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Phase II Investigation/Remediation Work Plan for Material Disposal Area A, Solid Waste Management Unit 21-014, at Technical Area 21

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EXECUTIVE SUMMARY

This Phase II Investigation/Remediation Work Plan (work plan) describes the methodology that will be used to excavate the contents of Material Disposal Area (MDA) A, Solid Waste Management Unit 21-014, at Technical Area 21, at Los Alamos National Laboratory (the Laboratory). This Phase II work plan also describes the sampling and analysis methodology to be used to investigate the waste before removal and the confirmation sampling of the bottom and sidewalls after waste removal. Included within the scope of this Phase II work plan is the complete removal of potential contaminant sources (in the form of buried waste) from the MDA A disposal pits, trenches, and Plutonium Tanks (formerly known as the General's Tanks). After an initial characterization sampling campaign, all buried waste will be removed and disposed of at appropriate off-site disposal facilities, according to the characteristics of the waste. Soil and tuff in contact with waste will be excavated until analytical results from confirmation samples indicate that inorganic chemical, organic chemical, and radionuclide concentrations are below their respective industrial cleanup levels.

This Phase II investigation/remediation is being conducted under the requirements of the March 1, 2005, Compliance Order on Consent, and the implementing regulations and U.S. Department of Energy orders under the Atomic Energy Act. Waste removal activities for the contents of the Plutonium Tanks will include development of specific engineered controls for protection of the public from potential airborne radiological exposure in accordance with nuclear safety. Work activities for removal of the eastern trenches and central pit waste will also be planned and executed to minimize off-site releases. To assess a variety of possible issues, plan and control the work environment, and prevent damage to the surrounding environment, drawings and specifications will be developed to control the excavation and waste removal activities. Materials removed from the excavation will be evaluated to ensure proper handling in accordance with all applicable Laboratory health and safety requirements. All buried waste will be removed and disposed of at appropriate disposal facilities, according to the characteristics of the waste. Surrounding soil and tuff will be excavated until analytical results from associated confirmation samples indicate that inorganic chemical, organic chemical, and radionuclide concentrations are below their respective industrial cleanup levels.

During field operations, quarterly status reports will be prepared to keep the New Mexico Environment Department informed of field conditions and the progress of activities. The first status report is due 90 d after the start of the field activities. Any deviations from this work plan will be documented in these reports. A Phase II investigation report will be prepared upon completion of field activities and will summarize the investigation and removal actions. The report will also recommend future actions at the site, including, as appropriate, further monitoring of vapor-phase volatile organic compounds.

It is the intention that MDA A remain under the control of the federal government until decisions are made concerning the possible future land transfers. Because of the existing releases to the subsurface below MDA A, the site must remain for industrial use with restrictions and may require long-term monitoring of contaminants historically released to the environment. An approved investigation report discussed the results of sampling and analyses of the nature and extent of contaminants released the environment from the pits, trenches, and tanks. Results of risk-screening calculations for industrial workers indicated acceptable levels of current-day risk. Concentrations of pore-gas vapor below MDA A were not, however, adequately determined. A plan to further investigate pore-gas concentrations will be developed after waste removal and confirmation sampling results are available.

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Acronyms and Abbreviations

AK	acceptable knowledge
AOC	area of concern
bgs	below ground surface
BH	borehole
CAM	continuous air monitor
CFR	Code of Federal Regulations
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
D&D	decontamination and decommissioning
DOE	Department of Energy (U.S.)
DOT	Department of Transportation (U.S.)
DP	Delta Prime
DSA	documented safety analysis
EPA	Environmental Protection Agency (U.S.)
GPS	global positioning system
HIR	historical investigation report
IDLH	immediately dangerous to life and health
IDW	investigation-derived waste
IR	investigation report
ISM	Integrated Safety Management
LANL	Los Alamos National Laboratory
LLW	low-level radioactive waste
MLLW	mixed LLW
MDA	material disposal area
NES	nuclear environmental site
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
PCB	polychlorinated biphenyl
pH	potential of hydrogen
PPE	personal protective equipment
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation

SAL	screening action level
SAP	sampling and analysis plan
SMO	Sample Management Office
SOP	standard operating procedure
SSHASP	site-specific health and safety plan
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list (EPA)
TCLP	toxicity characteristic leaching procedure
TRU	transuranic
TSD	treatment, storage, and disposal
TSTA	Tritium Systems Test Assembly
VOC	volatile organic compound
WAC	waste acceptance criteria
WCSF	waste characterization strategy form

1.0 INTRODUCTION

This Phase II Investigation/Remediation Work Plan (hereafter, work plan) documents the work that will be conducted for removal of wastes from Material Disposal Area (MDA) A, Solid Waste Management Unit (SWMU) 21-014, at Los Alamos National Laboratory (LANL or the Laboratory). MDA A consists of a 1.25-acre fenced, radiologically controlled area situated on the eastern end of DP Mesa and is bounded by DP Canyon to the north and Los Alamos Canyon to the south. Figure 1.0-1 depicts the location of Technical Area 21 (TA-21) and MDA A with respect to other Laboratory technical areas and surrounding landholdings. MDA A is currently inactive and undergoing corrective action. The location of MDA A in relation to TA-21 and surrounding MDAs and other SWMUs is shown in Figure 1.0-2. The site contains potential hazardous waste or constituents subject to provisions of the Resource Conservation and Recovery Act (RCRA) and the New Mexico Hazardous Waste Act, as described in the March 1, 2005, Compliance Order on Consent (the Consent Order). A previously approved investigation report (IR) (LANL 2006, 095046) discussed the results of sampling and analysis of the nature and extent of contaminants released in and adjacent to MDA A, but the contents of the disposal trenches, pit, and tanks are not yet fully characterized.

MDA A also contains radioactive wastes managed by the U.S. Department of Energy (DOE), pursuant to the Atomic Energy Act of 1954. Information on radioactive materials and radionuclides is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with DOE policy. It a Hazard Category 2 nuclear facility (DOE 2003, 087047, p. 1), based on the contents of the Plutonium Tanks. The disposal trenches and central pit are currently being recategorized in accordance with DOE Standard 1027-92, and preliminary indications are they will be downgraded to a less than Hazard Category 3 nuclear facility before implementation of work described in this Phase II work plan. DOE will assess the hazards and work controls required to conduct the work described in this Phase II work plan for compliance with the implementing regulations and DOE orders under the Atomic Energy Act and may require additional engineered controls once the characteristics of the Plutonium Tanks are fully identified.

1.1 General Site Information

MDA A is situated within a 1.25-acre, fenced area divided into two separate areas comprising the Plutonium Tanks (formerly known as the General's Tanks) and two trenches and a central pit situated on the eastern end of DP Mesa.

MDA A was historically used to dispose of wastes generated during operations and contains the following.

- Two 50,000-gal. cylindrical steel storage tanks (referred to as the Plutonium Tanks and designated as TA-21-107 [West] and TA-21-108 [East]) constructed for underground storage that contain residual plutonium salts, referred to a sludge in this work plan. Historic analyses of the sludge indicated that the solutions are contaminated with plutonium-239/240 and americium-241. The two tanks reportedly received materials from 1945 to 1947.
- Two eastern pits containing solid waste potentially contaminated with polonium, plutonium, uranium, thorium, and other unidentified chemicals associated with Laboratory operations. The two eastern pits received waste from 1945 to 1946.
- One central pit containing TA-21 decontamination and decommissioning (D&D) debris potentially contaminated with radionuclides. The central pit reportedly received waste from 1969 to 1978.

The relative locations of the disposal units described above with respect to the MDA A fenceline, topography, and other SWMUs/areas of concern (AOCs) are shown in an orthophotograph taken in 2005 (Figure 1.1-1). Site characterization activities were conducted from April 27 to October 5, 2006, and in November 2007 (LANL 2007, 100482).

1.2 Investigation Objectives

MDA A has been investigated numerous times since disposal operations were discontinued. These investigations focused on surface characterization and subsurface releases outside the actual disposal trenches and beneath the Plutonium Tanks. As discussed in the MDA A IR (LANL 2006, 095046), waste-disposal practices during MDA A's operational lifetime are not well documented. The contents of the MDA A disposal trenches and central pit are largely uncharacterized but represent an ongoing potential source for release of contamination beyond the boundaries of the disposal trenches and central pit.

The principal objectives of the Phase II work plan are to

- characterize the types and quantities of waste contained in the historical disposal trenches, the central pit, and the Plutonium Tanks at MDA A;
- remove and properly dispose of all waste material buried in the central pit and trenches;
- remove and properly dispose of the Plutonium Tanks, including the waste material contained inside; and
- confirm the radionuclide, organic chemical, and inorganic chemical concentrations in the soil and rock adjacent to the eastern trenches, the central pit and the Plutonium Tanks' sides and bottoms and in the deeper subsurface beneath the site after removal activities are complete.

All data collected will be included in the Phase II IR to be submitted to NMED following completion of the investigation and source-removal activities. This Phase II IR will also include any recommendations deemed appropriate for modifying the technical approach associated with excavation of the disposal trenches and central pit as well as finalizing the waste treatment and removal of the Plutonium Tanks.

This Phase II work plan describes the rationale for the proposed scope of work and specifies the excavation and sampling methodologies and protocols that will be used for collecting, analyzing, and evaluating the data.

2.0 BACKGROUND

This section summarizes the historical and current characteristics of MDA A as excerpted from the historical investigation report (HIR) for MDA A (LANL 2005, 088052.5, pp. 1-30). The central pit operational history has been augmented with newly found information (see section 2.1.4). Table 2.0-1 summarizes the operational history of the site.

2.1 Operational History

TA-21 comprises two operational areas, DP West and DP East, both of which produced liquid and solid radioactive wastes. The operations at DP West included plutonium processing, while the operations at DP East included the production of weapons initiators. MDA A was used between 1945 and May 1978 to dispose of and store solid and liquid wastes, as described in sections 2.1.1 through 2.1.5.

Site stabilization activities, such as removing surface contamination, adding cover material, recontouring, and reseeding, were performed in 1985. In 1987, isolated areas at MDA A were reseeded and fertilizer was applied. Gravel mulch was also spread on the site's north side (LANL 2005, 088052.5, p. 2).

2.1.1 Plutonium Tanks

In 1945, the Plutonium Tanks (two 50,000-gal. cylindrical steel storage tanks) were constructed and buried at the western end of MDA A (Figure 2.1-1). The tanks were designed and installed to receive waste solutions containing plutonium-239/240 and americium-241 from the plutonium purification and recovery operations. Liquids with very high magnesium and iron salt contents were to be stored until improved chemical methods could be developed to extract and recover the plutonium. Some liquids were eventually removed from the tanks in 1975 and 1976, but an uncertain volume of sludge remains in the bottom of the tanks (LANL 2005, 088052.5, p. 4). In this work plan, the residual sludge is referred to as the heel of the tank.

2.1.2 Vertical Shafts

In 1975, two 4-ft-diameter vertical shafts were excavated to a depth of approximately 65 ft below ground surface (bgs), south of the Plutonium Tanks (Figure 2.1-1). The shafts were installed to clarify rinse water generated by cleaning cement paste from the transfer hose between the pug mill and the Plutonium Tanks. The tanks were never filled with cement paste, so the vertical shafts were not used. In 1977, the vertical shafts were filled with soil (LANL 2005, 088052.5, p. 3).

2.1.3 Eastern Disposal Trenches

In 1945, the eastern disposal trenches were excavated to receive radioactive solid waste from DP East. Little, if any liquids or pressurized containers are anticipated to have been disposed. The location of the eastern disposal trenches is shown in Figure 2.1-1. Early engineering drawings indicate that the pits are approximately 18 ft wide × 125 ft long × 12.5 ft deep. In 1946, crushed Bandelier Tuff was used to backfill and cover the pits (LANL 2005, 088052.5, pp. 3–4). Based upon the dimensions provided, each disposal trench has a calculated air space of 1000 yd^3.

2.1.4 Central Pit

The central pit was opened in 1969 and used to dispose of demolition debris during rehabilitation of TA-21 after TA-50 came online as the new plutonium-processing facility at Los Alamos. The rehabilitation work was essentially complete in 1976, with the central pit being three-quarters full (Keenan 1976, 000507). The central pit may have received waste until September 1977 and was backfilled in May 1978 (Merrill 1990, 011721). There are only partial records of the demolition wastes placed in the central pit, but based on the history of the TA-21 facilities, building 21-61—demolished in either 1960 or 1969—may be in the bottom of the pit if demolition occurred at the later date (LANL 2005, 088052.5). Building 21-61 was used as a laboratory and was a concrete slab on grade metal structure with metal siding and roof. It contained fume hoods and sinks. There are no other records of demolition activities at TA-21 during 1969.

The central corridors located between buildings 21-001, 21-002, 21-003, 21-004, and 21-005, were replaced by new structures in 1971. The replacement structures are associated with a newer ventilation system that replaced an earlier ventilation system located along the ridgelines of buildings 21-002, 21-003, 21-004, and 21-005 and along the north side of the north plant road, ultimately connecting to the 21-12 filter building (which handled only room air after 1959). Building 21-005 ductwork was reported to be disposed of in the central pit (Enders 1972–1975, 000514, p. 2). The new filter system went online in 1973 (Christensen et al. 1975, 005481). The date for demolition matches the central pit operational dates, and old photographs show portions of the ductwork in the central pit (LANL 2005, 088052.5). A radiation control technician logbook describes the number of trucks and content of loads going to the central pit (Christensen 1973, 001599). The D&D report from structure 21-12, removed in 1973 (Christensen et al. 1975, 005481) indicates most of the higher contaminated waste, including the blowers, went to MDA G and that only cleaner structural debris, foundations, soils, and some larger structural components with surface contamination went to the MDA A central pit. Photographs taken during the filling of the central pit indicate the filter frames were also sent to the central pit (Gerety et al. 1989, 006893; LANL 2005, 088052.5). A central pit volume of approximately 18,000 yd^3 (Merrill 1990, 011721) has been provided in historic documents. However, based on the shape of the excavation sides and ends (Purtymun 1969, 000519), the volume appears to be too large. Based on dimensions of the central pit, the air space of the empty pit has been calculated to be approximately 16,000 yd^3. The 1991 RCRA facility investigation (RFI) work plan (LANL 1994, 026073) states that unspecified waste was placed in the unused portion of the central pit. There is no supporting documentation for this statement. If the pit was filled only three-quarters full, only 12,000 yd^3 would have been used, based on waste-generating activities occurring at TA-21 during the central pit waste disposal time period. It is likely the remaining volume was backfilled with clean soil. Using volumes estimated from existing records discussed above, approximately 10,000 yd^3 of waste are calculated to have been placed in the central pit.

2.1.5 Former Drum Storage Area

Although not a subject of this investigation, several hundred 55-gal. drums containing iodide waste were stored on the surface at the eastern end of MDA A in the late 1940s and early 1950s (Table 2.0-1). The stored drums can be seen at the eastern end of MDA A in a 1949 aerial photograph and in a subsequent 1950 aerial photograph (LANL 2005, 088052.5). These drums contained sodium hydroxide solution and stable iodine, used to scrub ventilation exhaust air, containing plutonium and possibly uranium. The corrosion of the drums resulted in liquid releases to the surface soil at MDA A. The drums were removed in 1960 and the storage area was paved (LANL 2005, 088052.5, pp. 4–5). The MDA A IR (LANL 2006, 095046) investigated potential releases from the drum storage area.

2.1.6 Surface Storage

Although not a subject of this investigation, historical photographs show that the area of the central pit (before excavation) was used to store equipment that was removed during remodeling of the process buildings before shipment to other disposal areas. The MDA A IR (LANL 2006, 095046) discussed the investigation of the subsurface storage area for nature and extent of contamination.

2.1.7 Summary of Subsurface Utilities

Active and inactive utility lines present in the immediate vicinity of MDA A are shown in Figure 2.1-1.

Immediately north of MDA A is a 3-in. cast-iron radiological waste line in the southern shoulder of North Perimeter Road. This line previously conveyed liquid waste from the Tritium Science and Fabrication Facility and the Tritium Systems Test Assembly (TSTA) to the building 21-257 waste treatment facility located west of MDA A. The depth of the line varies between 4 ft 6 in. and 4 ft 10 in.; the line is equipped with two cleanout valves at the northeastern and northwestern corners of MDA A. The line has been in service since the 1970s, concurrent with the initial operations at TSTA, and it is scheduled for decommissioning and removal as part of this MDA A remediation effort. An underground telemetry cable runs parallel to the radiological waste line and transmits operating information on the sump pumps and other facilities at the TSTA. This telemetry cable is currently inactive and will be abandoned.

Two parallel 8-in. cast-iron water lines run east-west along the northern shoulder of the North Perimeter Road, parallel to the MDA A site, and branch off to facilities to the east and west. Both of these water lines will be abandoned as part of this MDA A remediation effort. A fire hydrant is located adjacent to the northeastern corner of MDA A.

A 6-in. steel natural gas line runs along the west and southwest of the SWMU. Immediately west of the Plutonium Tanks (far western portion of the site), the gas line and associated valves are abovegrade and will be abandoned in the near future when building 21-257 is deactivated. The gas line is temporarily active and conveys natural gas to building 21-257 until it is deactivated.

A culvert runs beneath North Perimeter Road near the northeastern corner of MDA A and conveys storm drainage from the roadways adjacent to MDA A to DP Canyon.

2.2 Inventory Estimates

Plutonium Tanks: There have been various estimates of the radionuclide inventory contained in the Plutonium Tanks. These were made for the entire tank contents before pumping and treating the liquid (Rogers 1977, 005707). Posteffluent samples taken on the tank sludge indicate most of the inventory remains in the tanks (LANL 2004, 088713.2). The total estimated current-day inventory corrected for decay of radionuclides of the west tank is approximately 75 plutonium-equivalent Ci and that of the east tank is 25 plutonium-equivalent Ci (LANL 2004, 088713.2). Based on the processes used during operation of the plutonium facility and information obtained from 1947 Laboratory notebooks of chemical experiments conducted on the tanks' contents, chemical content of the sludge includes the presence of the following for both tanks: plutonium, americium, calcium nitrate, magnesium nitrate, iodine, peroxide, potassium nitrate, aluminum, iron, chromium, nickel, magnesium, lanthanum, potential of hydrogen (pH), nitrate, ammonium, magnesium, and calcium. Other test results indicate the presence of sodium, chlorine, and potassium in both tanks. Notebooks from tests conducted in the mid-1970s and 1980s indicate the pH of the east tank sludge was 8.3 and that of the west tank sludge was 11.4 (LANL 2006, 095046). Total dissolved solids were approximately 233,480 and 90,690, respectively (units of measure not reported; probably in parts per million). No samples have been collected or tests performed on the wastes using RCRA-accepted analytical methods.

Eastern Trenches: Very little documentation has been found detailing the types of chemicals and quantities of radionuclides and/or chemical contamination in the two eastern trenches. Material in the trenches consists of all contaminated waste from the Chemistry and Metallurgy Research operations, including laboratory equipment, building construction material, paper, rubber gloves, filters from air-cleaning systems, and contaminated or toxic chemicals (Meyer 1952, 028154). Polonium and plutonium-239/240 were thought to be the major contaminants in the waste. Polonium would no longer be present at the site because of its short half-life (138.4 d).

The eastern trenches were excavated in 1945 and likely contain the same inventory range as would be found in the early portions of the MDA B disposal. Based upon the MDA B inventory, the potential radionuclides in the form of contamination present on waste materials in the trenches include plutonium, polonium, uranium, americium, curium, radium-lanthanum, actinium, and waste products from a water boiler (Meyer 1952, 028154). The radiological inventory of MDA A has been conservatively estimated, based on data developed for the MDA B HIR (LANL 2006, 095499); adjusting for the difference in volumes between the two trenches results in 19 g of plutonium 239 (50th percentile) and 28 g of plutonium-239 for the 90th percentile inventory estimate.

No chemical inventory records are found for the eastern trenches. Based on chemicals encountered in the investigation of the MDA A site (LANL 2006, 095046), it has been concluded that chemicals of potential concern (COPCs) in the soil surrounding MDA A include aluminum, iodine, arsenic, barium, beryllium, cyanide, iodide, nitrate, perchlorate, selenium cadmium, chromium, copper, iron, manganese, nickel and vanadium, acenaphthene, acetone, anthracene, Aroclor-1254, Aroclor-1260, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzoic acid, bis(2-ethylexyl)phthalate, chrysene, dichlorobenzene[1.4-], fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, isopropyltoluene[4-], methylene chloride, phenanthrene, pyrene, toluene, numerous dioxins and furans, americium-241, cesium-137, plutonium-238, plutonium-239, strontium-92, uranium-235, and tritium. Found in various formations below the disposal site or in surface soils directly affected by site runoff, these chemicals are considered to be present possibly in the MDA A waste. The levels of these chemicals present in the eastern trenches are uncertain. However, it may be concluded that the primary contaminants present in the eastern trenches are radioactive isotopes based on (1) the low levels observed in the foundation soil and rock at MDA A, (2) the period (1945) when the materials were disposed of, (3) qualitative historical documentation of disposal, and (4) photographs taken of the disposal trenches during operation.

Small quantities of volatile organic compounds (VOCs) may remain in the trenches as disposed chemicals but will not constitute a significant source of contamination.

The dioxins and furans are likely a result of surface air contamination and a fire that occurred around 1946.

Central Pit: As with the eastern trenches, there is no record for chemical or radiological inventory of contamination that might be associated with the D&D material disposed of (such as any coating inside of disposed pipes). It is postulated that a similar list of COPCs might be present, as in the eastern trenches, because the D&D operations were on buildings used for the same period as materials disposed of in MDAs A and B.

2.3 Results from Previous Investigations

The MDA A IR (LANL 2006, 095046) and the status report for supplemental sampling (LANL 2007, 100482) reported on the characterization of the media outside of the waste for nature and extent of contamination, with the exception of pore gas. No industrial soil screening levels (SSLs) or industrial screening action levels (SALs) were exceeded. The risk assessment presented as part of the IR demonstrated that the site meets industrial cleanup standards.

3.0 SITE CONDITIONS

The site conditions at MDA A are described in detail in the approved IR for MDA A (LANL 2006, 095046).

The following sections summarize the surface and subsurface conditions at MDA A.

3.1 Surface Conditions

Figure 2.1-1 depicts the elevation of DP Mesa in the vicinity of MDA A, which ranges from 7125 to 7135 ft, with a gentle slope into DP Canyon to the north. The DP Canyon slope ranges in elevation from 7035 ft at the bottom to 7125 ft on the northern edge of DP Mesa, immediately north of MDA A.

The surface of MDA A is heavily vegetated with forbs, native grasses, and sagebrush. The surface slopes at a gradient of less than 5% (2.25 degrees) downward across the site from south to north. Approximately 30 ft north of the site, the slope increases to approximately 67% (30 degrees).

3.2 Subsurface Conditions

The natural or undisturbed surface soil cover is limited because of Laboratory operations, such as building, road construction, and demolition. Where undisturbed, soils on the mesa surface are thin and poorly developed. The texture of soils tends to be sandy near the surface and more claylike beneath the surface. Soil profiles tend to be more poorly developed on the cliff-forming, south-facing slopes than on the north-facing slopes, which tend to have a higher organic content. A discussion of soils in the Los Alamos area is in section 2.2.1.3 of the installation work plan (LANL 1998, 062060, pp. 2-21) and in Nyhan et al. (1978, 005702, pp. 24-25).

3.2.1 Stratigraphy

The generalized stratigraphy of DP Mesa in the area of MDA A is shown in Figure 3.2-1. DP Mesa consists of Bandelier Tuff (Qbt) overlain by a thin layer of alluvium and soil. The Bandelier Tuff unit is subdivided into two members, the Otowi and the Tshirege (in ascending order). MDA A is situated within the Tshirege Member, which is a compound-cooling unit divided into four distinct cooling units (Broxton et al. 1995, 050121, pp. 33-63). The bedrock directly underlying TA-21 is cooling unit 3 (Qbt 3) of the Upper Tshirege, a cliff-forming, nonwelded to partially welded tuff. Below MDA A, the Otowi and Tshirege Members are separated at about 340 ft bgs by the Cerro Toledo (Qct) interval, a 10- to 40-ft-thick sequence of volcaniclastic sediments deposited in braided stream systems. Bandelier Tuff and deposits of the Cerro Toledo interval are derived primarily from explosive volcanic eruptions in the Valles Caldera approximately 1.2 million years ago (Goff 1995, 049682, p. 7). The basal Guaje Pumice Bed of the Otowi Member separates Bandelier Tuff from the underlying clastic fanglomerate sediments of the Puye Formation (LANL 2004, 087358, p. 13).

3.2.1.1 Quaternary Bandelier Tuff Unit 3

Qbt 3 is approximately 110 ft thick at MDA A and consists of nonwelded to moderately welded ash-flow tuff. The degree of welding tends to increase with depth. However, the degree of welding is not closely associated with an increase in fracture density.

3.2.1.2 Quaternary Bandelier Tuff Unit 2

Qbt 2 is a vertical cliff-forming unit, typically 80 to 90 ft thick. The upper contact is defined by the appearance of generally thin, nonwelded, and unconsolidated tuff. The lower contact is generally marked by an abundance of phenocrysts and pumice fragments. Fracture zones tend to be prevalent in this unit. The unit is described in the log for borehole (BH) 12 (location 21-26588), as described in Appendix C of the MDA A IR (LANL 2006, 095046).

3.2.1.3 Quaternary Bandelier Tuff Units 1v and 1g

Qbt 1v is used to identify the vapor-phase unit of Qbt 1. Qbt 1g represents the glass phase of the unit. The vapor-phase unit (Qbt 1v) separates the glass-phase unit (Qbt 1g) from the overlying Qbt 2. At MDA A, the Qbt 1v unit was found to be 50 ft thick and consisted primarily of devitrified, nonwelded ash-flow tuff. The unit is described in the BH 12 log (location 21-26588), as described in Appendix C of the MDA A IR (LANL 2006, 095046).

3.2.1.4 Tsankawi Pumice Bed

The Tsankawi Pumice Bed (approximately 4 ft thick at MDA A) is the basal pumice fall of the Tshirege Member of Bandelier Tuff. The Tsankawi Pumice Bed consists of a gray to white angular pumice layer, grading from 0.39- to 1.18-in.-diameter pumice gravel in the basal layer at a depth of 345–346 ft bgs. The unit is described in the BH-12 log (location 21-26588), as described in Appendix C of the MDA A IR (LANL 2006, 095046).

3.2.1.5 Cerro Toledo and Otowi Intervals

The Tshirege and Otowi Members are separated by the Cerro Toledo interval, a volcaniclastic sequence of sediments deposited as part of a braided stream system (Broxton and Eller 1995, 058207). Drilling at BH-12 (location 21-26588) advanced 10 ft into the Otowi Member to a depth of 353 ft bgs. The Otowi Member, a light-gray ash-flow tuff with light-gray pumice clasts, is estimated to be 180 ft thick at TA-21.

3.2.1.6 Guaje Pumice Bed

The Guaje Pumice Bed occurs at the base of the Otowi Member and is an extensive marker horizon in both outcrops and wells. It is a slightly to moderately consolidated stratified unit that contains sorted layers of pumice fragments, ash, and crystals with an aggregate thickness of 10 to 30 ft. In vapor-monitoring well location 21-25262 at MDA T adjacent to MDA A, the Guaje Pumice Bed was encountered from 670 to 693 ft bgs.

3.2.1.7 Puye Formation

The Puye Formation unconformably overlies rocks of the Santa Fe Group, and the Otowi Member of the Bandelier Tuff unconformably overlies the previous formation. The Puye Formation is a heterogeneous unit consisting of crudely stratified deposits of weakly cemented lithic sandstones, silts, conglomerates, and ash beds. In location 21-25262 at MDA T, the Puye Formation was encountered at 693.7 to 695.1 ft bgs.

3.2.2 Groundwater

Two geologic properties of Bandelier Tuff that influence recharge rates are the degree of welding and devitrification; both bear the effects of the prolonged presence of residual gases and high temperatures after deposition. Cooling of the units was not uniform, as the different tuff units were deposited at different temperatures. Welding tends to vary spatially, both between units and within separate depositional layers. Welded tuffs tend to be more fractured than nonwelded tuffs. Fractures within the tuff, however, do not enhance the movement of dissolved contaminants unless saturated conditions exist because the fractures tend to be clay-filled, resulting in generally higher sorptive capacity.

Based upon information reported in the MDA A IR (LANL 2006, 095046), moisture content of site soils ranged from 6% to 20%, averaging less than 20%. At these moisture levels, the fractures beneath the site are unsaturated. Fractures will conduct water only in situations where substantial infiltration occurs from the ground surface; however, past modeling studies indicate that when fractures become discontinuous at stratigraphic subunit contacts, fracture moisture is absorbed into the tuff matrix (Soll and Birdsell 1998, 070011, pp. 200-201).

The regional aquifer is approximately 1265 ft bgs at MDA A (Figure 3.2-2). During the 2006 investigation, groundwater was not encountered beneath MDA A to a depth of 360 ft bgs.

4.0 SCOPE OF ACTIVITIES

Except for pore gas, the nature and extent of contaminants in the media surrounding the disposal trenches, the central pit, and the Plutonium Tanks have been characterized (LANL 2006, 095046). Executing the activities included in this Phase II work plan will result in the removal of buried waste and of the Plutonium Tanks at MDA A. The sequencing of disposal of trench excavation waste will maximize efficiency and safety and optimize the ability to stage material and equipment on the site. An emergency response plan will be implemented to provide specific steps for notifying and protecting the public in the event of a release of hazardous material. The impact on the public will be minimized to the degree practicable by careful planning of the excavation and investigation activities. Activities related to investigation/remediation and materials management will be conducted within a designated area of contamination, as described in section 4.1.2. The site will be recontoured to allow surface drainage to DP Canyon, balance cuts and fills, and provide stable slopes. By controlling where excavation and recontouring equipment goes, the potential for tracking contamination onto clean surfaces will be eliminated.

4.1 Scope of Activities for Eastern Trenches and Central Pit

4.1.1 Justification for Proposed Scope of Work

On April 16, 2009, the Laboratory and the National Nuclear Security Administration (NNSA) requested that NMED approve a request to prepare a Phase II work plan, in conjunction with the withdrawal of the previously submitted MDA A corrective measures evaluation report. In a letter dated May 4, 2009 (NMED 2009, 106017), NMED approved the request. The scope of this Phase II work plan; the sampling conducted for the 2006 IR (LANL 2006, 095046) approved by NMED; the previous RFIs and data collected for TA-21, MDA A, and contained in the “Investigation Report for Material Disposal Area A, Solid Waste Management Unit 21-014, at Technical Area 21” (LANL 2006, 095046); and the “Status Report for Supplemental Sampling at Material Disposal Area A, Technical Area 21” (LANL 2007, 100482) form a basis for compliance with the Consent Order.

The Laboratory’s proposed approach is to excavate and remove all historical contents of MDA A and the Plutonium Tanks and remediate the site to industrial cleanup levels (i.e., SSLs for chemicals and SALs for radionuclides). The successful completion of these activities constitutes the implementation of an NMED-approved remedy for MDA A.

Remediating to industrial cleanup levels could allow future commercial development of the DP Road corridor sooner than currently anticipated.

4.1.2 Regulatory Basis for Technical Approach

The regulatory basis for handling waste materials during the MDA A investigation/remediation is based on the application of the U.S. Environmental Protection Agency’s (EPA’s) area of contamination concept. This concept was discussed in detail in the preamble to the National Contingency Plan (55 Federal Register 8758-8760, March 8, 1990) and more recently in an Office of Solid Waste and Emergency Response guidance memorandum, “Use of the Area of Contamination (AOC) Concept During RCRA Cleanups” (Shapiro and Luftig 1996, 082288). The area of contamination concept provides for areas of contiguous contamination to be designated as a RCRA “unit” (for example, a landfill) for the purpose of implementing a remedy. In general, activities such as excavation, movement, consolidation, in situ treatment, and redeposition of hazardous remediation wastes within the area of contamination will not trigger RCRA Subtitle C requirements because they are not considered treatment, storage, or disposal (TSD). These activities must occur entirely within the area of contamination boundaries and cannot be associated with any ex situ treatment or storage units either within or outside the area of contamination.

A request to obtain an area of contamination designation for this work will be submitted to NMED for approval no less than 30 d before a notification of site investigation sampling. The request will specify the boundaries of the proposed area of contamination, the rationale for how the boundaries were established, and an explanation of how the boundaries will be delineated.

With respect to the Plutonium Tanks, decisions regarding waste removal (tank heel) and physical tank removal can be made only after the receipt of the characterization data. This Phase II work plan will be conducted under the requirements of the Consent Order. The removal of contaminant source material will involve the excavation of buried historical waste and surrounding soil and tuff until inorganic chemical and organic chemical levels are below industrial cleanup levels, as specified in Section VIII.B.1 of the Consent Order. Once initial screening and segregation activities have been completed, the excavated material will be transferred to a staging facility for definitive identification, packaging, and shipping to appropriate off-site disposal facilities. Waste will be containerized and managed in accordance with RCRA regulatory requirements upon transfer outside of the area of contamination boundaries.

Long-Term Effectiveness of the Proposed Activities

Achieving industrial cleanup levels, verified by confirmation sampling, will ensure long-term effectiveness by removing all waste and contaminated media. Starting with the highest priority, the long-term benefits of this action are as follows:

- remove the primary source term for contaminant releases to the environment
- eliminate the potential for future contaminant releases to the environment
- render the site suitable for future industrial development
- provide the most expeditious approach to waste characterization and remediation of MDA A

As the excavation proceeds, screening and confirmation samples will be taken at the exposed excavation bottom and side slopes. This sampling will directly determine any residual contamination and allow a high confidence in determining potential risk/dose.

4.1.3 Health and Safety and Environmental Protection

4.1.3.1 Integrated Safety Management

Efforts are ongoing to categorize the disposal trenches and central pit as a radiologically controlled area. If the Laboratory is successful with this recategorization effort, compliance with 29 Code of Federal Regulations (CFR) 1910 (Hazardous Waste Operations and Emergency Response) will be required. In addition, an approved site-specific health and safety plan (SSHASP) must be in place before work begins.

4.1.3.2 Environmental Protection Monitoring

Activities within the excavation areas will be monitored using real-time continuous air monitoring (CAM) systems or similar devices. The CAMs will survey airborne radioactive particles inside the work zone and outside the excavation areas at specific locations around the site. In particular, beta and/or alpha activities will be monitored to ensure that they remain below action levels identified in the SSHASP. Levels of VOCs and airborne particulates (dust) will also be monitored. The need for air-net monitoring stations will be evaluated, and the network will be adjusted to fill any potential gaps, most likely in areas that are closest to the public. The SSHASP will specify the monitoring requirements to ensure that federal, state, and local environmental protection limits are not exceeded. Details of radiation monitoring equipment and procedures will be included in a radiation protection program to be developed specifically for MDA A activities.

4.1.3.3 Emergency Response

An emergency response plan will be prepared to establish a program that optimizes a safe and informed response to emergency situations, with the intent of protecting project personnel, the public, the environment, and property in the event of hazardous substance releases, employee contamination, accidents, injuries, fires, or natural disasters. At a minimum, the emergency response plan will contain the following elements:

- training
- drills and exercises
- site security and control
- notification procedures (emergency responders and the public)
- personnel accountability process
- site evacuation
- medical support
- emergency response equipment
- emergency response equipment maintenance and inspection
- emergency response actions to the following:
    - radiological material releases
    - hazardous chemical releases
    - accidents resulting in property damage or injury
    - fires and explosions
    - natural disasters
    - emergencies resulting from personal protective equipment failure

A critical part of any emergency response will be the ability of on-site project personnel to recognize and mitigate actual or potential emergency situations. To accomplish this, on-site personnel will train to the emergency response plan and will demonstrate their ability to effectively respond to emergency situations through the use of mockups, drills, and exercises. Additionally, the abilities of on-site personnel will be independently confirmed using the Laboratory readiness assessment process.

4.1.4 Preliminary Sampling Activities (Trenches and Central Pit)

Preliminary sampling of the waste will be conducted to determine waste characteristics which will aid in designing removal and disposal actions. Details of the preliminary sampling activities are described in Appendix B. Representative samples will be analyzed to provide preliminary waste characterization data that will guide further excavation activities. Analyses will be performed for target analyte list (TAL) metals, semivolatile organic compounds (SVOCs), VOCs, and radionuclides.

4.1.5 Excavation of Central Pit and Disposal Trenches

The central pit and trenches will be completely excavated, and waste and excavated environmental media (e.g., soil, overburden material, and tuff) will be characterized. Waste trenches will be excavated to a minimum depth of the buried material (with further excavation done, as required if buried waste is found at greater depth, or if the underlying soil or rock exceeds industrial SALs or SSLs) with the excavated waste being disposed of off-site.

Eastern trenches and central pit contents will be handled as waste and processed for disposal. Overburden material will be removed from above the pits and trenches and staged in piles or containers in an environmentally protective manner. The material will be stockpiled within the boundary of the area of contamination until analytical results are received and reviewed. If the analytical results indicate hazardous waste and/or that contaminants exceed industrial cleanup levels, the material will be managed as waste. If results indicate that hazardous waste and cleanup goals are met, the material will be stockpiled for use as site restoration and grading fill. The placement of the material as backfill will be controlled so that analytical data may be linked to specific areas of the site.

Field screening of the excavation floor and sidewalls will be used to determine if further excavation is required. Material will be excavated until field screening indicates that residual contaminant levels are at or below the industrial cleanup levels.

The site will be recontoured to allow surface drainage to DP Canyon, balance cuts and fills, and provide stable slopes.

4.1.6 Segregation of Waste by Material Type

Excavated wastes will be segregated according to identifiable waste types. Segregation will help with the evaluation of waste streams and the estimation of waste volumes. A variety of segregation methods, such as mechanical screens, hand operations, robotic arms, etc., may be evaluated and used, as appropriate.

4.1.7 Waste Management

Using representative samples of the waste materials from MDA A, qualitative and quantitative analytical tests will be performed on-site to rapidly identify primary physical, radiological, and chemical hazards to the site worker. Based on the historical information available about the MDA A area, the primary hazard characteristics for rapid identification will be radioactivity, flammability, corrosivity, oxidation potential, physical properties, and reactivity with air and water. Investigation-derived waste (IDW) generated during the MDA A activities is described in Appendix A.

Waste analyses will be performed at a laboratory that is certified for those analyses required to meet the waste acceptance criteria (WAC) for each identified TSD facility. The laboratory will be equipped with analytical instruments, which may include a gas chromatograph, immunoassay kit, x-ray fluorescence spectrometer, or other instruments suitable for the specific analyses needed for the WAC.

Characterization of containers exhibiting special physical or chemical hazards (e.g., high-pressure gas cylinders) may require the use of both manual and remote sample-handling techniques. We do not anticipate encountering significant quantities of materials having these characteristics.

The inventory of excavated materials will be recorded in an electronic database developed specifically to meet the MDA A data collection requirements and populated with data from each step in the investigation/remediation.

Waste materials excavated from MDA A will be containerized appropriately for off-site disposal. Wastes will be characterized through laboratory analyses to segregate waste materials for treatability and/or disposal. This level of characterization will be required for comparison with the WAC of each identified TSD facility, for selection of appropriate waste packaging, and for compliance with U.S. Department of Transportation (DOT) requirements.

The regulatory classification for each of the possible waste streams includes solid waste, industrial solid waste, New Mexico special waste, RCRA hazardous waste, low-level radioactive waste (LLW), transuranic (TRU) waste, mixed low-level waste (MLLW), and TRU mixed waste (TRU waste).

An analysis of treatment and disposal pathways will be used to define specific waste streams, their parameters, and their acceptability for treatment or disposal at specific off-site TSD facilities.

4.1.8 Confirmation Sampling

Samples will be collected to confirm that waste material that exceeds industrial risk standards have been removed. Samples of geologic material will be collected from beneath the excavation floor (Figure 4.1-1), including the entire SWMU area. In addition, confirmation sampling results will be used in conjunction with the MDA A IR data to help define the horizontal and vertical extent of potential contamination in the media. The results will be evaluated to determine if additional excavation is necessary.

4.1.9 Surveying Locations and Features of Excavation

The geometry and primary features of the excavation(s) will be surveyed using a global positioning system (GPS) or other appropriate method. Survey points will include locations and elevations of sampling locations, locations of buried items of interest, locations of potential residual contamination identified by field screening, and any other features deemed important to the investigation/remediation. Survey results will be plotted on a site map delineating the actual waste trench boundaries and excavation boundaries.

4.1.10 Site Recontouring

The site will be recontoured to allow surface drainage to DP Canyon, balance cuts and fills, and provide stable slopes.

4.2 Scope of Activities for Plutonium Tanks

4.2.1 Justification for Proposed Scope of Work

The scope of activities described in this Phase II work plan includes the complete removal and disposal of the Plutonium Tanks as part of the overall work scope proposed for the remediation of MDA A. Associated with this scope of work is the characterization and disposal of all tank waste and the tanks as well as confirmation that the remediation meets the industrial cleanup standards. This proposed approach (excavation and complete removal of the Plutonium Tanks) provides several advantages over the interim

process as described in the Consent Order. Advantages of the Laboratory's proposed approach include the following.

- Removal of the potential contaminant source associated with the Plutonium Tanks will reduce the overall environmental risk associated with the site.
- Potential risk to the public will be reduced or eliminated by removing the contaminant source in a single effort.
- Remediating to industrial cleanup levels could allow future commercial development of the DP Road corridor sooner than currently anticipated.

4.2.2 Regulatory Basis for Technical Approach

The Phase II work plan for the Plutonium Tanks will be conducted under the requirements of the Consent Order. The removal of contaminant source material (tank components, residual sludge, and surrounding environmental media) will involve the excavation of the Plutonium Tanks, soil overburden, reinforced concrete slab, existing backfill material, and concrete piers until contaminant levels are below industrial cleanup levels, as specified in Section VIII.B.1 of the Consent Order.

An analytical sampling program will be developed to investigate the presence or absence of RCRA constituents in the sludge. Based upon the analytical results of this sludge sampling, a determination will be made whether the waste disposal approach that will be taken for the eastern trenches and the central pit should be modified for the sludge. In addition, because of the high radiological content of the sludge, the available technical options associated with sludge disposal may be impacted.

Section 4.1.2 provides the remaining discussion regarding the regulatory basis.

4.2.3 Health and Safety and Environmental Protection

The health and safety and environmental protection approaches applicable to the Plutonium Tanks are defined in section 4.1.3.

4.2.3.1 Integrated Safety Management

The Integrated Safety Management (ISM) approach for the Plutonium Tanks will be the same for the eastern trenches and central pit (see section 4.1.3.1) in addition to the following.

The nuclear safety program for the Plutonium Tanks will be implemented in two stages: (1) preliminary sampling activities to characterize headspace gas and residual tank sludge and (2) excavation and removal, including possible waste retrieval/treatment of residues within the Plutonium Tanks.

The Plutonium Tanks are categorized as a Hazard Category 2 nonreactor nuclear facility. The hazard category is based on inventories documented in the DOE/NNSA-approved documented safety analysis (DSA) (LANL 2004, 088713.2). The DSA was developed and approved in 2004 to provide safety basis coverage for ongoing surveillance and maintenance activities at the Plutonium Tanks and other nuclear environmental sites (NESs).

The nuclear safety program for sampling and characterization will revise the current NES-approved DSA to include the sampling and characterization activities identified by this Phase II IRWP. Revisions to the current DSA will use a graded approach and will be consistent with requirements established in

- 10 CFR 830, Subpart B, Safety Basis Requirements;
- DOE Standard 3009-94, Change Notice 3, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facilities Documented Safety Analysis;
- DOE Order 420.1B, Facility Safety;
- DOE Guide 420.1-2, Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Nonnuclear Facilities; and
- DOE-STD-1027-92, “Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports.”

The nuclear safety program for excavation and tank removal will require a separate DSA to be prepared and maintained for the Plutonium Tanks. The DSA will employ a graded approach, consistent with 10 CFR 830; Subpart B, to establish the safety envelope and boundaries for the full range of planned activities associated with the complete removal of the Plutonium Tanks. The Plutonium Tanks removal DSA will incorporate the results from tank sampling and characterization, operational history/process knowledge, and past tank characterization data to establish the engineered safety features necessary to prevent or mitigate the consequences of an operational accident. The DSA will contain controls to protect the public, workers, and environment from the hazards associated with the Plutonium Tanks calculated inventory, primarily radionuclides. Work conducted as part of the Plutonium Tanks removal will be performed in accordance with the controls established by the DSA and any technical safety requirements. The controls will be incorporated into the SSHASP required by 29 CFR 1910 and 29 CFR 1926, the Laboratory’s ISM requirements, and other site-specific procedures. The DSA for the Plutonium Tanks removal operation will be prepared by the Laboratory and approved by DOE.

4.2.3.2 Environmental Protection Monitoring

Activities within the excavation areas will be monitored using real-time CAM systems or similar devices. The CAMs will survey airborne radioactive particles inside the work zone and outside the excavation areas at specific locations around the site. In particular, beta and/or alpha activities will be monitored at excavation areas to ensure that they remain below action levels identified in the SSHASP. Levels of VOCs and airborne particulates (dust) will also be monitored. The need for air-net monitoring stations will be evaluated, and the network will be adjusted to fill any potential gaps, most likely in areas that are closest to the public. The SSHASP will specify the monitoring requirements to ensure that federal, state, and local environmental protection limits are not exceeded. Details of radiation monitoring equipment and procedures will be included in a radiation protection program to be developed specifically for MDA A activities.

The remaining approaches to environmental protection monitoring for the Plutonium Tanks will be as described for the eastern trenches and central pit (see section 4.1.3.2.

4.2.3.3 Emergency Response

Emergency response is discussed in section 4.1.3.3.

4.2.4 Preliminary Sampling Activities

Preliminary tank samples will be collected from the headspace gas and within the residual sludge to determine the presence of flammable gas, evaluate sludge physical properties, and establish the nature of radiological and hazardous constituents. The results of the preliminary sampling will support development of a separate tank excavation and removal DSA; development of safety basis requirements, engineering designs, safe work control processes, and hazard mitigation strategies; identification of potential waste streams and disposal pathways; and selection of potential sludge retrieval technologies.

Headspace samples can be obtained by excavating to the surface of the tank and tapping the sidewall, tapping existing tank fill and vent lines to install gas-sampling ports, or accessing the existing 18-in.-diameter postconstruction access hole installed in the tanks in 1974. Since the location and condition of the fill and vent lines are unknown, accessing the postconstruction sample port is the most effective approach. To access the sample port, the overburden soil will be removed over the center of each tank. Standard field-screening methods will be used during excavation to determine the presence of potential contamination and volatiles. Overburden will be stockpiled for future contouring backfill operations; contaminated soil will be segregated and appropriately packaged for disposal. The excavation will be secured with caissons (portable shoring devices) to support the sidewalls and prevent collapse. If impedance to access at this location is encountered, access will be attempted through the pipes at the end of the tanks. Although technically more difficult, this is a proven technology for accessing tanks containing potentially flammable vapors.

4.2.5 Excavation of Plutonium Tanks

The excavation process for the tanks will be similar to the eastern trenches and central pit. Waste residues can be retrieved and treated and the Plutonium Tanks excavated (including removal of the reinforced concrete slab and concrete support piers). All environmental media (e.g., soil, overburden material, concrete, and tuff) will be characterized for the purpose of evaluating treatment and disposal options before shipping. Waste from the Plutonium Tanks will be processed for disposal at approved off-site disposal facilities. Tank externals, piping, and other ancillary components and debris will be processed for disposal at approved off-site disposal facilities. Environmental media will be evaluated for either disposal as waste or stockpiled for future clean backfill at MDA A. Conditions for returning environmental media to the site are described below and will be addressed further as part of the Laboratory's request for an area of contamination designation to be submitted to NMED upon approval of this work plan. Soil surrounding the Plutonium Tanks will be excavated to the base of the four concrete piers supporting each of the Plutonium Tanks. The entire width of the tank trenches will be excavated; sidewalls will be sloped as needed to eliminate the need for shoring, in compliance with 29 CFR 1910.129, Subpart P.

Two primary methods exist for removing the Plutonium Tanks. The first method includes retrieving the sludge, packaging the waste, and removing the tanks either as a single structure or size-reduced for off-site disposal. A potential second method involves grouting the sludge to create a homogeneous mass within each tank; however, this can work only if the activity of the grouted mass is reduced to less than 10 nCi/g. This second method solidifies the sludge and allows disposal of the tanks as a single waste package or allows size reduction of the monolith for disposal in an appropriate off-site repository. The means and methods to remove the Plutonium Tanks will be developed through a systematic and progressive process, starting with the assessment of the preliminary tank characterization data and sludge mechanical properties. Mechanical properties of the sludge as well as the radionuclide contents will significantly impact potential sludge retrieval/tank removal alternatives. Once the sludge characterization data are evaluated, the Laboratory will conduct an alternatives analysis to select the appropriate technology and methods to retrieve and remove the Plutonium Tanks. The alternatives analysis and technology selection for removal of the Plutonium Tanks are not part of this document but will be included in a quarterly status report.

After the tanks are removed from MDA A, excavated areas will be contoured with fill material (i.e., appropriate soil and/or rock either from an off-site source or from excavated overburden and side slope material that has been sampled and determined to be nonhazardous and meets cleanup goals) after waste is removed. Fill for contouring will be compacted to an appropriate density to prevent erosion or settling; contoured areas will be seeded or covered with appropriate erosion-control material as appropriate.

4.2.6 Segregation of Waste Material by Type

The approach to segregation of waste material by type is discussed in section 4.1.6 and Appendix A. Upon excavation, materials will be segregated according to identifiable waste types.

4.2.7 Waste Management

The approach to waste management is discussed in section 4.1.7.

4.2.8 Confirmation Sampling

The strategy associated with confirmation sampling is discussed in section 4.1.8. If a release from the Plutonium Tanks is confirmed, additional sampling will be performed.

4.2.9 Surveying Locations and Features of Excavation

Techniques for surveying locations and excavation features are the same as discussed in section 4.1.9.

4.2.10 Site Recontouring

The approach to be taken for recontouring the site is the same as discussed in section 4.1.10.

5.0 INVESTIGATION METHODS

The methods and design specifications for conducting the activities identified in the Phase II work plan are presented below. Specific procedures and standardized methods are available for some activities, such as sample collection and analysis. If there is no approved method for a specific activity, a method will be developed as part of design specifications that will be written before beginning field operations.

5.1 Preliminary Sampling Methods (Central Pit and Trenches)

If proven successful at MDA B, preliminary sampling methods may use direct-push technology at the eastern trenches. If the results at MDA B indicate the technology cannot be satisfactorily applied to MDA A, then test pits will be used in the eastern trenches. Test pits will be used in the central pit because of the known presence of debris which would prevent the use of direct-push technology.

Overburden material will be removed from above the pits and trenches and staged in piles or containers in an environmentally protective manner, using a combination of containers and/or appropriately designed and controlled (e.g., bermed, covered) staging piles. Representative samples of the overburden soil will be collected and submitted through the analytical laboratory for analysis of TAL metals, radionuclides (by gamma spectroscopy), isotopic uranium, isotopic plutonium, tritium, strontium-90, VOCs, SVOCs, dioxins/furans, polychlorinated biphenyls (PCBs), perchlorate/nitrate, and cyanide. The material will be stockpiled within the boundary of the area of contamination until analytical results are received and reviewed. If the analytical results indicate that contamination exceed industrial cleanup levels, then the material will be managed as waste. If results indicate that industrial SALs and SSLs are met, the material will be stockpiled for use as site restoration and grading fill.

Once the overburden has been removed, the waste material will be excavated, sorted and logged. Samples will be collected at a minimum of 5-ft intervals for analysis. The same analytical suite as used for the overburden sampling will be used for the waste. The waste will be sorted for visual identification and hazard screening adjacent to the excavation. The same initial screening methods as used during waste excavation operations will be applied as described in section 5.2.1. A temporary pad will be constructed to prevent the ground surface adjacent to the excavation from becoming contaminated.

5.2 Excavation Methods for Central Pit and Trenches

Excavations will be completed using a standard track-mounted hydraulic excavator (a trackhoe) to carefully expose and remove landfill contents for inspection, identification, and removal. The primary method employed will involve initiating the excavation with a downward-sloping ramp leading to the initial access point within the waste trench area. A sloping dig face will be established, on which the buried waste is exposed for inspection and initial characterization. The slope of the dig face may vary, depending upon the angle of repose of the waste trench contents, but it will not be so steep that hazardous conditions are created so that the face could collapse unexpectedly. The dig face will be advanced in lifts, the thickness of which will be determined by the nature of the buried waste, and the ease or difficulty of removing material with the excavator and the need to prevent the spread of contaminated material by keeping the excavator on clean material. Lift thickness will be the minimum that is practicable to minimize the variability of exposed material and the volume of material being processed at any given time.

To avoid the danger of excavation wall collapse, the excavation will be in compliance with 29 CFR 1926, Subpart P.

The waste excavation consists of the following activities.

- The overburden will be removed from above the waste material from the surface down to the top of the buried waste and staged in controlled (e.g., bermed, covered) staging piles or containerized.
- After the overburden is removed, excavation will proceed until all waste is removed and confirmation sample analyses indicate the exposed soil/tuff meets industrial cleanup levels. Excavated waste material will require careful initial screening and segregation immediately after its removal from the dig face. Excavated material will be staged for initial screening and segregation.
- Field technicians will perform an initial survey of newly exposed material for immediately dangerous to life and health (IDLH) or other dangerous conditions.
- If initial screening results indicate conditions are acceptable, the excavator equipment operator will shut down the excavator, and screening personnel may enter, using appropriate levels of personal protective equipment. If initial screening results indicate conditions are not safe for entry,

the excavator equipment operator may cover the suspect material with clean soil until the appropriate course of action is determined.

- Material may be removed by hand or with the excavator equipment and then segregated into proper transfer containers or overpacks. Hand excavation is permitted if initial IDLH and other screening results indicate safe conditions, and the excavation is evaluated and approved for personnel access to the face.
- Excavation will continue until analytical results indicate that all undisturbed geologic material is below industrial cleanup levels for TAL metals, SVOCs, and VOCs, as determined by NMED (NMED 2005, 090802, or current version) or EPA (EPA 2005, 091002, or current verison) radionuclides (LANL 2005, 088493, or current version).

5.2.1 Initial Screening Methods

Several screening tools will be used for initial health and safety monitoring. Radiological monitoring equipment includes a gamma dose rate meter (ion chamber), sodium iodide detector, a neutron dose rate meter, and a CAM instrument. VOCs will be screened using a photoionization detector with an 11.7-electronvolt lamp. Combustible gases can be screened by using Drager tubes for acid gases, basic gases, carbon monoxide, hydrocyanic acid, nitrous gases, and others as appropriate for the trenches. Combustible gases may be screened by using a multigas detector if voids within the disposal area are present. The heat of waste trench contents will be regularly monitored using a handheld infrared thermometer. The infrared thermometer will also help monitor for pyrophoric materials (pyrophoric materials can spontaneously ignite when exposed to air). Conditions will be continuously monitored for changes that could affect the safety of workers in the excavation. Health and safety requirements may preclude personnel entry into the excavations, so it may be necessary to equip the end of the boom of the excavator with a camera or other continuous monitoring tools, as required. Remote sensing instruments may also be used to monitor conditions and identify materials in the open excavation that could pose an immediate threat to site personnel.

Representative samples of excavated soil or bedrock outside the eastern trenches or pit (i.e., overburden material that does not come from the waste trenches but has been excavated only to facilitate the safe removal of the waste trench contents) will be collected to make an initial determination about whether the material must be handled as waste. Existing sample data from previous investigations, where available, may be used to supplement initial screening of the excavated soil or bedrock. A plan for representative sampling and analysis of this material will be developed. The samples will be analyzed for TAL metals, SVOCs, VOCs, and alpha- and gamma-emitting radionuclides. The material will be stockpiled until the analytical results are available for review. If the results of this initial screening on overburden and lay-back material indicate organic, inorganic, or radionuclide constituents above industrial cleanup levels, the material will be handled as IDW. This material, when excavated, will be stockpiled in discrete lots in a volume that will allow adequate representative sampling. Any lots expected to have only low levels of contamination by the initial screening will be further sampled to determine their suitability for use as backfill at MDA A. Lots with contamination below background levels may be used elsewhere at the Laboratory.

Representative samples of the lots that pass the initial screening (no detections on screening instruments) will be collected and may be combined and submitted to the SMO for analysis of TAL metals, radionuclides (by gamma spectroscopy), isotopic uranium, isotopic plutonium, tritium, strontium-90, VOCs, SVOCs, dioxins/furans, PCBs, ,perchlorate, nitrates, and cyanide. If the overburden meets industrial SSLs/SALs material and is found to be uncontaminated, it may be used for final site contouring fill at the MDA A excavation. If it does not meet the screening levels, it will be managed as waste. This approach allows for the minimization of waste generated during excavation while ensuring any contour material used is uncontaminated.

5.2.2 Initial Waste-Segregation Methods

The excavated waste and any other excavated material will be initially sorted by using the excavator bucket. If manual sorting is required, appropriate handling devices will be used to minimize the direct handling of material.

The initial segregation of waste will be based on field observations, physical characteristics, and initial screening results. Waste will be segregated or may be staged, opened, and tested.

Segregated material may be containerized in drums, boxes, rolloff bins, or other appropriate waste containers. Size reduction of debris (i.e., compaction) may be performed if appropriate, but only after the initial characterization and identification of potential hazards have been completed. Inspection and declassification of materials will be conducted during the initial sorting.

All materials will be managed appropriately to prevent the release of any contamination to the environment within the area of contamination or off-site.

5.2.3 Final Waste-Segregation Methods

Materials identified as waste will be segregated into specific waste types for appropriate disposal. Investigation/remediation activities will minimize the waste generated by following the most recent version of the annual Laboratory's Hazardous Waste Minimization Report. Any containers removed from the excavation will be physically inspected for their ability to continue to hold the waste materials safely. If warranted, the contents will be either transferred to a new container or placed in an overpack. The waste material's hazardous characteristics and compatibility will dictate the manner in which the containers will be further handled. Small containers (<5 gal.) of similar hazard class or compatibility may be placed in larger containers, such as a laboratory pack, for subsequent safe storage and/or transportation. Large containers of similar hazard class, compatibility, and/or waste stream will be grouped together for subsequent safe storage and/or transportation.

Before field investigation/remediation activities, the subcontractor will develop a waste management plan. The plan will include a completed waste characterization strategy form (WCSF). The WCSF will provide detailed information about the anticipated waste to be managed, including IDW and other waste materials deemed to be "newly generated." The WCSF information will include characterization, management, containerization, and potential or estimated volume. Upon the discovery of unanticipated material, an addendum to the WCSF will be generated to cover the new waste stream.

Selection of waste containers will be based on the appropriate DOT shipping requirements and the type and amount of waste generated. Containers removed as a result of the investigation/remediation and new containers used for safe- and compliant-handling purposes will be individually labeled by waste classification, item identification number, radioactivity (if applicable), and date generated.

5.2.4 Confirmation Sampling Methods for Soil and Tuff

As described in sections 4.1.8 and 4.2.8, samples will be collected from the tuff beneath the bottom of the excavation(s) after all waste contents have been removed. At each location, a minimum of two samples will be collected at depths corresponding to approximately 0–0.5 ft and 1.5–2.0 ft below the excavation bottom. The deeper samples should be collected at a depth with little or no evidence of contamination, based on visual observation and field-screening results. The locations of all samples will be identified by use of GPS coordinates obtained when the locations are selected or when the samples are collected.

Field duplicate, equipment rinsate, and field trip blank samples will be collected at a frequency of 5% for quality assurance/quality control purposes and in accordance with the Consent Order.

If saturated conditions or free water are encountered in the excavation bottom in sufficient quantities, water samples will be collected and submitted for off-site analytical laboratory analysis. The extent of saturation or high-moisture conditions, if any, will be observed and documented during excavation and sampling.

5.2.5 Geodetic Survey Methods

To record the location and dimensions of the excavation and to record the locations of the selected sample collection points, geodetic surveying will be conducted before excavations are backfilled. Horizontal coordinates and elevations will be determined by differentially corrected GPS or other applicable methods.

5.2.6 Site Restoration

Once all waste is removed, the eastern trenches and central pit areas will be recontoured and compacted, and overburden material will be replaced over the affected area. Any additionally required clean fill material will be shipped in from off-site. All affected surfaces will be contoured, reseeded, and a straw mulch or appropriate erosion-control fabric will be applied to help stabilize the surface. To prevent future subsidence, moisture content and lift thickness of fill will be controlled. In addition, use of heavy equipment will be used for compacting. Best management practices will be established to monitor and prevent erosion.

5.2.7 Waste Management Methods

Representative samples of the waste will be collected from the waste containers in a manner compliant with EP Directorate standard operating procedures (SOPs), EPA methods, and/or the disposal facility's sampling guidelines. The WAC will prescribe analytes, sample frequencies, sample sizes, sample type (discrete or composite), and the analytical techniques for the chosen disposal facilities. Waste characterization samples, where required, will be submitted to analytical laboratories.

The investigation/remediation activities described in this work plan will generate various types of IDWs that will be managed in accordance with applicable federal, state, DOE, and Laboratory requirements (Appendix A).

Bar code labels and scanners will be used to link containers and samples to the database and to track movement of containers and samples among the excavation, staging area(s), and the definitive identification facility. The database will contain fields for capturing the following types of data:

- type, location, and volume of excavated materials
- physical descriptions and initial hazard classification
- hazard identification results
- waste characterization results
- waste volume, compositing, packaging, storage, and shipping details

- sample collection, analyses, and tracking records for excavated materials and in-situ soil and tuff samples
- geodetic survey or GPS data for the locations of key features in the excavations, such as disposal trench geometry, disposal trench contents of specific interest, and sampling locations

5.2.8 Equipment Decontamination Methods

Following excavation and transportation activities, project personnel will decontaminate all the equipment involved in excavation, drilling, and material removal activities. Residual material adhering to equipment will be removed using dry decontamination methods, including the use of wire brushes and scrapers (EP-ERSS-SOP-5061). If equipment cannot be free-released following dry decontamination, a high-pressure sprayer, along with long-handled brushes and rods, will be used to more effectively remove contaminated material from equipment. Pressure-washing of equipment will be performed on a temporary wash pad with a high-density polyethylene liner. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination fluids will be sampled to determine final disposition. Air filters on equipment operating in the exclusion zone will be considered contaminated and will be removed and processed for disposal; the filters will be replaced with new clean filters before equipment leaves the site. Equipment will be surveyed and tagged for free release by a Heath Safety and Radiation Protection technician before being demobilized.

5.3 Excavation/Removal Methods for the Plutonium Tanks

5.3.1 Initial Screening Methods

As discussed in section 4.2, waste treatment/disposal activities that lead to final excavation and disposal will be guided by the initial screening activities and the means and methods used for characterization of the contents. Initial screening methods will be dictated within the safety basis documentation as well as site-specific safety and health criteria developed for the Plutonium Tanks.

Lessons-learned activities from within the DOE Complex have been utilized, and it has been determined that preliminary tank samples will be collected from the headspace gas and within the residual sludge to determine the presence of flammable gas, evaluate sludge physical properties, and establish the nature and extent of radiological and hazardous constituents. The results of the preliminary sampling will support development of a separate tank excavation and removal DSA; development of safety basis requirements, engineering designs, safe work control processes, and hazard mitigation strategies; identification of potential waste streams and disposal pathways; and selection of potential sludge retrieval technologies.

Headspace samples will be obtained by (1) excavating to the surface of the tank and possibly tapping the sidewall and existing tank fill and vent lines (to install sample ports) or (2) accessing the existing 18-in.-diameter postconstruction access hole installed in the tanks in 1974. Since the location and condition of the fill and vent lines are unknown, accessing the postconstruction sample port is the most effective approach. To access the sample port, the overburden soil will be removed over the center of each tank. Standard field-screening methods will be used during excavation to determine the presence of potential contamination and volatiles. Clean soil will be stockpiled for future backfill operations; contaminated soil will be segregated and appropriately packaged for disposal. The excavation can be secured with caissons (portable shoring devices) to support the sidewalls and prevent collapse. If impedance to access this location is encountered, access will be attempted through the pipes at the end of the tanks. Although technically more difficult, this is a proven technology for accessing tanks containing potentially flammable vapors.

Standard industrial sampling methods will be used to determine the presence of VOCs, SVOCs, and potential explosive vapors before removing the rolled-steel cover placed over the access hole. Tank headspace samples will be obtained through the postconstruction access hole.

5.3.2 Characterization of Atmosphere and Tank Sludge

Once headspace gases have been analyzed and evaluated, a visual examination will be performed to inspect tank integrity, determine the presence of internal structural members and visual staining, and evaluate limited sludge properties (physical appearance, moisture, sludge depth, and volume).

Visual examination and initial screening and inspection activities will be used to aid in the decision process regarding the selection of tooling for sampling of free liquids, hard heel, sludges, salt cake, and/or dispersible materials. Up to three sludge samples will be obtained through the access hole using methods, such as hand augers, core samplers, or clamshells. At a minimum, one sample will be obtained directly below the sample port. Additional samples will be obtained as practicable to either side of the port. Tank geometry, access hole location (tank center), and diameter should allow additional samples to be collected approximately 12 to 16 ft on either side of the hole along the longitudinal axis of the tanks.

Samples will be analyzed for inorganic chemicals, organic chemicals, and radionuclides. Analyses may include TAL metals, radionuclides (by gamma spectroscopy), isotopic uranium, isotopic plutonium, tritium, strontium-90, VOCs, SVOCs, dioxins/furans, PCBs, perchlorate/nitrate, and cyanide. Additional analysis will be conducted to determine the mechanical properties of the tank sludge that impact slurry transfer/retrieval equipment, such as shear strength, density, particle size, and shape. Tank sludge characterization samples will be processed under chain of custody through the SMO and sent to off-site analytical laboratories for the requested analyses.

5.3.3 Removal of Overburden and Concrete Pad

Removal of the Plutonium Tanks overburden and concrete pad will begin after the MDA A trenches and central pit waste have been removed and will follow similar processes used for the trenches and central pit area. Excavation of the overburden soil will be accomplished as a single operation using a commercial excavator(s) outfitted with buckets, breakers, and shears. The size of the commercial equipment (i.e., weight) will be limited as necessary to ensure the structural integrity of the tanks is not compromised.

Excavated environmental media will be characterized with contaminated overburden and rubble processed for disposal at approved off-site disposal facilities. Environmental media will be evaluated for either disposal as waste or stockpiled for future clean backfill at MDA A. Conditions for returning environmental media to the site are described below and will be addressed further as part of the Laboratory's request for an area of contamination designation to be submitted to NMED upon approval of this work plan.

Material excavated to expose the tanks will be initially screened to determine if it must be considered waste or if it is potentially suitable for being returned to the excavation site. Stockpiling of overburden soils, excavated material, and debris will be based on a nonhazardous waste determination and on meeting industrial cleanup levels. Representative samples will be collected from all excavated environmental media as they are excavated. Screening analyses will be performed using standard field-screening methods and laboratory analysis. If the screening analyses indicate there is potential for hazardous waste and/or contaminants to be present above industrial cleanup levels, the material will be handled as waste. If the screening results indicate that the material is not hazardous waste and potentially meets industrial cleanup levels, representative samples will be collected and submitted to an analytical laboratory.

Overburden soil and debris will be stockpiled within the boundary of the area of contamination until analytical results are received and reviewed. If the analytical results indicate hazardous waste and/or that contaminants exceed industrial cleanup levels, the material will be processed as waste. If results indicate hazardous waste and cleanup goals are met, the material will be used to backfill the excavation. The placement of the material as backfill will be tracked so that analytical data may be linked to specific areas of the site.

5.3.4 Removal of Tank Waste

Mechanical properties of the sludge and the radionuclide contents will significantly influence the selection of potential sludge retrieval/removal alternatives. Two primary methods exist for removing the waste from the Plutonium Tanks. The first method is to retrieve the sludge from the tanks and package the waste. The second method solidifies the sludge (e.g., grouting, and disposes of the tanks and sludge as a single waste package).

The technical approach for removing and remediating the tank waste will be developed through a systematic and progressive process starting with the assessment of the preliminary tank characterization data and sludge mechanical properties. Once the sludge characterization data are evaluated, the Laboratory will conduct an alternatives analysis to identify and select the appropriate technology(ies) and methods to retrieve and remove waste from the Plutonium Tanks. The alternatives analysis and technology selection for removal of the Plutonium Tanks are not part of this document.

Regulatory drivers that must be considered are those affecting ancillary equipment, agreeing to completion end state objectives, and monitoring of leaks if liquid waste retrieval systems are used. Once the contents—radiological, chemical, and physical properties—are known, a treatment system can be defined and preselected that can safely and effectively remove the contents for treatment or allow for treatment in place leading to final disposal alternatives.

5.3.5 Removal of Tanks

The removal method for the Plutonium Tanks will be determined based on the sludge waste disposal method selected by the Laboratory through an alternatives analysis and technology selection process—sludge retrieval and separate removal of the tanks or solidification of the sludge and removal of the waste and tanks as a single disposal unit.

However, for either alternative, the Plutonium Tanks will be completely excavated and removed from MDA A. Tank externals, piping, and other ancillary components will be processed for disposal at an approved off-site disposal facilities. Environmental media surrounding the tanks will be evaluated for either disposal as waste or stockpiled for future clean backfill at MDA A. Conditions for returning environmental media to the site are discussed in Appendix A. Soil surrounding the Plutonium Tanks will be excavated to the base of the four concrete piers supporting each of the Plutonium Tanks. The entire width of the tank trenches will be excavated; sidewalls will be sloped, according to Occupational Safety and Health Administration requirements. Shoring may be used as necessary and where appropriate to ensure the stability of the excavation.

As appropriate, and dependent upon the technical approach selected for remediating the tank waste, the Plutonium Tanks will be size-reduced using commercial equipment or removed as single units.

Development of the technical methods and approach for removing the tanks will be included in the alternatives analysis conducted by the Laboratory as a separate document.

NMED requirements will be addressed as they apply to ancillary tank system(s) and the tanks themselves. If the contents of the tank are emptied and the waste residues and tank bottoms are retrieved for eventual treatment, the tanks can be evaluated for compliance to an empty status for tank removal. If liquid waste retrieval systems are used, means and methods for leak detection, including mass balance calculations, can be used to safely monitor the process to mitigate and monitor progress. Another option for this tank size is to grout or similarly treat the waste in situ, resulting in a monolith that can be removed and repackaged as necessary before final disposal. Secondary waste streams are managed following the plan outlined for waste treatment and repackaging with treatment and disposal options dependent on the characterization data received.

5.3.6 Dispositioning and Transport of Tanks

Dispositioning and transport alternatives are dependent on the final remedy. Proven alternatives include transporting as a single monolith, resectioning a grouted tank into smaller pieces, disposing of an empty tank and treatment of tank sludge residuals, and disposing using smaller DOT-compliant packages, such as 55-gal. drums. All alternatives lend themselves to off-site disposal options.

5.3.7 Recontouring, Compaction, and Clean Cover Replacement

Recontouring operations and surface restoration of the tank excavations will be conducted concurrently with backfilling and restoration of the MDA A trenches and central pit. Placement of recontouring material and compaction for the Plutonium Tanks will be conducted as described in section 5.2.6. As needed, clean fill material will be shipped in from off-site locations and will be used to supplement the overburden material and soil segregated and stockpiled during tank excavation. All impacted surfaces will be nominally restored to original grade and contoured to match the surrounding area. Restored areas will be reseeded and, as necessary, a straw mulch or appropriate erosion-control fabric will be placed to help stabilize the surface. To prevent future subsidence, backfill material will be compacted to the extent practical using existing equipment. The top 6 in. will not be compacted to ensure erosion prevention controls (e.g., reseeding) are effective. Best management practices will be established to monitor and prevent erosion.

5.3.8 Waste Management Methods

Wastes generated by this process will be treated and disposed of in compliance with DOE Order 435.1 and NMED regulatory criteria. Waste residuals, tank bottoms, ancillary equipment, and secondary waste will be sampled, characterized, and packaged in alignment with these requirements. Tank bottoms/heels can be treated either by means of transfer and treatment into secondary waste containers, or they may be able to be treated in place. Waste forms can be treated to meet TSD facility criteria in 55-gal. drums or other DOT-compliant packages. If waste treatment is completed in place, the package can be left as a single monolith and sent directly for disposal and/or the waste form segmented and packaged into smaller packages. Loose debris associated with ancillary equipment and soils/concrete material can be packaged in appropriately sized containers. Waste profiles and disposal pathways are highly dependent on characterization sampling results as well as secondary packaging and waste treatment alternatives selected for LLW, MLLW, or TRU waste that may be generated. Determinations can be made in alignment with NMED criteria for replacement of clean soil as fill material and pollution prevention and waste minimization opportunities preselected throughout the planning and implementation process.

6.0 SOIL-VAPOR MONITORING AND SAMPLING PROGRAM

Based on information collected from past investigation activities, it is not anticipated that monitoring will be required at MDA A following the implementation of this Phase II work plan. If any monitoring wells are necessary, a monitoring plan will be developed and submitted to NMED. The monitoring plan will detail the parameters to be monitored, the monitoring frequency, and the procedures to be followed.

A pore-gas/soil-vapor monitoring plan will be proposed for MDA A in the Phase II IR.

7.0 SCHEDULE

Work for characterization of the sludge in the Plutonium Tanks has been under way for several years and will be completed September 2010. Removal of the plutonium tanks sludge and tanks will be completed in 2014. The eastern pits and central trench waste characterization will be completed in January 2012. The excavation of the eastern trenches and central pit will begin in September 2012 and will be completed in March 2013.

Confirmation sampling and analysis and final grading will occur toward the end of waste removal, with the final work being completed below the plutonium tanks in October 2014. As confirmation results are collected, they will be included in the status reports.

The Phase II IR will be submitted to NMED in December 2014.

Table 7.0-1 presents the planned milestones.

8.0 REFERENCES

The following list includes all documents cited in this 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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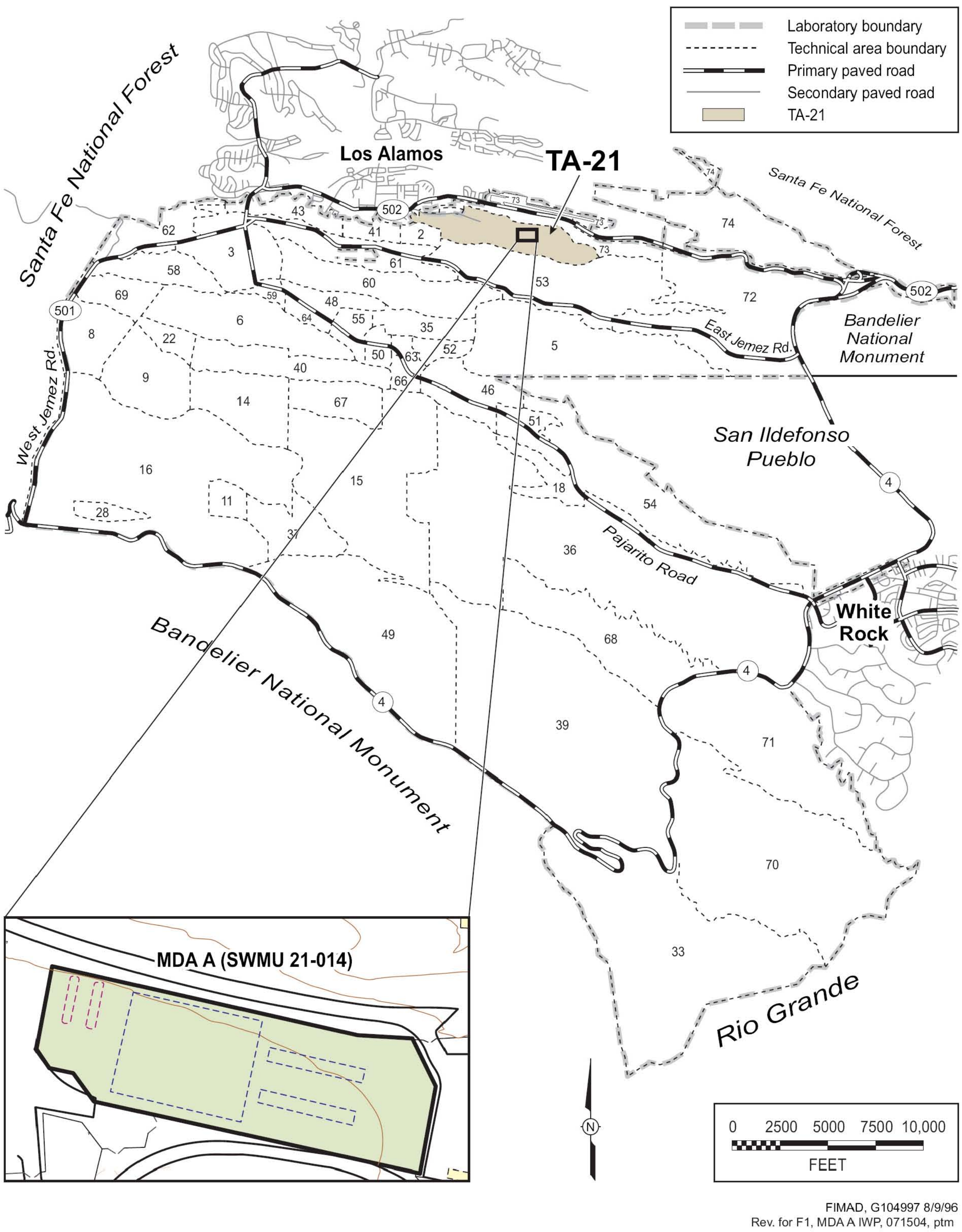

Figure 1.0-1 TA-21 and MDA A with respect to Laboratory TAs

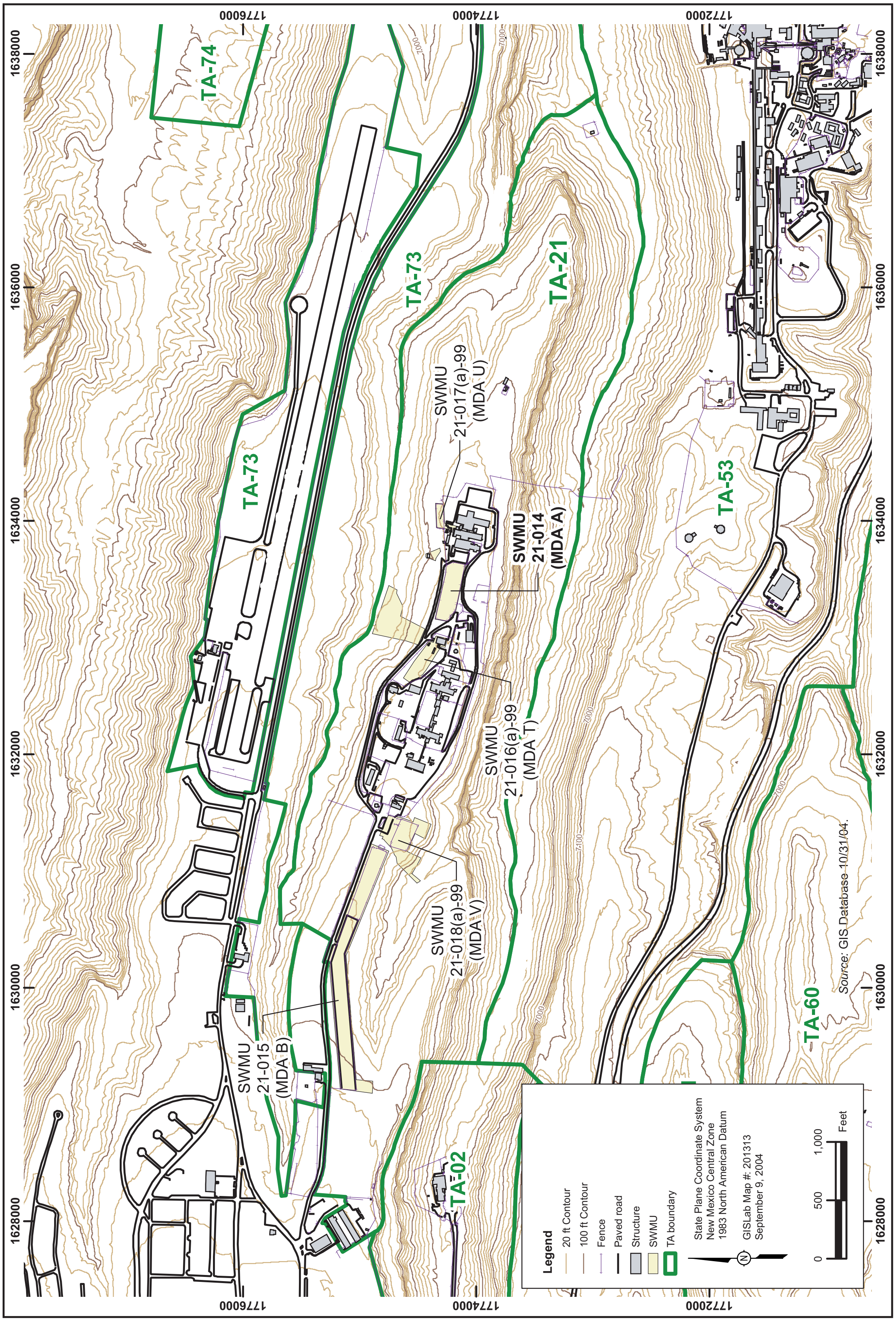

Figure 1.0-2 MDA A in relation to TA-21 and surrounding TAs, MDAs, and SWMUs

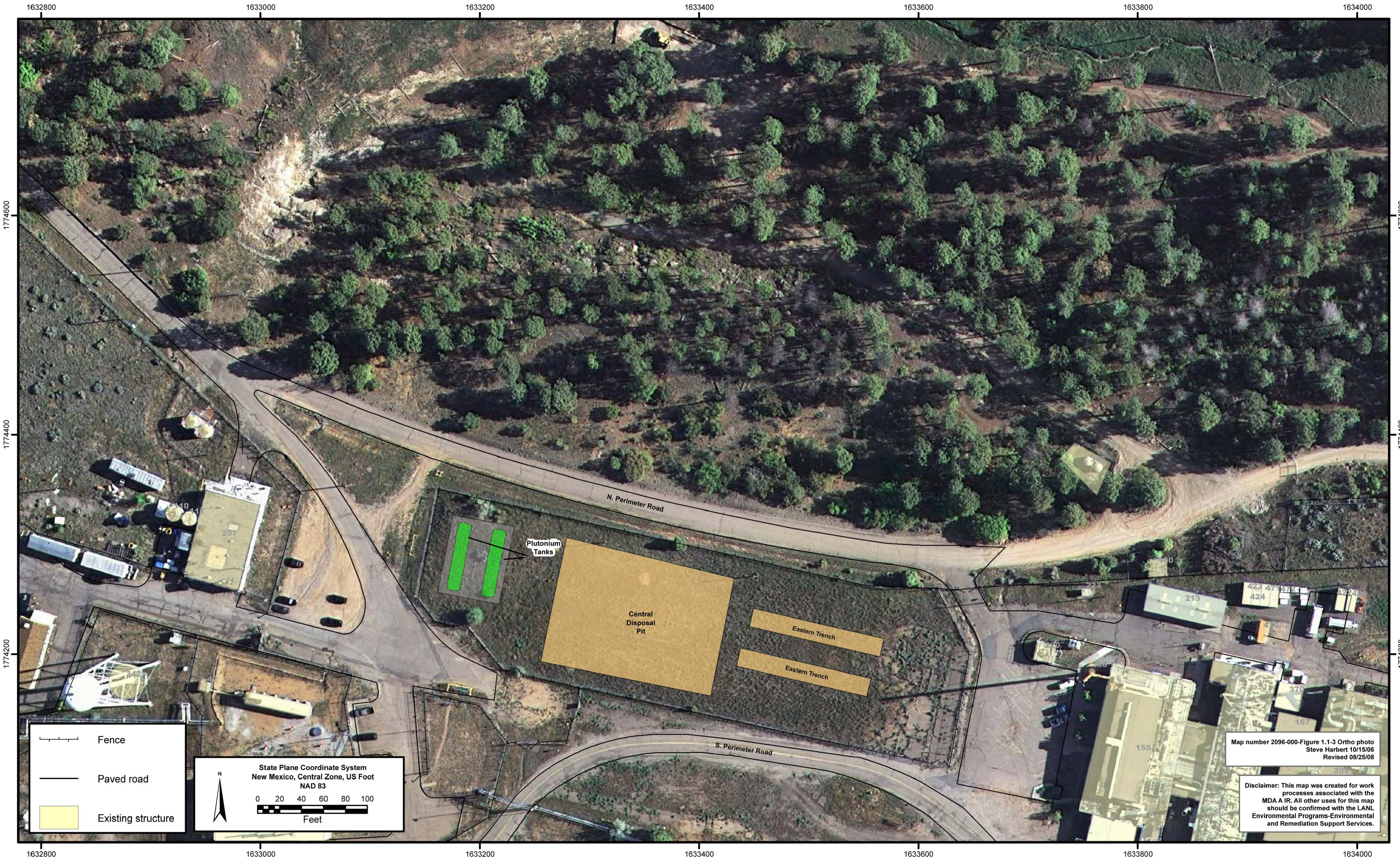

Figure 1.1-1 MDA A site plan (orthophotograph)

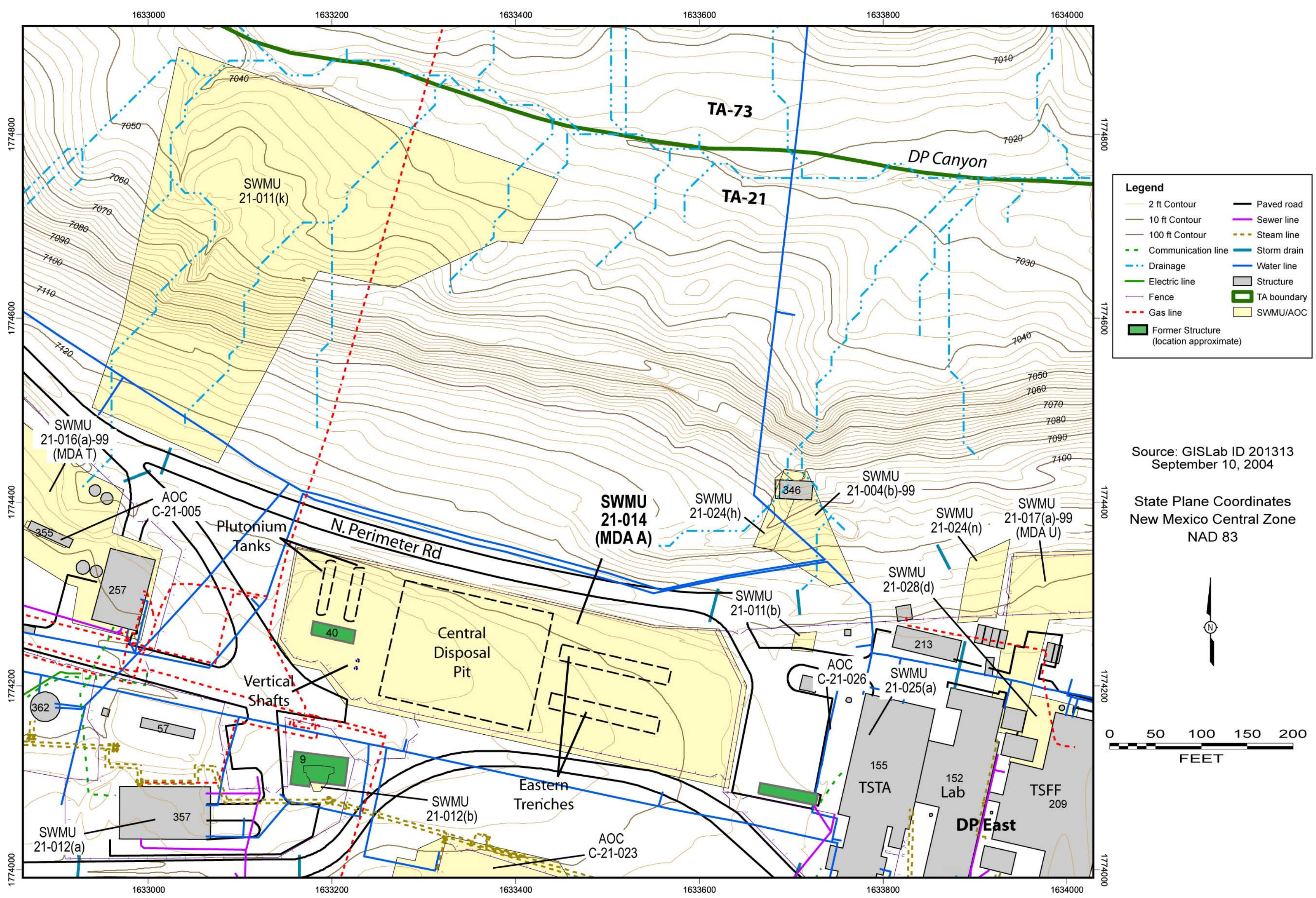

Figure 2.1-1 MDA A site plan showing the Plutonium Tanks, the central pit, the eastern trenches, and utility lines

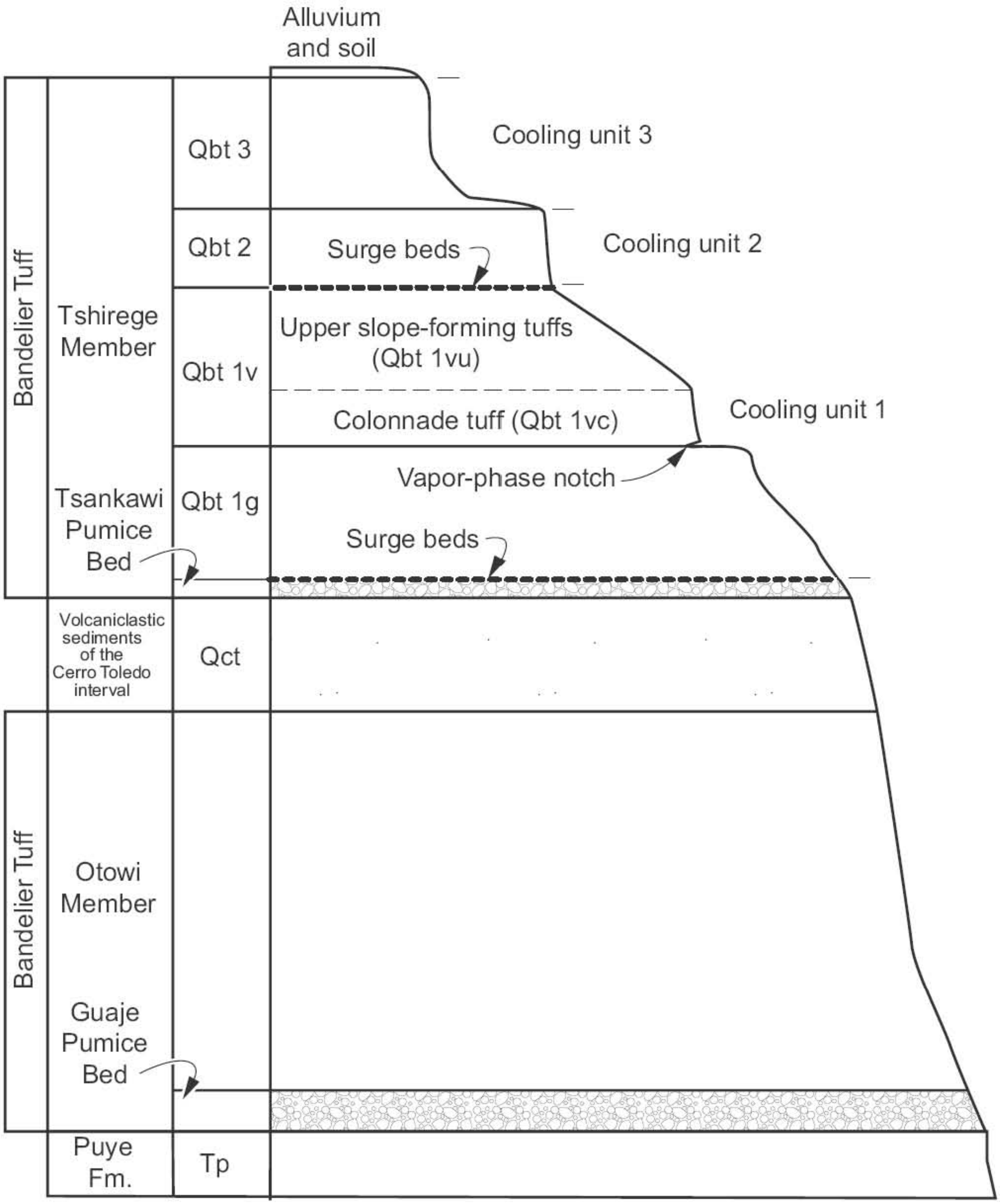

Figure 3.2-1 Generalized stratigraphy of DP Mesa in the area of MDA A

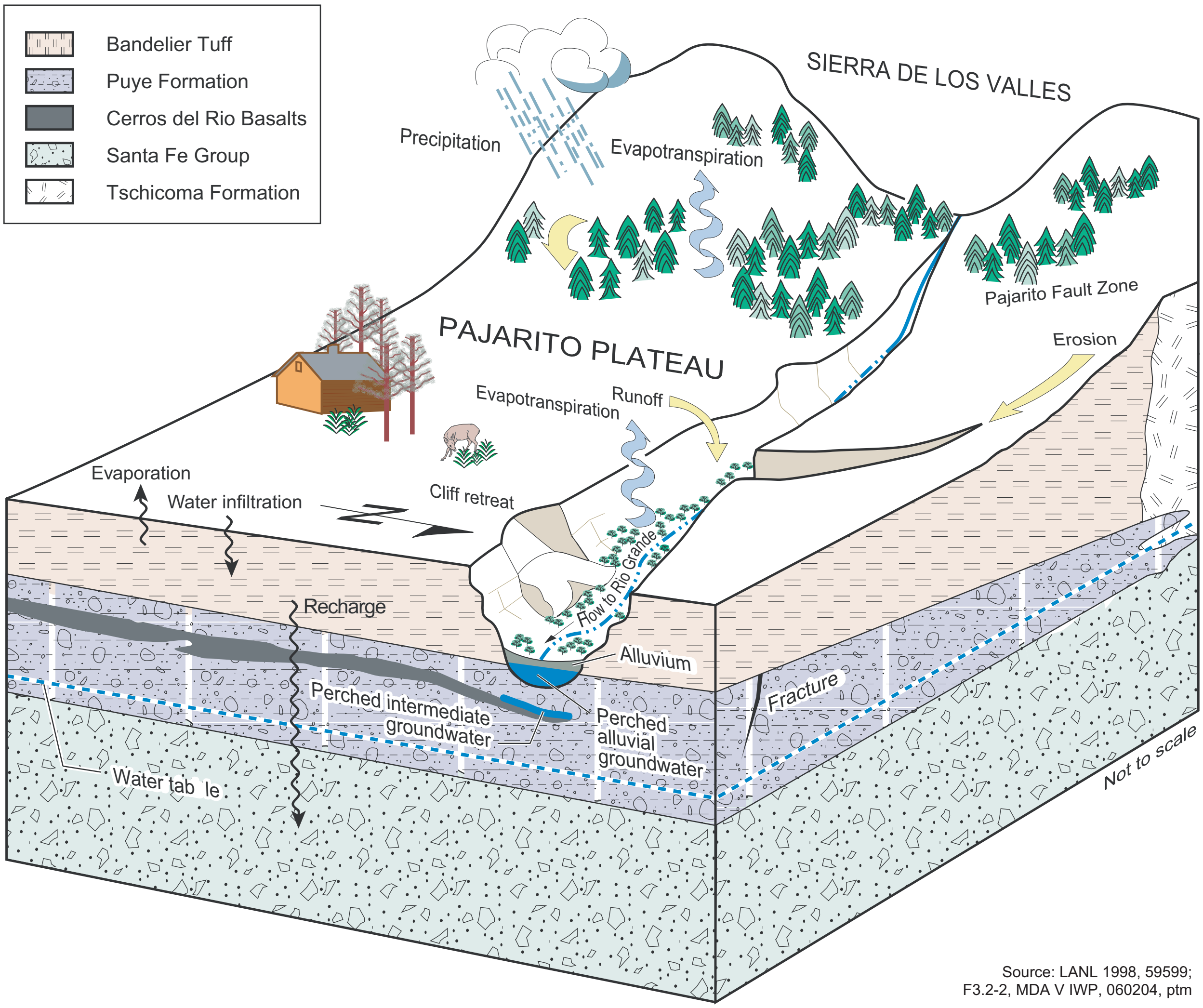

Figure 3.2-2 Perched saturation zones/regional aquifer

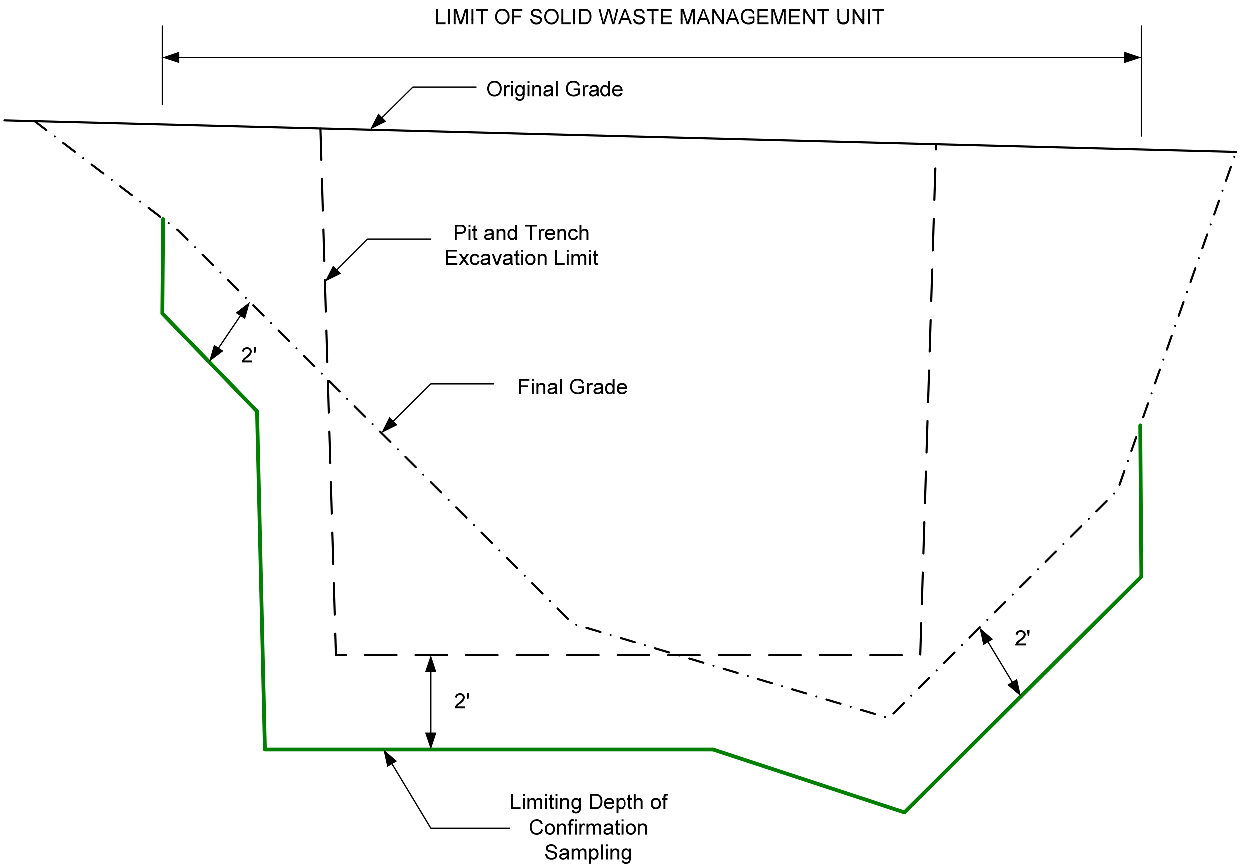

Figure 4.1-1 Bounding limits for confirmation sampling below MDA A

Table 2.0-1
Summary of Historical Activities at MDA A

Date	Plutonium Tanks	Vertical Shafts	Eastern Trenches	Central Pit	Former Drum Storage Area
1945	Two 50,000-gal. storage tanks (12-ft diameter, 62-ft-10 in. long) buried on the western end of MDA A to receive waste solutions containing plutonium-239, plutonium-240 and americium-241 (photo right)[a].		Construction of two pits on eastern end of MDA A (125 ft x 18 ft x 12.5 ft). Solid waste possibly containing mainly alpha contamination and some beta and gamma contamination placed into pits (photo right)[a].		
1946	No record of waste management activities.		Solid waste possibly containing mainly alpha contamination and some beta and gamma contamination placed into pits. Pits closed and crushed tuff used to backfill and cover the trenches.		
1947–1952					Late 1940s or early 1950s. Several hundred 55-gal. drums of sodium hydroxide solution and stable iodine waste, possibly containing plutonium and uranium, stored in area (photo left)[b].
1953–1959					No record of drum activity.
1960					Drums removed and area paved to immobilize contaminants.
1961					
1962					

Table 2.0-1 (continued)

Date	Plutonium Tanks	Vertical Shafts	Eastern Trenches	Central Pit	Former Drum Storage Area
1963–1968					
1969				Construction of large pit (150 ft x 40 ft x 22 ft) in the center of MDA A to receive debris from demolition work at TA-21. May 9, 1969: A geologic reconnaissance was made of the central disposal pit by observing geology and taking measurements with a compass.	
1970–1971				Building debris from demolition work at TA-21 placed into pit.	
1972				Pit enlarged to 172 ft x 134 ft x 22 ft to receive building debris from demolition of Building 21-012.	
1973				Pit received plutonium-contaminated building debris from demolition of Building 21-012 (see photo at left)[c].	
1974	May 1974: Four holes were augered adjacent to the Plutonium Tanks to a depth of 35 ft bgs, and composite samples were collected at 5-ft intervals.			Debris from TA-21 buildings and structures placed into pit.	

Table 2.0-1 (continued)

Date	Plutonium Tanks	Vertical Shafts	Eastern Trenches	Central Pit	Former Drum Storage Area
1975	June 19, 1975: Liquid waste (approximately 10,570 gal.) transferred from the western tank to Building 21-257 for processing.	December 3, 1975: Excavation of two 4-ft-diameter vertical shafts (~65 ft deep) adjacent to the Plutonium Tanks for disposal of nonretrievable cement paste.		Waste of an unspecified nature placed in pit.	
1976					
1977		Shafts "grouted up" for closure.			
1978				May 1978: Pit decommissioned and soil cover (crushed tuff) placed over the pit.	
1979	Aerial photograph at right[d]				
1980	A-2 sampled at three depth intervals.			Sample A-1 at three depth intervals.	
1981					
1982					
1983	Liquid waste transferred from the tanks to Building 21-257 for processing. Six holes were drilled around the perimeter of the Plutonium Tanks to a depth of 30 ft bgs, and subsurface soil profile samples were collected from 3-ft intervals.				
1984	A radiation field survey was conducted at approximately 100 locations with a phoswich detector analyzer and high-pressure ion chamber instrument. May–August 1984: Soil and vegetation samples were collected from 39 locations from the western third of MDA A.				

Table 2.0-1 (continued)

Date	Plutonium Tanks	Vertical Shafts	Eastern Trenches	Central Pit	Former Drum Storage Area
1985	Tops of the tanks sealed because of evidence of rain water seepage.				
	1st Quarter 1985: Seven locations were sampled for soils within and outside of MDA A at 0.03 ft to 0.33 ft and 0.33 ft to 0.98 ft.				
1986	A surface reconnaissance survey was performed, which addressed the general conditions of cover.				
1987–1988					
1989	Geophysical techniques were used, including magnetics, electromagnetics, resistivity, radar, and self-potential to determine pit geometry, accurately locate material, and determine the physical properties of sites and buried material.				
1990	October 1990: Surface soil was sampled within the boundaries of MDA A at approximately 20 locations.				
1991					
1992	March–May and June–July: Phase I RFI was performed across TA-21. Surface soil was sampled during two sampling events (Grid 1 and Grid 2).				
1993					
1994	August–September: A Phase I RFI was performed on the surface outside the MDA A fence and surface and near-surface within the associated drainage area. Activities included a radiation field survey (59 survey locations); collection of surface and near-surface samples (51 locations, sediment samples were collected from 0 ft to 0.25 ft, 0.25 ft to 0.5 ft, and 0.5 ft to 1 ft; all other surface samples were collected from 0 ft to 0.25 ft); field screening of samples with field instruments and a mobile laboratory; and analysis of samples at a fixed analytical laboratory.				
1995					
1996	June: An electromagnetic survey was conducted using a GEM-2.				
1997–1998					
1999	June: Geophysical surveys were conducted using GPR, magnetics, and electrical resistivity (students, faculty, and visitors of the Summer of Applied Geophysical Experience).				
2000–2002					
2003	September: An integrated geophysical survey was conducted using capacitively coupled electrical resistivity and digital GPR (Advanced Geological Services, Inc.)				
2004					
2005	January: Investigation work plan submitted to NMED. June: Plan approved by NMED.				

[a] Photograph 1945 or 1946 (Gerety et. al. 1989, 006893, p. 36).

[b] Aerial photograph January 1949 (Gerety et. al. 1989, 006893, p. 38).

[c] Photograph 1973 (Gerety et al. 1989, 006893, p. 44).

[d] Aerial photograph 1979 (Gerety et al. 1989, 006893, p. 50).

Table 7.0-1
Proposed Schedule for Investigation and Remediation of MDA A

Activity Description	Date Complete
NMED Approval of Work Plan	September 18, 2009
Access and Sample Plutonium Tanks Contents	May 22, 2010
Submit Analytical Report for tanks to NMED/DOE	September 15, 2010
Final DSA for Waste Removal to DOE (Tanks)	June 1, 2011
Readiness for Characterization (Pit/Trenches)	September 12, 2011
Waste Characterization (Pit/Trenches)	January 12, 2012
Engineering Design for Pit/Trenches Remediation	March 26, 2012
Readiness for Waste Removal (Pit/Trenches)	September 24, 2012
LANL Facility Approval of Technical Safety Requirement Implementation Plan (Tanks)	December 21, 2012
Waste Removal Complete (Pit/Trenches)	March 20, 2013
Engineering Design for Plutonium Tanks	March 22, 2013
Confirmation Results (Pit/Trenches)	August 2, 2013
Readiness and Field Operations Approved (Tanks)	April 15, 2014
Waste Removal (Tanks)	August 21, 2014
Confirmation Sampling Results (Tanks)	October 20, 2014
Final Site Grading MDA A	October 20, 2014
Phase II Investigation Report to NMED	December 18, 2014

Appendix A

Investigation-Derived Waste Management

A-1.0 INTRODUCTION

This appendix describes how investigation-derived waste (IDW) generated during the Material Disposal Area A (MDA A) investigation and remediation will be managed by Los Alamos National Laboratory (the Laboratory). IDW may include, but is not limited to, excavated environmental media, excavated waste, sludge, contact waste, decontamination fluids, and all other waste that has potentially come into contact with contaminants.

A-2.0 IDW

All IDW generated during investigation activities will be managed in accordance with the current version of the 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 applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy (DOE) orders, and Laboratory requirements.

The most recent version of the Laboratory's Hazardous Waste Minimization Report will be implemented during the investigation to minimize waste generation. The Hazardous Waste Minimization Report is updated annually as a requirement of Module VIII of the Laboratory's Hazardous Waste Facility Permit.

A waste characterization strategy form (WCSF) will be prepared and approved per requirements of EP-ERSS-SOP-5022, Characterization and Management of Environmental Restoration (ER) Project Waste. The WCSF will provide information on IDW characterization methods, management, containerization, and potential volumes. IDW characterization is completed through review of sampling data and/or documentation, or by direct sampling of the IDW or the media being investigated (e.g., surface soil, subsurface soil, etc.). Waste characterization may include a review of historical information and process knowledge to identify whether listed hazardous waste may be present (i.e., due diligence reviews). If low levels of listed hazardous waste are identified, a "contained in" determination may be submitted for approval to NMED.

Considerable amounts of material will be excavated during the remediation of MDA A. To facilitate the staging and segregation of the remediation waste, the Laboratory will submit an area of contamination designation request to the NMED for approval. The request will specify the boundaries of the proposed area of contamination and describe the activities to be conducted within the boundaries.

Wastes generated or moved outside the area of contamination will be containerized and placed 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 the waste is generated. Table A-2.0-1 summarizes how waste will be managed.

The primary waste streams that are anticipated to be generated during work plan implementation are described below.

A-2.1 Excavated Environmental Media

Overburden spoils (including environmental media mixed with buried debris) will consist of soil and rock removed from within or adjacent to (e.g., from benching to stabilize a trench) the areas that are to be excavated. This material will be field screened for radioactive and volatile organic compounds during the excavation process. If contamination is not detected during screening, the spoils will be stored either in roll off bins, other suitable containers, or on the ground surface with appropriate best management practices. If field screening indicates the potential for contamination, the overburden spoils will be placed in roll off bins or other suitable containers. The spoils will remain within the area of contamination boundary, awaiting analytical results. Representative samples of the spoils will be collected as the spoils are excavated and composited, (a minimum of one composite sample for every 100 yd^3). The samples will be analyzed for volatile organic compounds (VOCs); target analyte list (TAL) metals; radionuclides; and toxicity characteristic metals, as needed. If process knowledge, odors, or staining indicate that the soils may be contaminated with petroleum products, the materials will also be analyzed for total petroleum hydrocarbons and polychlorinated biphenyls (PCBs). Other constituents may be analyzed as necessary to meet the waste acceptance criteria (WAC) for a receiving facility. If the spoils are determined to be suitable for reuse (i.e., they meet industrial cleanup standards as determined using NMED's and DOE's soil screening guidance), the Laboratory will use this material to backfill the excavated SWMUs and areas of concern after removing any man-made debris that is present. If the spoils do not meet industrial cleanup standards, they will be treated/disposed at an authorized facility appropriate for the waste regulatory classification. The Laboratory expects the spoils that cannot be reused to be designated as low-level waste (LLW) or mixed low-level waste (MLLW) that will be treated/disposed of at an authorized off-site facility or industrial waste that will be disposed of at an authorized off-site industrial disposal facility.

A-2.2 Excavated Man-Made Debris

Excavated man-made debris will be generated from the trenches, central pit, and Plutonium Tanks (formerly known as the General's Tanks). Debris will be segregated based on factors, such as the type of debris, the type of alternative treatment technology that would be used to treat the debris, field screening, process knowledge, and/or staining or odors. Where practicable, this waste stream will be characterized by direct sampling of the waste. Direct samples will be analyzed for VOCs, SVOCs, radionuclides, total metals, and, if needed, toxicity characteristic metals. Other constituents may be analyzed as necessary to meet the WAC for a receiving facility or if process knowledge or visual observations indicate other contaminants may be present (e.g., PCBs or asbestos). For debris that is difficult to characterize, acceptable knowledge (AK) will be used whenever possible, supplemented by sampling as needed. Sampling methods will often have to be identified on a case-by-case basis by qualified sampling personnel and all decisions documented in the field activity notebook.

After being separated from soils and segregated by waste type, the excavated debris will be placed in containers (e.g., roll off bins) within the boundaries of the area of contamination. The Laboratory expects most of this waste to be designated as LLW or MLLW that will be treated/disposed of at an authorized off-site facility, or industrial waste that will be disposed of at an authorized off-site industrial disposal facility.

A-2.3 Sludge

If sludge is removed from the Plutonium Tanks, it will be containerized and managed within the area of contamination boundaries. Another alternative is to grout the sludge in-situ in the tanks. Samples of the sludge will be collected before it is removed from the tanks or grouted inside the tanks. Samples will be analyzed for VOCs, SVOCs, radionuclides, total metals, and, if needed, toxicity characteristic metals. Other constituents may be analyzed as necessary to meet the WAC for a receiving facility. The Laboratory expects the sludge to be designated as LLW or MLLW that will be treated/disposed of at an authorized off-site facility.

A-2.4 Contact Waste

The contact waste stream consists of potentially contaminated materials that "contacted" waste during sampling and excavation. This waste stream consists primarily of, but is not limited, to personal protective equipment (PPE) such as gloves; decontamination wastes such as paper wipes; and disposable sampling supplies. Characterization of this waste stream will use AK of the waste materials, the methods of generation, and analysis of the material contacted (e.g., soil). Contact waste generated within an area of contamination will be initially placed in containers and managed within the area. If contact waste is generated at a location that is not within the area of contamination, the initial management of waste will rely on the data from previous investigations and/or process knowledge. They will be managed in secure, designated areas appropriate to the type of the waste. If new analytical data changes the expected waste category, the waste will be managed in accumulation areas appropriate to the final waste determination. The Laboratory expects most of the contact waste to be designated as LLW that will be disposed of at Technical Area 54 (TA-54), Area G or an authorized off-site LLW facility. It may also be designated as nonradioactive waste if it passes the Laboratory's Green Is Clean program.

A-2.5 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. The decontamination fluids will be characterized through AK of the waste materials, the levels of contamination measured in the environmental media, and, if necessary, direct sampling of the containerized waste. If directly sampled, the following analyses will be performed: VOCs, SVOCs, radionuclides, total metals, and, if needed, toxicity characteristic metals. The Laboratory expects most of these wastes to be nonhazardous liquid waste or radioactive liquid waste that will be sent to one of the Laboratory's wastewater treatment facilities whose WAC allows the waste to be received. If the liquids are hazardous or mixed waste, they will be sent off-site for treatment, if needed, and disposal.

Table A-2.0-1
Summary of Estimated IDW Generation and Management

Waste Stream	Expected Waste Type	Estimated Volume (yd^3)[a]	On-Site Management	Expected Disposition
Environmental Media	LLW	1000	Staging in piles or B-25 boxes, within the area of contamination boundaries	Reuse or treatment/disposal at authorized off-site facility
Debris	LLW Industrial waste MLLW	13,000 600 400	Accumulation in containers within the area of contamination boundaries	Treatment/disposal at an authorized off-site facility
Sludge	Transuranic waste MLLW	360	Accumulation in containers or grouted in the Plutonium Tanks within the area of contamination boundaries	Final packaging at TA-54 and disposal at Waste Isolation Pilot Plan[b]
Contact Waste	LLW	1 × 55 gal.	Accumulation in containers (e.g., 55-gal. drum/B-25 boxes) initially within the area of contamination boundaries	Disposal at TA-54 or authorized off-site facility
Decontamination fluids	LLW	<55 gal.	Accumulation in containers, (e.g., 55-gal. drums) within the area of contamination boundaries	Treatment at the Radioactive Liquid Waste Treatment Facility at TA-50

[a] Environmental media, debris and sludge are estimated in-place waste volumes.

[b] This assumes that, if necessary, the plutonium sludge will be stabilized in situ to meet U.S. Department of Transportation shipping requirements.

Appendix B

Investigation Sampling and Analysis Plan

B-1.0 INTRODUCTION

This sampling and analysis plan (SAP) addresses Material Disposal Area (MDA) A, Solid Waste Management Unit 21-014 at Technical Area 21. This SAP presents information on and describes the sampling and characterization procedures used to determine the chemical and physical nature of waste. Confirmation sampling is described in the main body of the investigation/remediation work plan (work plan). This information is being presented to support the total waste removal from trenches and central pit and removal of the plutonium tanks at MDA A. The waste analysis information contained in this SAP is used for characterization of waste generated during sampling activities. The content of the SAP follows the guidance provided in "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual" (U.S. Environmental Protection Agency, available at http://www.epa.gov/Compliance/resources/policies/civil/rcra/wasteanalygman-rpt.pdf.

To define the nature and extent of waste at MDA A, direct-push sampling locations and sampling pits will be installed to the depth of the waste. Sampling pits, rather than direct-push sampling, will be used at the central pit. The direct-push sampling and sampling pits will provide information about MDA A's overburden, waste, subsurface stratigraphy, potential migration pathways, and geotechnical data. The direct-push sampling and sampling pit locations proposed in the work plan are based on an evaluation of access limitations, safety, historic data, and other relevant information. The proposed activities will accomplish the following objectives:

- define the nature and extent of possible contamination and volatile organic compounds (VOCs) in subsurface of the disposal trenches and central pit
- vertical extent of waste in the central pit, and the two eastern trenches
- confirmation that the two vertical shafts are not contaminated

B-2.0 SCOPE OF ACTIVITIES

B-2.1 Eastern Trenches Direct-Push and Central Pit Sampling

Each sampling location will be visually logged and where soil or rock is encountered; classification will conform to American Society for Testing and Materials D 2487 (Unified Soil Classification System) or American Geological Institute Methods. Detailed logs will be completed in the field by a qualified engineer or geologist, as required by Section IX.B.2.c of the Compliance Order on Consent (Consent Order). Additional information, such as moisture or water bearing zones and any unusual or notable conditions, shall be recorded. The waste shall also be logged and recorded.

Sampling will be performed with devices appropriate for the waste being sampled. Sampling devices include, but not limited to, tiers, scoops, shovels, weighted bottles, or composite liquid waste samples and weighted bottles.

The aim of the sampling method is to obtain a sample or samples representative of the waste stream. Sampling personnel must use and have an understanding of the waste-generating and handling processes to ensure samples are representative.

Appendix A of the work plan includes the description of investigation-derived waste (IDW) handling and disposition for the characterization activities.

B-2.1.1 Surface Soil Sampling

A surface overburden soil sample will collected at least one location of each direct-push or sample pit location. Each location will be sampled at two depths. The first depth at each location will be 0 to 0.5 ft below ground surface. The second depth may vary, depending on site conditions observed at the time of sampling but will be above the overburden/waste interface. Any additional field quality assurance/quality control (QA/QC) samples (e.g., field duplicates will be collected at a minimum frequency of 10% of the total samples collected, in accordance with Section IX.C of the Consent Order).

B-2.1.2 Waste Sampling

Waste samples will be collected at a minimum of immediately below the overburden/waste interface and at approximate 5-ft intervals through the waste. Additional samples may be collected based on the visual waste characteristics. Sample material will be collected from the sample device and placed into sealed containers to preserve sample moisture. A minimum of one tuff sample from each of the locations on the sampling grid will be submitted for analyses to the on-site analytical laboratory. QA/QC samples, including field duplicates, will be collected at a minimum frequency of 10% of the total samples, collected in accordance with Section IX.C of the Consent Order.

Proposed direct-push/sampling pits locations are shown in Figures B-2.1-1 and B-2.1-2. Proposed direct-push locations were determined using the following considerations: (1) data requirements; (2) access constraints, including setback requirements and minimizing locations where equipment will need to sit atop the waste areas; (3) push rig equipment limitations; (4) geophysical anomalies identified during geophysical surveys; and (5) other factors, such as subsurface utilities.

B-2.1.3 Subsurface Sampling

Subsurface tuff and vapor samples will be collected from the predetermined sample locations at a depth of 1.0 ft below the bottom of the eastern trenches and central pit. Sample material will be collected from the sample device and placed into sealed containers to preserve sample moisture. A minimum of one tuff sample from each of the locations on the sampling grid will be submitted for analyses to the on-site analytical laboratory. QA/QC samples, including field duplicates, will be collected at a minimum frequency of 10% of the total samples, in accordance with Section IX.C of the Consent Order.

B-2.1.4 Field Screening

Traditional field-screening techniques are effective tools for determining sampling intervals. Therefore, field screening will be performed and will provide additional protection of the health and safety of the workers. Field screening may include visual examination, headspace vapor screening for VOCs, pH, and metal screening using x-ray fluorescence.

B-2.1.5 Analytical Suites

Samples will be submitted to an analytical laboratory for analyses. Based upon previous investigations, analysis will be performed for radionuclides (gamma-emitting radionuclides, americium-241, strontium-90, isotopic uranium, tritium and isotopic plutonium), target analyte list (TAL) metals, perchlorate, nitrate, cyanide, semivolatile organic compounds (SVOCs), pH, dioxin/furans, and moisture content.

Explosive compounds and polychlorinated biphenyl analyses will not be performed because there is no operational history to indicate that these materials were disposed of at MDA A, nor did the investigation report encounter these constituents in the media surrounding the waste. However, if analytical results from the MDA B investigation indicate these chemicals are present at MDA B, the MDA A analytical program will be modified.

VOC analyses will not be requested for overburden samples because historical surface soil data from the MDA A area of influence indicate that VOCs are not chemicals of potential concern in the soil surface, and low-vapor-pressure organic compounds are unlikely to have been retained in the upper soils over the last 20 yr since the MDA A cover was placed.

B-2.1.6 Vapor Samples

Pore-gas samples will be collected from all the direct-push/sample pits for field measurements of percent oxygen, organic vapors, percent carbon dioxide, and static subsurface pressure. Vapor samples will also be collected for laboratory analysis of percent moisture and VOCs. Details of the sample collection and analyses are provided in section 5.0 of the Phase II work plan.

B-2.1.7 Water Samples

If water is encountered of sufficient quantity to collect a sample during the implementation of the field investigation, it will be analyzed for perchlorate, total uranium, TAL metals, cyanide, VOCs, SVOCs, and explosive compounds. In addition, the water sample will be analyzed for pH, americium-241, isotopic plutonium, isotopic uranium, strontium-90, tritium, and gamma spectroscopy.

B-2.1.8 Investigation-Derived Waste

IDW is waste generated as a result of field investigation activities and may include, but not limited to, excavation materials; potentially contaminated personal protective equipment; sampling equipment and supplies; fluids from decontamination of sampling equipment; returned samples; and all other waste potentially coming in contact with contaminates. IDW generated during Phase II investigation at MDA A will be managed to protect human health and the environment, comply with applicable EPA and New Mexico Environment Department regulations, U.S. Department of Energy Orders, and Los Alamos National Laboratory (Laboratory) implementation requirements, and adhere to Laboratory waste-minimization goals. The management of IDW is described in Appendix A, Investigation-Derived Waste Management.

B-2.2 Plutonium Tanks Sampling

Because of the lack of tank-detailed internal structural information and to protect the health and safety of sampling personnel, the actual sampling equipment and technique will be developed after access to and visual examination of tank internals. The equipment and sampling method chosen will obtain samples representative of the waste sludge. Sampling personnel will use and understand the disposal history and visual examination of the sludge to ensure samples are representative.

B-2.3 Equipment Decontamination

Following excavation and sampling activities, all equipment used in excavation and sampling activities will be decontaminated. Residual material adhering to equipment will be removed by using dry decontamination methods, such as the use of wire brushes and scrapers, etc. If equipment cannot be free-released using dry decontamination methods, wet decontamination methods will be used. If wet decontamination is required, the equipment will be pressure-washed on a temporary decontamination pad covered with 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 the final disposition of the wastewater and effectiveness of the decontamination procedures. Equipment ready for demobilization will be surveyed by a Health and Safety Radiation Control Division technician before it is released from the area.

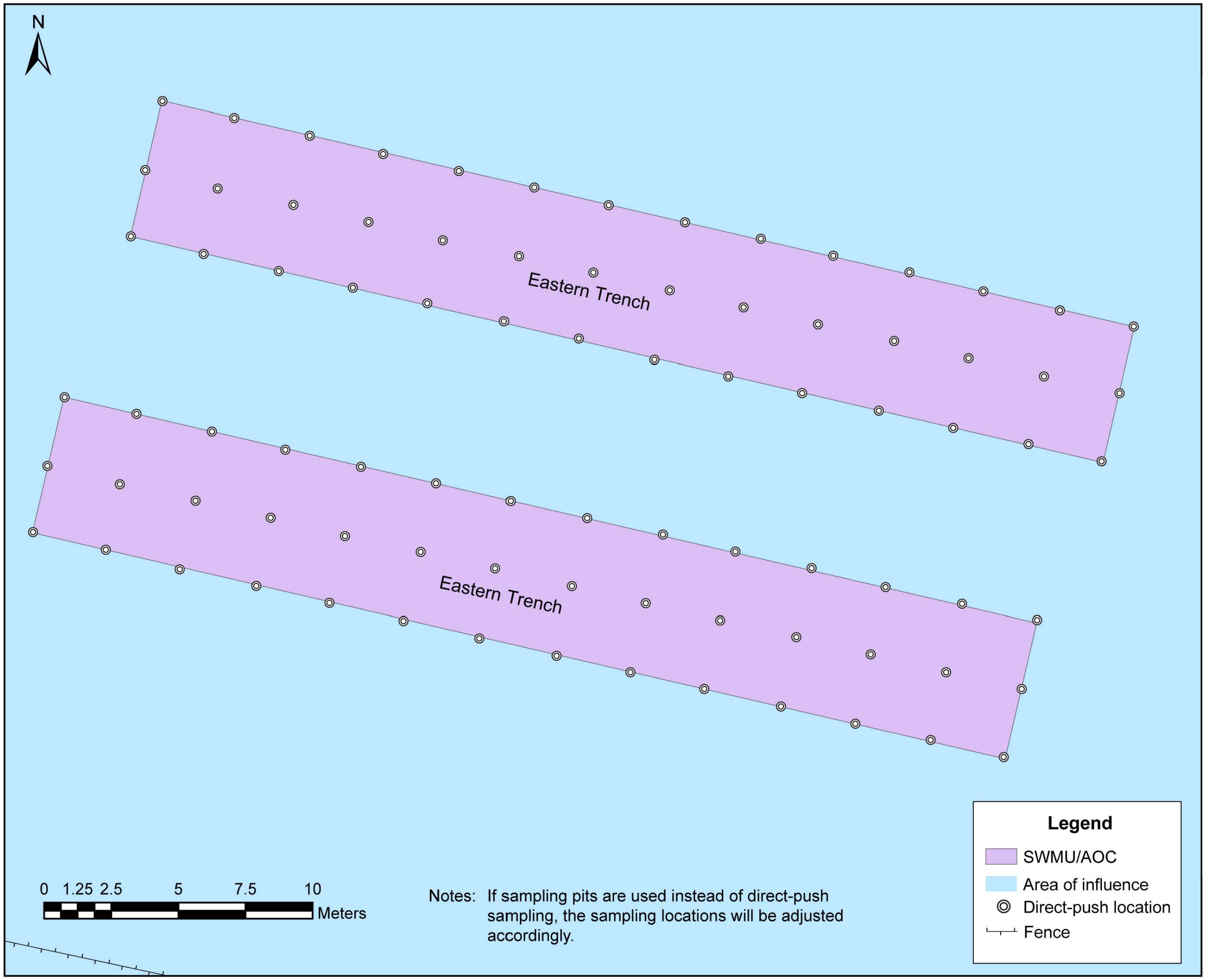

Figure B-2.1-1 Proposed direct-push sampling locations

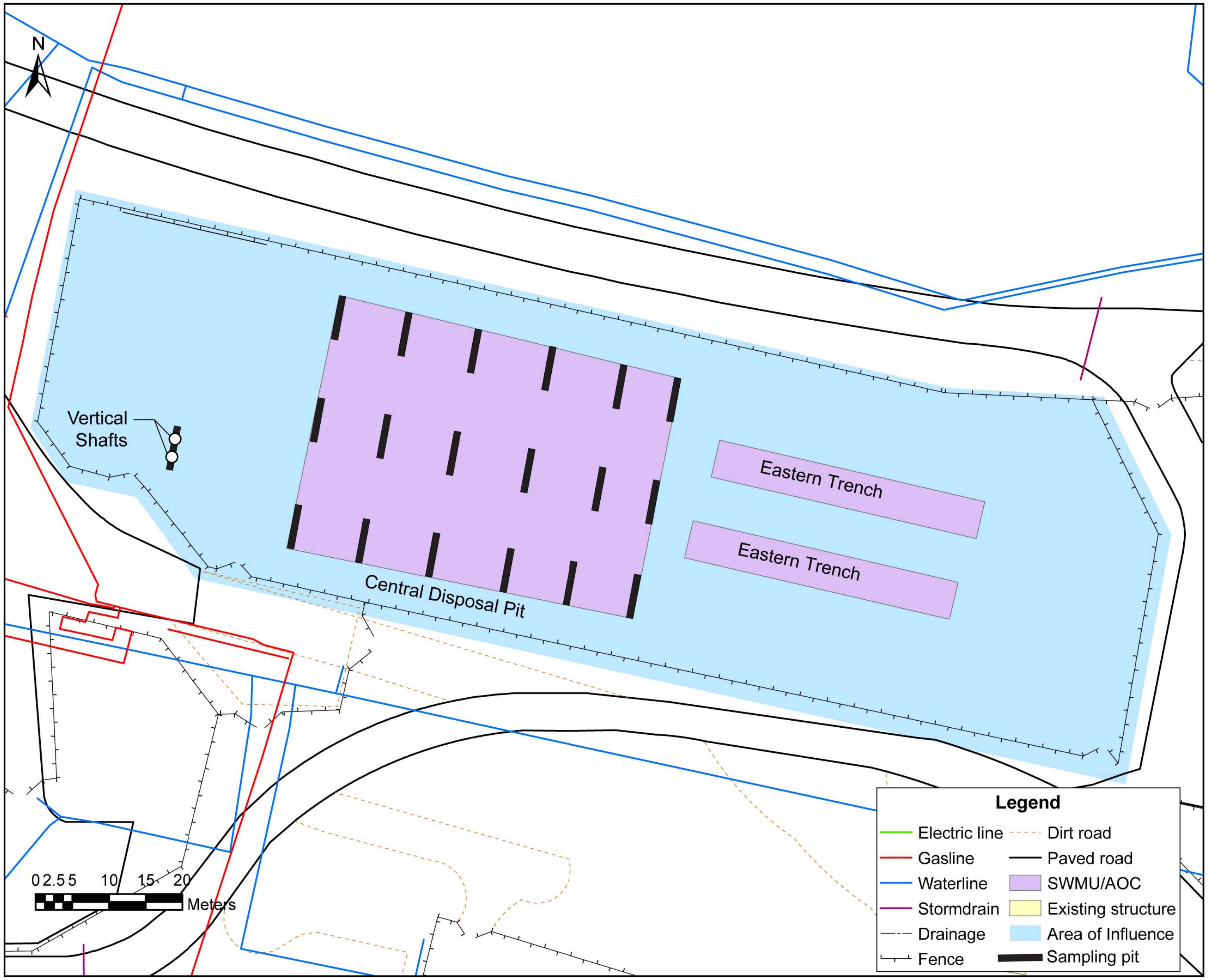

Figure B-2.1-2 Proposed sampling pit locations

MDA A Phase II Work Plan