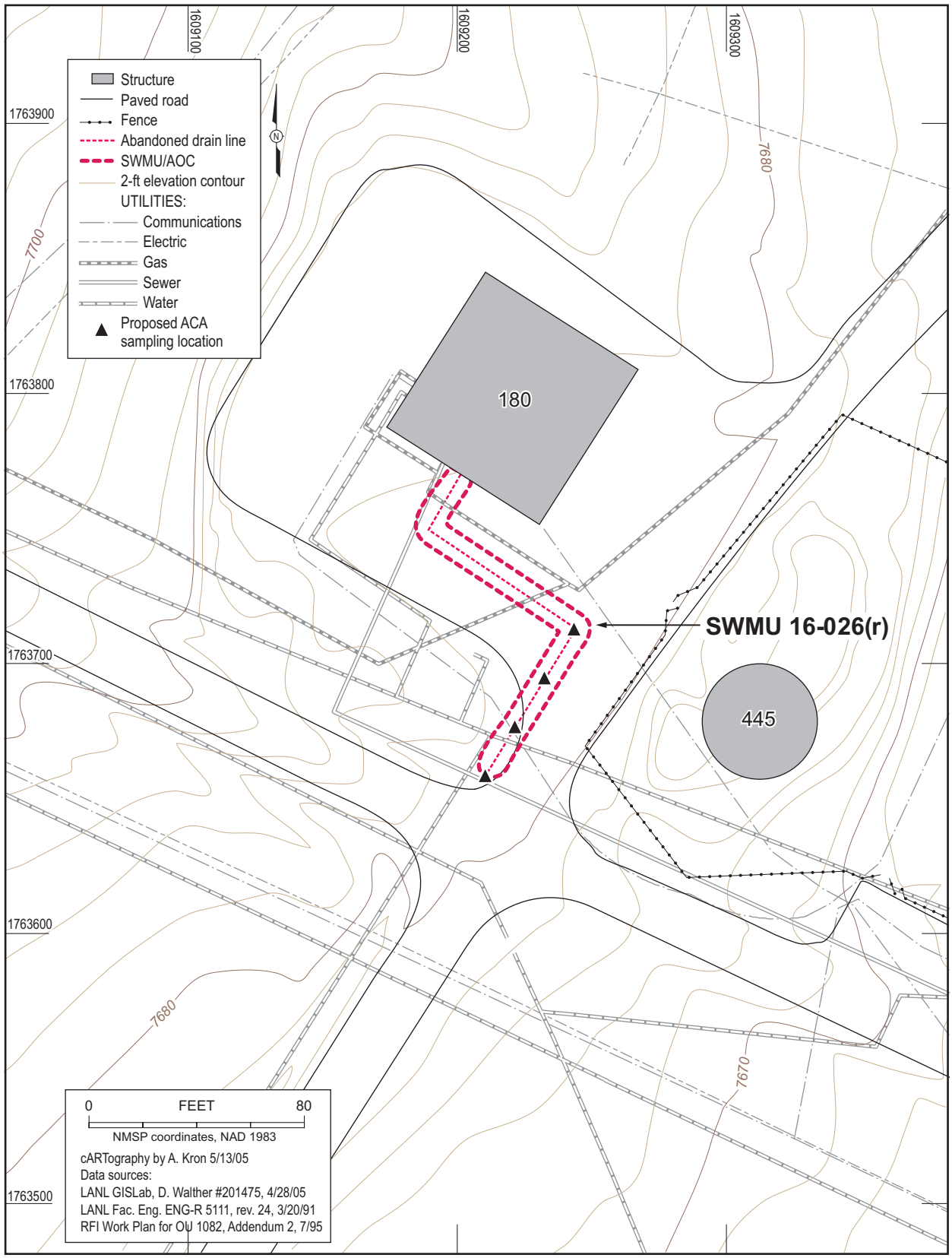
F2, ACA WP TA-16, 011206, ptm

Figure 2. Locations of AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) at TA-16



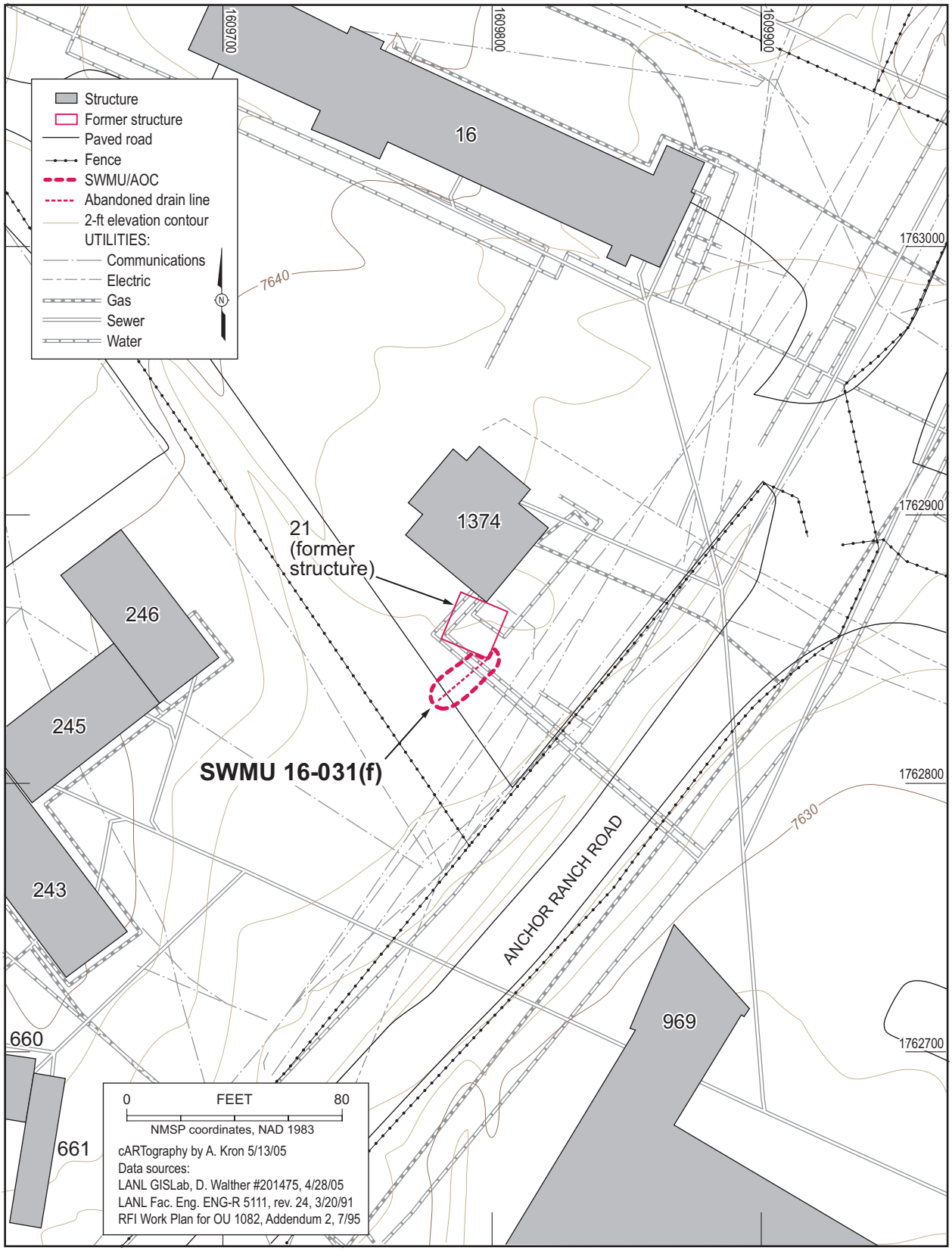
F3, ACA WP TA-16, 011206, ptm

Figure 3. Sampling locations at AOC 16-024(v) at TA-16



F4, ACA WP TA-16, 011206, ptm

Figure 4. Sampling locations at SWMU 16-026(r) at TA-16



F5, ACA WP TA-16, 011206, ptm

Figure 5. Location of SWMU 16-031(f) at TA-16

Table 1
Brief Description of Field Investigation Methods

Method	Summary
Spade and Scoop Collection of Soil Samples	This method is typically used for the collection of shallow (i.e., approximately 0–12 in.) 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. I.D.), creating a vertical hole that 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.
Headspace Vapor Screening	Individual soil, rock, or sediment samples may be field-screened for volatile organic compounds by placing a portion of the sample in a plastic sample bag or in a glass container with a foil-sealed cover. The container is sealed and gently shaken, and allowed to equilibrate for 5 minutes. The sample is then screened by inserting a PID probe into the container and measuring and recording any detected vapors.
Handling, Packaging, and Shipping of Samples	Field team members seal and 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 so as to minimize the possibility of breakage during transportation. After all environmental samples are collected, packaged, and preserved, a field team member transports them to either the SMO or an SMO-approved radiation screening laboratory under chain-of-custody. The SMO arranges for shipping of samples to analytical laboratories. The field team member must inform the SMO and/or the radiation screening laboratory coordinator 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 is documented on standard forms generated by the SMO. These include sample collection logs, chain-of-custody forms, and sample container labels. Collection logs 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 initialed and applied to each sample container, and custody seals are placed around container lids or openings. Chain-of-custody 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 Order on Consent as follows: Field Duplicate: At a frequency 10%; collected at the same time as a regular sample and submitted for the same analyses. Equipment Rinsate Blank: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which 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. Trip blanks are containers of certified clean sand that are opened and kept with the other sample containers during the sampling process.

Table 1 (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 the removal of soil or other material adhering to the sampling equipment, followed by the use of a commercial cleaning agent (nonacid, waxless cleaners) 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, etc.). All samples are preserved by placing them 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.

Table 2
Proposed Samples and Analytical Suites for AOC 16-024(v) and SWMU 16-026(r)

AOC/SWMU	Depth (in.)	Description	Analyte Suite/Method Number	Total Number of Samples
AOC 16-024(v)	0 to 6 and 24 to 30	Collected from within the footprint of former Building 16-62	VOCs (8260B), SVOCs (8270C), TAL metals (6010B, 6020, 7471A), explosive compounds (8321A)	8 planned 1 duplicate
SWMU 16-026(r)	0 to 6 and 24 to 30	Collected from likely release points along the oil overflow line	VOCs (8260B), SVOCs (8270C), TAL metals (6010B, 6020, 7471A), TPH-DRO (8015M) and TPH-GRO (8015M)	8 planned 1 duplicate

Table 3
ACA Field Implementation Schedule for AOC 16-024(v) and SWMU 16-026(r)

Activity	Duration (workdays)
Preparation/readiness review	45
Field preparation: • mobilize equipment • implement BMPs • establish work zone and waste management area	6
Geodetic surveys (pre-excavation)	3
Excavation and soil removal	30
Sampling	10
Postsampling geodetic survey	3
Laboratory analysis	40
Site restoration and demobilization	6
Final site inspection	1
Total Duration	**144**

Appendix A

Acronyms and Abbreviations

ACA	accelerated corrective action
AOC	area of concern
bgs	below ground surface
BMP	best management practice
COC	chain of custody
COPC	chemical of potential concern
DOE	Department of Energy
DOT	Department of Transportation
DRO	diesel range organics
ENV-ECR	Environmental Stewardship Division–Environmental Characterization and Remediation Group
ENV-ERS	Environmental Stewardship Division–Environmental Remediation and Surveillance Program
EPA	Environmental Protection Agency
ER	Environmental Restoration (Project)
GRO	gasoline range organics
GIS	geographical information system
HE	high explosives
IDW	investigation-derived waste
LIR	Laboratory Implementation Requirement
NFA	no further action
NIOSH	National Institute for Occupational Safety and Health
NMED	New Mexico Environment Department
OSHA	Occupational Safety and Health Administration
OU	operable unit
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
QA	quality assurance
QC	quality control
QP	quality procedure
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	RCRA facility investigation
RPF	Records Processing Facility

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
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
UC	University of California
VOC	volatile organic compound
WCSF	waste characterization strategy form

Appendix B

Investigation-Derived Waste Management

This appendix to the work plan describes how investigation-derived waste (IDW) generated during the accelerated corrective action (ACA) of Area of Concern (AOC) 16-024(v) and Solid Waste Management Unit (SWMU) 16-026(r) at the Los Alamos National Laboratory (the Laboratory) will be managed. IDW is solid waste generated as a result of field investigation activities and may include, but is not limited to, drill cuttings; purge water; contaminated personal protective equipment (PPE), sampling supplies, and plastic; fluids from the decontamination of PPE and sampling equipment; and all other wastes potentially contacting contaminants. IDW generated during the ACA will be managed to protect human health and the environment, comply with applicable regulatory requirements, and adhere to the Laboratory waste minimization goals.

All IDW generated during ACA field activities will be managed in accordance with applicable Environmental Stewardship Division–Environmental Characterization and Remediation (ENV-ECR) Group standard operating procedures (SOPs). These SOPs incorporate the requirements of all applicable Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, Department of Energy (DOE) orders, and Laboratory Implementation Requirements (LIRs). ENV-ECR SOPs applicable to the characterization and management of IDW are

- SOP-01.06, Management of Environmental Restoration Project Waste and
- SOP-01.10, Waste Characterization.

These SOPs are among the SOPs applicable to the ACA and are available at the following URL: http://erproject.lanl.gov/documents/procedures.html.

The Environmental Stewardship–Environmental Remediation and Surveillance (ENV-ERS) Program portion of the 2004 Pollution Prevention Roadmap (LANL 2004, 88465) will be implemented during ACA field activities to minimize waste generation.

The IDW waste streams associated with the ACA at AOC 16-024(v) and SWMU 16-026(r) are identified in Table B-1 and are briefly described below. Table B-1 also summarizes the waste type, estimated volume, and method of on-site management.

Excavated soil and drainline debris. The soil and drainline debris waste stream will consist of the soil and debris generated during the excavation of the utility trenches and the removal of former drainlines. These wastes will be collected in roll-off boxes at the site. The soil and debris waste stream will be characterized by a combination of acceptable knowledge from site characterization sampling and direct sampling of the containerized waste. Composite samples of soil will be collected from the containerized waste and submitted for laboratory analysis using the toxicity characteristic leaching procedure (TCLP). The results of the TCLP analysis, in combination with evaluation of the site characterization data, will be used to determine whether the wastes are hazardous or nonhazardous. Based on the operational history of the sites, the Laboratory expects these wastes to be designated as nonhazardous solid waste that will be disposed of at a New Mexico solid waste landfill.

Spent PPE. The spent PPE waste stream will consist of PPE that has potentially “contacted” contaminated environmental media (i.e., soil) and that cannot be decontaminated. The bulk of this waste stream will consist of protective clothing, such as coveralls, gloves, and shoe covers. Spent PPE will be collected in containers at personnel decontamination stations. Characterization of this waste stream will be performed through acceptable knowledge based on analysis of the excavated soil. Based on the operational history of the sites, the Laboratory expects these wastes to be designated as nonhazardous solid waste that will be disposed of at a New Mexico solid waste landfill.

Disposable sampling supplies. The disposable sampling supplies waste stream will consist of all equipment and materials necessary for the collection of samples that come into direct contact with contaminated environmental media and that cannot be decontaminated. This waste stream also includes wastes associated with dry decontamination activities. This waste stream will consist primarily of paper and plastic items collected in bags at the sampling location and transferred to accumulation drums. Characterization of this waste stream will be performed through acceptable knowledge based on analysis of the excavated soil. Based on the operational history of the sites, the Laboratory expects these wastes to be designated as nonhazardous waste that will be disposed of at a Northern New Mexico solid-waste landfill.

Decontamination fluids. The decontamination fluids waste stream will consist of liquid wastes from decontamination activities (i.e., 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. Small amounts (less than six gallons) of nonhazardous decontamination fluids may be discharged directly on-site provided these discharges are unlikely to generate leachate that will move directly or indirectly into groundwater and provided that the New Mexico Water Quality Control Commission groundwater protection standards are met. Decontamination fluids meeting these conditions may be disposed of by discharge to the ground without submitting a Notice of Intent. Otherwise, the decontamination fluids waste stream will be accumulated in drums and characterized with analytical results from direct sampling of the containerized waste. The Laboratory expects that these wastes would be designated as nonhazardous liquid waste that would be sent to the wastewater treatment facility at TA-46 for disposal.

Before the start of field investigation activities, a waste characterization strategy form (WCSF) will be prepared and approved as required by SOP-01.10, Waste Characterization. The WCSF will provide detailed information on IDW characterization, management, containerization, and possible volumes. IDW characterization will be completed through the review of existing data and/or documentation, by direct sampling of the IDW, and/or by sampling the media being investigated (i.e., surface soil, subsurface soil, etc.). If direct waste sampling is necessary, it will be described in 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, item(s), radioactivity (if applicable), and the date generated. If wastes are pending analytical results in order to make a final characterization determination, the containers will be labeled as such until analytical results are available. The wastes will be contained in clearly marked and appropriately constructed waste-accumulation areas. Waste-accumulation area postings, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements will be detailed in the WCSF and approved before waste is generated.

REFERENCE

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the ENV-ERS Program. 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), December 1, 2003. "2004 Pollution Prevention Roadmap, December 2004," Los Alamos National Laboratory document LA-UR-04-8973, Los Alamos, New Mexico. (LANL 2004, 88465)

Table B-1
Summary of Estimated IDW Generation and Management

Waste Stream	Anticipated Classification	Estimated Volume	On-Site Management	Anticipated Final Disposition
Excavated soil and drainlines	Nonhazardous waste	17 yd^3 2 roll-off containers	20 yd^3 roll-off containers	Off-site solid waste landfill
Spent PPE	Nonhazardous waste	<55 gal.	Accumulation in 55-gal. drums	Off-site solid waste landfill
Disposable sampling supplies	Nonhazardous waste	<55 gal.	Accumulation in 55-gal. drums	Off-site solid waste landfill
Decontamination fluids	Nonhazardous waste	<55 gal.*	Accumulation in 5-gal. containers.	On-site or TA-46

* Dry decontamination methods will be used to the maximum extent possible, and only minimal amounts of decontamination fluids are expected to be generated.