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Supplemental Interim Measure Report for Solid Waste Management Unit 01-001(f), Revision 1

Los Alamos
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EXECUTIVE SUMMARY

This report describes supplemental interim measure activities conducted from May to September 2010 at the outfall and in the drainage downgradient of Solid Waste Management Unit (SWMU) 01-001(f) in former Technical Area 01 (TA-01) within the Upper Los Alamos Canyon Aggregate Area.

The supplemental interim measure activities were implemented within the SWMU 01-001(f) outfall and drainage areas to reduce the inventory of contaminants present and to mitigate contaminant migration to Los Alamos Canyon. Releases from SWMU 01-001(f), a former septic system, have resulted in the presence of contaminants, primarily polychlorinated biphenyls (PCBs) and radionuclides, in the SWMU 01-001(f) drainage. The supplemental interim measure activities included removal of contaminated environmental media and collection of confirmation samples from the drainage downgradient of SWMU 01-001(f); inspection of the two surface water retention and sediment deposition basins in Los Alamos Canyon below the SWMU 01-001(f) drainage; and characterization and disposal of waste generated during removal activities in accordance with applicable regulatory requirements.

During June and July 2010, 98 yd^3 of additional contaminated media were removed from three areas within the SWMU 01-001(f) outfall area and the drainage below. Following the removal activity, 13 confirmation samples were collected from the excavated areas.

All of the environmental media removed from the site was categorized as low-level radioactive waste (LLW) because of radionuclides (primarily isotopes of uranium) above background values. To date, 594 yd^3 of environmental media characterized as Toxic Substances Control Act– (TSCA-) regulated LLW and 2286 yd^3 characterized as non-TSCA LLW have been removed from the site and shipped to the EnergySolutions facility in Clive, Utah. The material removed from the site contained an estimated inventory of 112 lb (51 kg) of PCBs.

Based on the confirmation sampling data, additional removal and stabilization activities are recommended for the mesa-top portion of the site because of the accessibility of this area by the public. In addition, installation of controls to divert run-on away from the SWMU 01-001(f) outfall and stabilize the hillside drainage portion of the site is recommended to further reduce contaminant migration. Lastly, performance of a risk assessment for the hillside drainage portion of the site is recommended as part of the Phase II investigation for Upper Los Alamos Canyon Aggregate Area to determine what additional activities, if any, are needed.

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Acronyms and Abbreviations

AOC	area of concern
ARS	American Radiation Services
BMP	best management practice
COC	chain of custody
Consent Order	Compliance Order on Consent
DOE	Department of Energy (U.S.)
DGPS	differential global-positioning system
EP	Environmental Programs Directorate
EPA	Environmental Protection Agency (U.S.)
FD	field duplicate (sample)
FFCA	Federal Facility Compliance Agreement
FR	field rinsate (sample)
GPS	global-positioning system
IA	Information Architecture
IDW	investigation-derived waste
IM	interim measure(s)
LA-SMA	Los Alamos Site Monitoring Area
LANL	Los Alamos National Laboratory
LLW	low-level radioactive waste
MI	multi-incremental (MULTI INCREMENT)
NMED	New Mexico Environment Department

PCB	polychlorinated biphenyl
RCT	radiation control technician
RP	Radiation Protection (Division)
RPF	Records Processing Facility
SMA	site monitoring area
SMO	Sample Management Office
SOP	standard operating procedure
SSL	soil screening level
SWMU	solid waste management unit
TA	technical area
TSCA	Toxic Substances Control Act

1.0 INTRODUCTION

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

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

This report describes supplemental interim measure activities conducted in the outfall area of SWMU 01-001(f) and in the drainage downgradient of SWMU 01-001(f) in former Technical Area 01 (TA-01) within the Upper Los Alamos Canyon Aggregate Area. SWMU 01-001(f) is contaminated with hazardous chemicals and radionuclides. Corrective actions at the Laboratory are subject to a Compliance Order on Consent (the Consent Order). Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with DOE policy.

1.1 Location of Supplemental Interim Measure Activities

The supplemental interim measure activities described in this report were implemented at the former outfall location and within the drainage downgradient of the SWMU 01-001(f) outfall within the Upper Los Alamos Canyon Aggregate Area. These activities are a continuation of interim measure activities undertaken from October 2009 to March 2010 (LANL 2010, 109422). Figure 1.1-1 shows the location of Upper Los Alamos Canyon Aggregate Area with respect to the Laboratory and surrounding land holdings. Figure 1.1-2 shows the location of SWMU 01-001(f) and the drainage area where the supplemental interim measure activities were performed.

1.2 Purpose of Supplemental Interim Measure Activities

The objectives of the interim measure implemented within the SWMU 01-001(f) outfall area and drainage were to decrease the polychlorinated biphenyl (PCB) inventory and control contaminant migration to minimize risk while long-term corrective measures are identified and implemented. The specific activities identified for the supplemental interim measure were the removal of weathered tuff and residual soil where confirmation sampling results from the initial interim measure activities exceeded recreational soil screening levels (SSLs) for PCBs, as reported in the interim measure report submitted to NMED in May 2010 (LANL 2010, 109422). Releases from SWMU 01-001(f), a former septic system, resulted in the presence of contaminants, primarily PCBs and radionuclides, in the outfall area and drainage below the outfall. Interim measure activities implemented at the site in late 2009 and early 2010 are described in the May 2010 interim measure report (LANL 2010, 109422).

1.3 Report Overview

This supplemental interim measure report describes activities performed in the SWMU 01-001(f) outfall area and in the drainage downgradient of SWMU 01-001(f) since submittal of the original interim measure report (i.e., after May 1, 2010) and provides confirmation sampling results from these activities. Section 2 presents background information on the site, including a brief site description, operational history, summary of the types of waste historically present at the site, and a brief summary of previous investigations. Section 3 describes the regulatory context and criteria for the interim measure activities. Section 4 provides a description of supplemental interim measure activities implemented based on the results presented in the interim measure report (LANL 2010, 109422); confirmation sampling results; and waste management. Section 5 presents the results of the supplemental interim measure activities implemented from May to September 2010. Section 6 presents conclusions and recommendations for additional work, and section 7 includes the proposed schedule for additional work. Section 8 lists the references cited in this report and the map data sources. Appendix A presents photographs taken during the implementation of supplemental interim measure activities. Appendix B presents field methods. Appendix C (on DVD) provides copies of the field forms. Appendix D (on DVD) contains sample collection logs, analytical data, data packages, data validation reports, and chain-of-custody forms. Appendix E (on DVD) provides copies of waste management documents, disposal records, and waste-tracking tables.

2.0 BACKGROUND

2.1 Site Description and Operational History

SWMU 01-001(f) is the former location of septic tank 140 (former structure 01-140), its associated inlet and outlet drainlines, and outfall in former TA-01 (Figure 1.1-2). The septic system outfall discharged into Los Alamos Canyon to an area later designated as Hillside 140 (LANL 2001, 069946, p. 36), which is situated in TA-43 downslope from former TA-01. Heat-treating and machining of natural and enriched uranium was conducted in the former buildings tied to the former septic system. The heat treatment and machining operations likely resulted in discharges of radioactive waste to the tank and outfall (Buckland 1964, 004810; Ahlquist et al. 1977, 005710, p. 39), and the machining operations were likely the source of the PCBs found in the SWMU 01-001(f) outfall and drainage below. The septic system ceased to be used in 1965 and the tank was removed in 1975 (Ahlquist et al. 1977, 005710, p. 39).

2.2 Description of Waste

An unknown volume of wastewater was discharged to septic tank 140 from former buildings HT and FP from 1945 to 1965. From 1974 to 1975, septic tank 140 was found to be filled with sludge with 60,000 counts per minute of uranium activity, and both inlet and outlet lines were found to be contaminated along with surrounding soil (Ahlquist et al. 1977, 005710, p. 111). Solvents and machining oil possibly contaminated with PCBs were potentially discharged to the septic system from former building HT, although the use of these compounds was not documented in historical records. Based on the investigation conducted at SWMU 01-001(f) in 2008, chemicals of potential concern include PCBs, volatile organic compounds, semivolatile organic compounds, inorganic chemicals, and radionuclides (LANL 2010, 108528).

2.3 Previous Investigation and Remediation Activities

Previous investigation and remediation activities conducted at SWMU 01-001(f) and the chronology of recent regulatory communications between NMED and the Laboratory regarding SWMU 01-001(f) were presented in the May 2010 interim measure report (LANL 2010, 109422).

NMED approved the Laboratory's extension request for completing removal of PCB-contaminated soil (NMED 2010, 109035) and required the Laboratory to submit a report summarizing all activities conducted from October 2009 through May 2010 at SWMU 01-001(f) by May 1, 2010 (LANL 2010, 109422). NMED directed the Laboratory to submit this supplemental report documenting completion of required removal of PCB-contaminated soils from the SWMU 01-001(f) drainage by October 1, 2010 (NMED 2010, 109035).

3.0 REGULATORY CONTEXT AND CRITERIA

The work described in this report is part of the interim actions being performed by the Laboratory, pursuant to the Consent Order, to mitigate contaminated sediment transport in Los Alamos Canyon. These actions were directed by NMED's August 2007 approval with directions for the Los Alamos and Pueblo Canyons supplemental investigation report (NMED 2007, 098284). The work described in section 4.0 of this report was conducted pursuant to an interim measure plan prepared by the Laboratory in November 2008 (LANL 2008, 104020) and approved with modifications by NMED on May 5, 2009 (NMED 2009, 105858).

As described in Section VII.B.1 of the Consent Order, interim measures are performed to reduce or prevent migration of contaminants while long-term corrective action remedies are evaluated and implemented. Therefore, the actions described in this report are not final corrective measures and are not intended to meet cleanup levels or other criteria that would result in corrective action complete status. The specific requirements for the interim measure are contained in the approval with modifications (NMED 2009, 105858), and activities implemented between October 2009 and March 2010 to meet those requirements were presented in the May 2010 interim measure report (LANL 2010, 109422).

SWMU 01-001(f) is also regulated under the Consent Order as part of the Upper Los Alamos Canyon Aggregate Area and was included in the investigation of the aggregate area. In addition to PCB contamination, the Upper Los Alamos Canyon Aggregate Area investigation report indicated that the extent of cadmium, copper, chromium, nickel, methylene chloride, plutonium-239/240, uranium-238, and polycyclic aromatic hydrocarbons had not been defined at SWMU 01-001(f) (LANL 2010, 108528). Additional investigations to define nature and extent of contamination at this site will be included in a Phase II investigation work plan.

In addition, SWMU 01-001(f) is regulated under the Laboratory's individual National Pollutant Discharge Elimination System permit for stormwater discharges from SWMUs and AOCs (individual permit). Under the individual permit, the Laboratory is required to implement best management practices (BMPs) and monitor stormwater discharges from SWMU 01-001(f). Additional corrective actions may be needed if concentrations of contaminants in stormwater discharges exceed target action levels. To date, the individual permit has not required additional corrective actions at SWMU 01-001(f). Stormwater monitoring for SWMU 01-001(f) is conducted at site monitoring area (SMA) LA-SMA-2.1, which is located below SWMU 01-001(f) (Figure 1.1-2).

4.0 SUPPLEMENTAL INTERIM MEASURE ACTIVITIES

4.1 Supplemental Removal Activities

4.1.1 Contaminated Sediment, Soil, and Rock Removal Activities

The supplemental removal of additional contaminated sediment, soil, and tuff resumed within the SWMU 01-001(f) outfall area and drainage below on June 21, 2010, and was deemed complete on

July 13, 2010. Because residual PCB concentrations within the SWMU 01-001(f) outfall area and drainage were established by the confirmation sampling data presented in the May 2010 report, field screening and expedited analyses for PCBs were not used during the supplemental removal and confirmation sampling described in this report. Air hammers and hand-digging methods were used to remove a total of 98 yd^3 of contaminated soil, sediment, and tuff from the SWMU 01-001(f) outfall area and from two additional areas within the drainage channel below SWMU 01-001(f) (Appendix A and Figure 4.1-1). Contaminated soil, sediment, and tuff were excavated in the areas of previous confirmation sampling locations LA-609812, LA-609813, LA-609814, LA-609817, LA-611165, LA-611166, LA-611167, LA-611168, LA-611169, LA-611170, LA-611171, LA-611172, LA-611173, LA-611174, and LA-611178 (LANL 2010, 109422). Contaminated media were removed from the drainage using wrangler bags and zip lines (Appendixes A and C). A total of 2880 yd^3 of material containing an estimated 112 lb (51 kg) of PCBs has been removed from SWMU 01-001(f) and the associated drainage system during interim measure activities conducted in 2009 and 2010 (Appendix E).

4.1.2 Supplemental Confirmation Sampling

The supplemental confirmation sampling approach for the excavated areas in the SWMU 01-001(f) outfall area and hillside drainage was based on MULTI INCREMENT (MI) sampling (State of Alaska DEC 2009, 110573). MI sampling differs from grid sampling in that samples are collected to fully characterize the mean concentration of a predetermined area called a decision unit. The analytical result from a MI sample collected from a discrete decision unit represents the concentration of the contaminant throughout the entire decision unit, not the contaminant concentration at a single point. This approach was used to get a more representative evaluation of the PCB concentrations remaining in the larger excavation areas near the top of the drainage.

The MI sampling approach was followed for the collection of supplemental confirmation samples from three distinct excavated areas within the SWMU 01-001(f) outfall area and hillside drainage (Figure 4.1-1). This approach involved the collection of one MI sample from a decision unit covering 100 ft^2 (or less) (NMED 2009, 105858). Decision unit boundaries and dimensions were determined before MI confirmation sampling. The perimeters of the three excavated areas were delineated by pin flags, the dimension of each excavated area was measured, and the approximate square footage was calculated. Next, each of the excavated areas was divided into approximately 100 ft^2 decision units, giving each of the decision units a distinct boundary for MI confirmation sampling.

Area 1 is located above the upper cliffs below the Ridge Park Condominiums within the SWMU 01-001(f) outfall area and is approximately 400 ft^2. Area 2 is located downslope below the upper cliffs and covers approximately 760 ft^2. Area 3 is located approximately 50 linear feet down the drainage from Area 2 and covers approximately 50 ft^2. The total area excavated during June and July of 2010 is approximately 1210 ft^2 and falls within the footprint of areas previously excavated during November 2009 to February 2010. The depth of the additional areas excavated in June and July 2010 averaged a little more than 2 ft.

Based on the estimated square footage, 13 decision units were established within the 3 excavated areas. Area 1 was divided into four decision units, Area 2 was divided into eight decision units, and Area 3 was one distinct decision unit.

The MI confirmation sampling was conducted in accordance with Standard Operating Procedure (SOP) 0609, Spade and Scoop Method for Collection of Soil Samples (Appendix B). MI confirmation samples were collected from a 0- to 0.5-ft depth interval at the bottom of the excavation. The MI confirmation sample “top depth” was the distance measured from the original ground surface to the current surface at the bottom of the excavation. The MI confirmation sample “bottom depth” was the distance measured from the original ground surface to the total depth where the MI confirmation sample was collected.

A total of 13 MI confirmation samples were collected, one from each discrete decision unit. Within each decision unit, 25 increments were collected by stainless-steel scoop throughout the entire footprint of the decision unit and combined in a stainless-steel bowl into a single sample. The entire sample volume was homogenized and then containerized and submitted for fixed-laboratory analysis. The material being sampled was generally less than 1 mm in size with some pumice fragments up to 5 mm in size. No larger rocks or other material, which may not be volumetrically contaminated with PCBs and could potentially dilute the results, was present in the samples. Therefore, the samples were not sieved before they were sent to the analytical laboratory.

Quality control samples were collected and include one field duplicate (FD) sample, to evaluate the reproducibility of the sampling technique, and one field rinsate (FR) sample, to evaluate the effectiveness of decontamination procedures in the field. FD and FR samples were collected at a frequency of 1 for every 13 MI confirmation samples. No triplicate samples were collected.

All confirmation samples were field screened for gross alpha and beta/gamma radiation and submitted for off-site laboratory analysis of PCBs by U.S. Environmental Protection Agency (EPA) Method SW-846:8082. MI confirmation sampling locations are shown in Figure 4.1-1. Confirmation sampling locations, sample depth intervals, and analyses requested are provided in Table 4.1-1. Confirmation sampling results are discussed in section 5.1 and presented on Plate 1. The expedited PCB screening analyses used to help guide PCB removal activities implemented in late 2009 and early 2010, as reported in the May 2010 interim measure report (LANL 2010, 109422), were not used during supplemental removal and confirmation sampling activities implemented in June and July 2010. The expedited screening analyses, which used a more simplified solvent extraction technique than the standard analytical method, tended to bias results low. While useful for quickly identifying areas with high levels of contamination requiring removal, it is not appropriate for confirmatory analyses.

4.2 Surface Water Retention Basins

The surface water retention basins constructed in late 2009 and early 2010 were designed to balance retention volume with site constraints (LANL 2010, 109422). An important part of the interim measure design was an enhanced control measure consisting of a riparian vegetation zone that was planted in March 2010 between the lower, eastern basin and the downstream culvert to approximate preconstruction drainage conditions. This enhanced control measure, which consists of willows, native grasses, and cattails, is anticipated to provide additional polishing of stormwater runoff from the site and has taken root (Appendix A). To date, the retention basins have functioned as designed. Between May 9 and July 26, 2010, stormwater runoff entering the basins was insufficient to flow through both basins and discharge to the riparian vegetation zone from the discharge pipe (Appendix A). Stormwater runoff was collected primarily in the upper basin, while shallow groundwater infiltrated the lower basin. Precipitation events that occurred between July 22 and July 25, 2010, resulted in the first discharge of stormwater from the lower basin into the riparian zone and into the Los Alamos stream channel (Appendix A). Significant precipitation events in Los Alamos County on August 15 and 16, 2010, each resulted in more than 1 in. of rainfall in areas upgradient of and around the retention basins. On Monday August 16, 2010, stormwater flowed through the spillway at a depth of approximately 6 to 8 in. (Appendix A). The culvert in the lower pond was underwater, and water in the lower pond came within approximately 1 ft of topping the berm. The water level in the stream channel east of the lower basin was above the discharge culvert, causing water to fill the riparian zone (Appendix A). The basins and riparian zone remained intact, and sediment migration from the SWMU 01-001(f) drainage was mitigated by the retention basins.

4.3 Monitoring

Monitoring of the site is conducted in accordance with the individual permit and in coordination with Consent Order activities. Monitoring results are reported under the individual permit in semiannual status reports and annual discharge monitoring reports. Under the Consent Order, discharges from the retention basins will be monitored as part of the Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project (monitoring plan) (LANL 2009, 107457). Per the approval with modifications for this plan, discharges from the retention basins are monitored at location c0101037, at the outlet of the culvert in the eastern berm (Appendix A and Plate 1) (NMED 2010, 108444). Monitoring results will be reported in annual monitoring reports to be submitted by February 28 each year, beginning on February 28, 2011. The monitoring plan will be updated on an annual basis, and it is anticipated that monitoring may be moved to the downgradient end of the riparian vegetation zone described in section 4.2 once vegetation has become fully established. Monitoring locations may also be adjusted or added in the future to evaluate the performance of the interim measure.

Three stormwater grab samples were collected from the retention basins on July 26, 2010, following three days of rain (Appendix A). The PCB concentrations in the grab samples decreased from 15.1 µg/L at the culvert intake in the upper basin to 1.01 µg/L at the culvert intake in the lower basin and to 0.545 µg/L in the riparian zone below the lower basin. These results were reported in Stormwater Performance Monitoring in the Los Alamos/Pueblo Watershed During 2010 (LANL 2011, 111808).

4.4 Waste Management

Waste generated during supplemental cleanup efforts at SWMU 01-001(f) included PCB-contaminated soil, sediment, and rock; and contact waste including vacuum hoses used to remove contaminated media from the drainage.

The contaminated environmental waste was categorized as Toxic Substances Control Act– (TSCA-) regulated (greater than 50 mg/kg PCBs) and non-TSCA (less than 50 mg/kg PCBs). All of the environmental media removed from the site were categorized as low-level radioactive waste (LLW) because of radionuclides (primarily isotopes of uranium) above background values. Approximately 127 yd^3 of TSCA LLW, including contact waste, was generated as a result of additional removal activities conducted between June 21 and July 21, 2010. Contact waste was managed in accordance with the materials it came into contact with (i.e., TSCA LLW) and disposed of with the PCB-contaminated soil, sediment, and rock.

Soil and sediment excavated from the canyon bottom during the interim measure and staged at TA-41 was loaded into wrangler bags for shipment to EnergySolutions in Clive, Utah, beginning on May 12, 2010, after the restart of operations following the threatened and endangered species shutdown in March 2010. Waste packaging and shipping continued until August 14, 2010, when the final waste containers were shipped from the site (Appendixes C and E).

To date, 594 yd^3 of environmental media characterized as TSCA LLW and 2286 yd^3 characterized as non-TSCA LLW have been removed from the site and shipped to the EnergySolutions facility in Clive, Utah. All available waste documentation is presented in Appendix E.

5.0 SUPPLEMENTAL INTERIM MEASURE RESULTS

5.1 Confirmation of Supplemental Source Removal

Data from the supplemental confirmation samples collected on July 22, 2010, are presented in Table 5.1-1 and on Plate 1. Appendix D (on DVD) provides the analytical data, data packages, and data validation reports. Although Table 5.1-1 shows that Aroclor-1254 and Aroclor-1260 were the only Aroclors detected, review of the analytical data in Appendix D indicates that there were a number of instances where detection limits for other Aroclors were greater than cleanup levels. These elevated detection limits were associated with the analytical sample dilution needed because of high concentrations of Aroclor-1254 and/or Aroclor-1260. In no cases were there high detection limits for some Aroclors without at least one other Aroclor being detected at high concentrations. Therefore, although some Aroclors above cleanup levels may not have been quantified in all samples, the results were acceptable for identifying all locations requiring removal. Elevated detection limits were not an issue with the supplemental confirmation data set because samples were less contaminated and high sample dilution was not needed.

Sampling data for the 13 confirmation samples collected on July 22, 2010, show PCB concentrations above target cleanup levels (i.e., recreational SSLs). Aroclor-1254 was detected above the recreational SSL (6.65 mg/kg) in 9 of the 13 confirmation samples, and Aroclor-1260 was also detected above the recreational SSL (10.5 mg/kg) in 3 of the 9 samples. The combined concentrations of Aroclor-1254 and Aroclor-1260 in these nine samples are 1.3 to 10.7 times higher than recreational SSLs.

As described in section 3.0, the interim measure is not intended as a final remedy for the site and recreational SSLs are used to guide cleanup based on expected land use. Although PCB concentrations above recreational SSLs remain in some locations of the SWMU 01-001(f) outfall area and drainage, the interim measure has resulted in the reduction of PCB concentrations in soil, sediment, and tuff at and below SWMU 01-001(f). The 95% upper confidence limit (UCL) of the mean for Aroclor-1254 calculated using EPA's ProUCL software decreased from 46.0 mg/kg before the start of cleanup activities to 8.49 mg/kg following the supplemental interim measure activities. The "before" value was calculated using the characterization data presented for SWMU 01-001(f) in the Investigation Report for Upper Los Alamos Canyon, Revision 1 (LANL 2010, 108528); the "after" value was calculated using the confirmation data presented in this supplemental interim measure report.

Additional activities proposed to complete corrective actions at the site are discussed in section 6.0.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Implementation of the interim measures achieved the desired objectives of reducing the contaminant inventory in the drainage system below SWMU 01-001(f) and controlling contaminant migration. Recommendations for additional actions are associated with long-term controls for the site.

Additional removal and stabilization activities are recommended for the mesa-top portion of the site because of the accessibility of this area by the public. To assist in planning for these efforts, vertical-profile sampling is recommended around the area of the current excavation (Area 1 in Figure 4.1-1) to verify the volume of additional material to be removed and to define the lateral and vertical extent of PCBs. Final confirmation sampling will be performed, as necessary, to ensure decision-level data have been collected for every 100 ft^2 of excavated area.

To further control migration of residual contamination at the site, it is recommended that run-on be diverted from the outfall area and hillside drainage portions of the site and that additional stabilization measures be implemented within the hillside drainage. These activities will be coordinated with installation of BMPs and other controls under the individual permit. To date, the individual permit has not required the installation of run-on controls or monitoring at the top of the SWMU 01-001(f) drainage.

To evaluate the potential need for further cleanup activities within the hillside drainage portion of the site, a risk assessment is recommended for this area. This risk assessment would evaluate the risk associated with current and potential future use of the site. It is recommended that this risk assessment be performed as part of the Phase II investigation for Upper Los Alamos Canyon Aggregate Area and that any additional cleanup activities be implemented as part of corrective measures for the aggregate area. The Phase II investigation will also address the determination of the nature and extent of contamination at SWMU 01-001(f), including at the former location of the SWMU 01-001(f) septic system.

Finally, it is recommended that monitoring be performed below the riparian vegetation zone. These monitoring results would be used to evaluate the effectiveness of the retention ponds and the riparian vegetation zone in controlling migration of contaminants in Los Alamos Canyon.

7.0 SCHEDULE FOR ADDITIONAL WORK

Additional sampling and cleanup of the mesa-top area would be implemented in advance of the Phase II investigation for Upper Los Alamos Canyon Aggregate Area to expedite final cleanup of this area. Actions for the hillside drainage would be integrated into the schedules for the Phase II investigation and implementation of individual permit requirements.

8.0 REFERENCES AND MAP DATA SOURCES

8.1 References

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

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

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NMED (New Mexico Environment Department), May 5, 2009. "Approval with Modifications, Los Alamos Site Monitoring Area 2 (LA-SMA-2) Interim Measure and Monitoring Plan to Mitigate Contaminated Sediment Transport in Los Alamos Canyon," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2009, 105858)

NMED (New Mexico Environment Department), December 2009. "Technical Background Document for Development of Soil Screening Levels, Revision 5.0," with revised Table A-1, New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2009, 108070)

NMED (New Mexico Environment Department), January 11, 2010. "Approval with Modifications, Los Alamos and Pueblo Canyons Sediment Transport Monitoring Plan," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 108444)

NMED (New Mexico Environment Department), March 8, 2010. "Approval of Extension Request, Removal of Polychlorinated Biphenyls (PCBs), Los Alamos Site Monitoring Area 2 (LA-SMA-2)," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 109035)

State of Alaska DEC (State of Alaska Department of Environmental Conservation), March 2009. "Draft Guidance on Multi Increment Soil Sampling," State of Alaska Department of Environmental Conservation, Division of Spill Prevention and Response Contaminated Sites Program, Juneau, Alaska. (State of Alaska DEC 2009, 110573)

8.2 Map Data Sources

Former Structures of the Los Alamos Site, Line Feature Representation; Los Alamos National Laboratory, Environment and Remediation Support Services Division, EP2010-0170; 1:2,500 Scale Data; 09 April 2010.

Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, 2010-0A; 1:2,500 Scale Data; 09 April 2010.

Potential Release Sites; Los Alamos National Laboratory, Waste and Environmental Services Division, Environmental Data and Analysis Group, EP2009-0633; 1:2,500 Scale Data; 25 January 2010.

Orthophotography, 2008 Los Alamos National Laboratory Aerial Photography, Site Planning and Project Initiation Group, February 2009.

Former FFCA sampler, Current sampler, FFCA drainage area, Expanded drainage area; Unpublished 2009 data, Project 09-0004. Contains GPS locations, planned locations, field verified drainages, modeled expanded drainages. Los Alamos National Laboratory, ADEP-CAP Storm Water Program

LA Canyon berm/basin contour data; CAD export from Brown and Caldwell.

Watercourse; Los Alamos National Laboratory, ENV Water Quality & Hydrology Group; 05 April 2005.

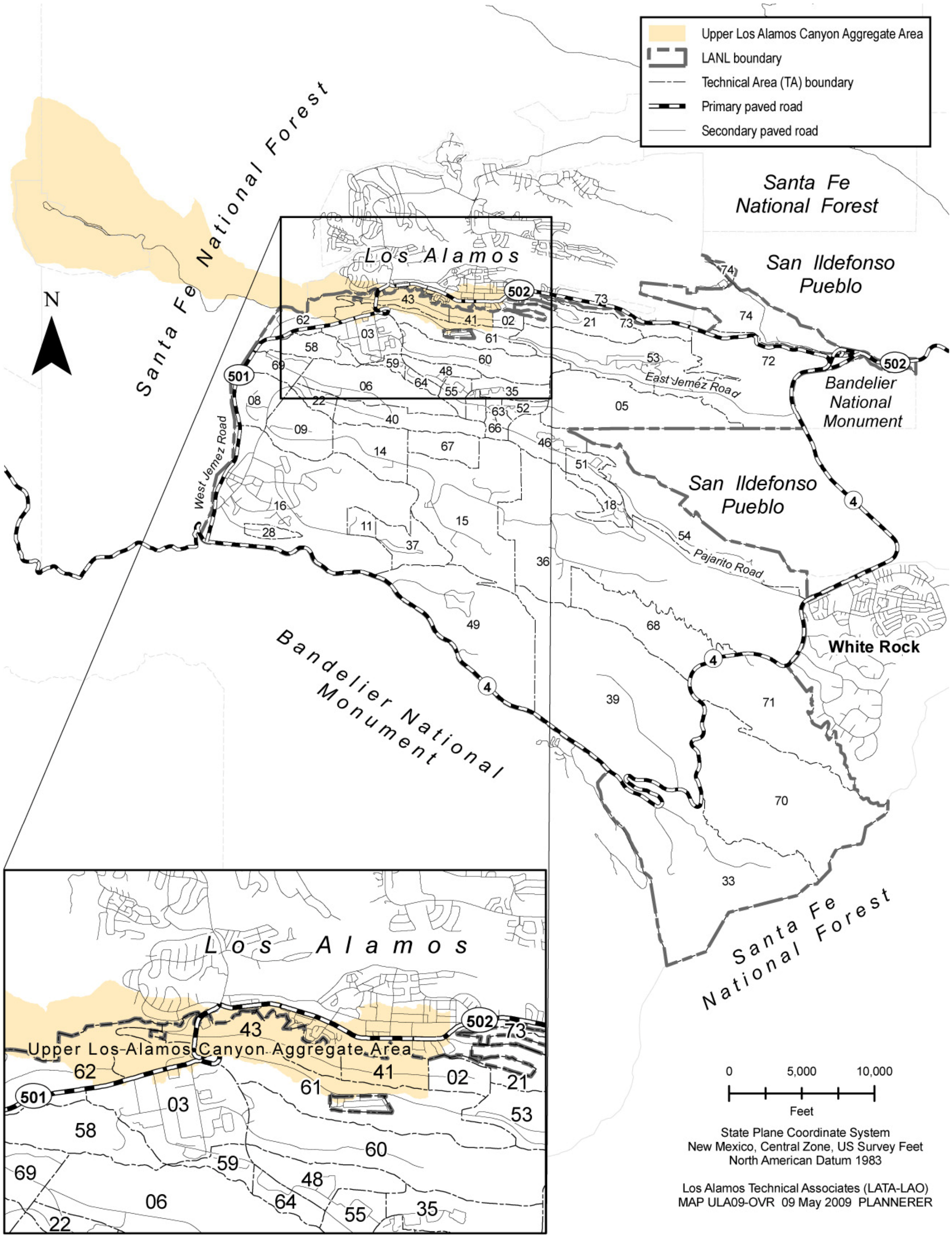


Figure 1.1-1 Location of Upper Los Alamos Canyon Aggregate Area and surrounding technical areas

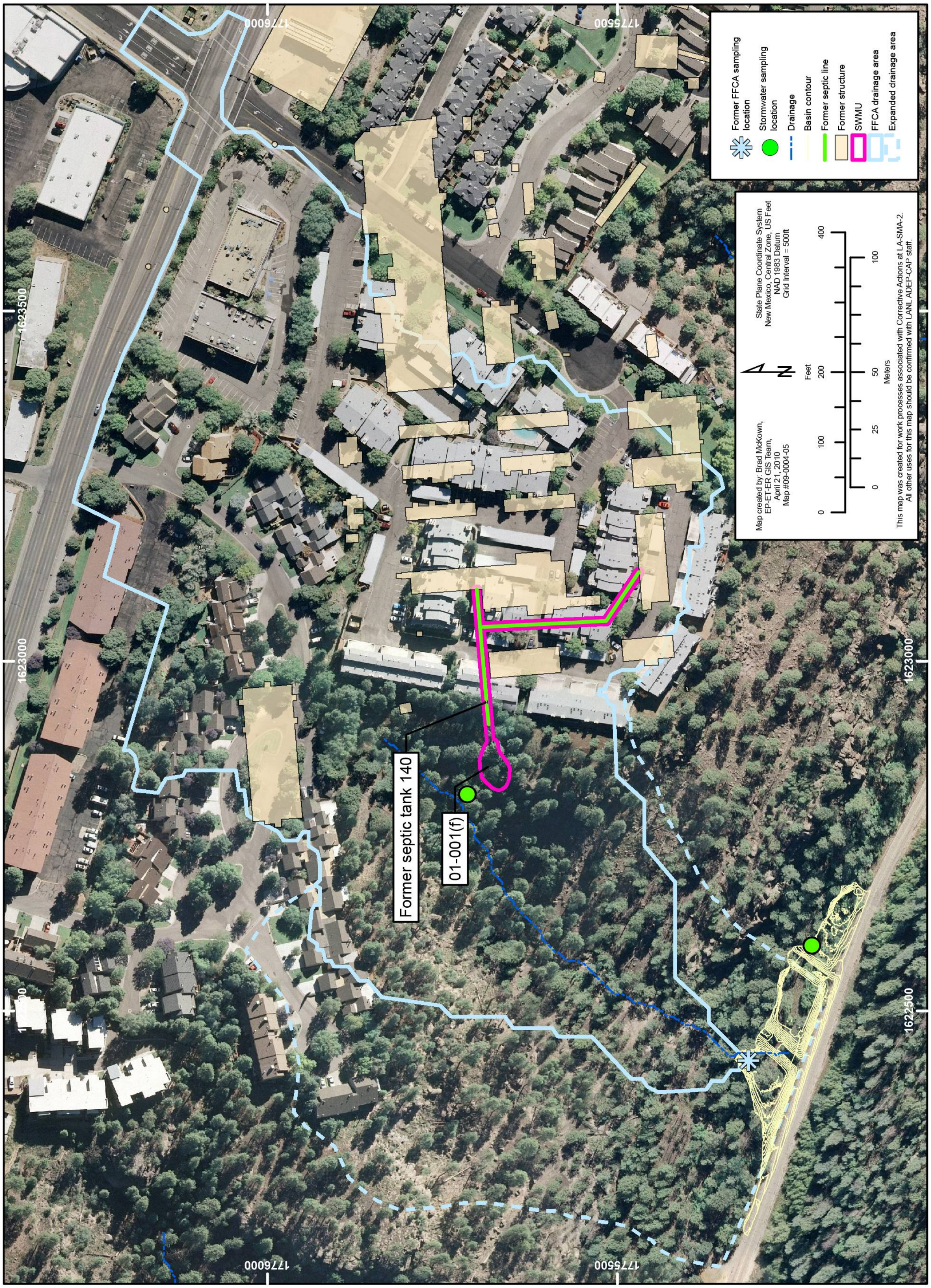


Figure 1.1-2 Location of SWMU 01-001(f), associated outfall and drainage

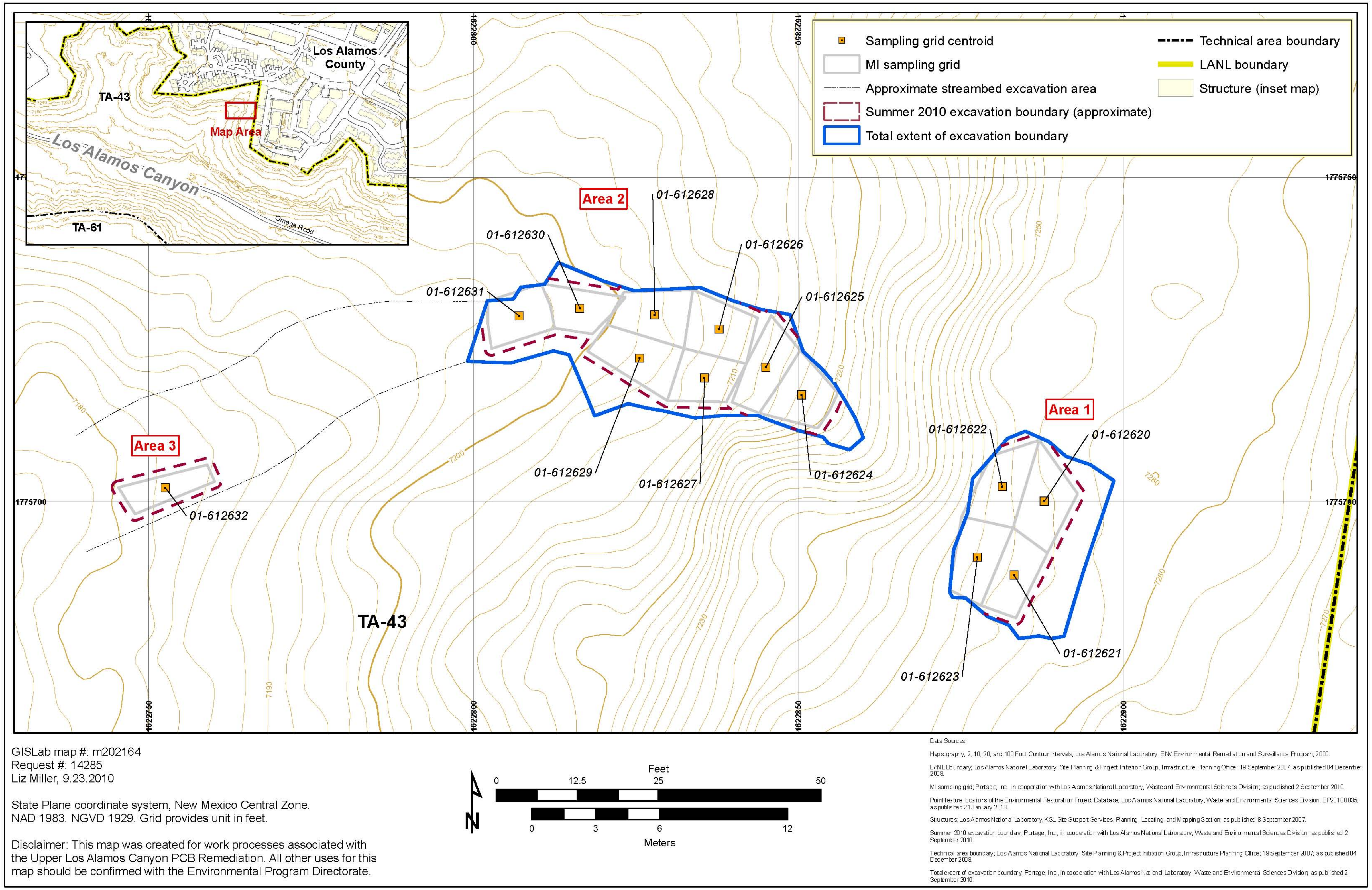


Figure 4.1-1 Areas excavated during supplemental interim measure activities at SWMU 01-001(f) outfall and drainage and corresponding confirmation sampling locations

Table 4.1-1
Samples Collected and Analysis Requested at SWMU 01-001(f)

Sample ID	Location ID	Depth (ft)	Media	PCB*
RE00-08-16146	00-603830	0–1.25	SED	09-242
RE00-08-16147	00-603830	1.25–3.25	QBT3	09-242
RE00-08-16150	00-603832	0–1.25	SED	09-236
RE00-08-16151	00-603832	1.25–2.5	QBT3	09-236
RE00-08-16152	00-603833	0–1	SED	09-236
RE00-08-16153	00-603833	1–2	QBT3	09-236
RE00-08-16154	00-603834	0–1	SED	09-236
RE00-08-16155	00-603834	1.25–2.25	QBT3	09-236
RE00-08-16156	00-603835	0–1	SED	09-236
RE00-08-16157	00-603835	1–2	QBT3	09-236
RE00-08-16158	00-603836	0–1	SED	09-220
RE00-08-16159	00-603836	1.75–2.75	QBT3	09-220
RE01-10-5536	01-609991	0–0.04	SED	10-525
RE01-10-5537	01-609992	0–5.25	SED	10-525
RE01-10-5538	01-609993	0–2	SED	10-525
RE01-10-5539	01-609994	0–1.41	QAL	10-525
RE01-10-5540	01-609995	0–4.13	SED	10-525
RE01-10-11576	01-611286	0–0.25	SOIL	10-1307
RE01-10-11577	01-611287	0–0.25	SOIL	10-1307
RE01-10-11578	01-611288	0–0.25	SOIL	10-1307
RE01-10-11579	01-611289	0–0.25	SOIL	10-1307
RE01-10-11580	01-611290	0–0.25	SOIL	10-1307
RE01-10-11581	01-611291	0–0.25	SOIL	10-1307
RE01-10-11582	01-611292	0–0.25	SOIL	10-1307
RE01-10-11583	01-611293	0–0.25	SOIL	10-1307
RE01-10-11584	01-611294	0–0.25	SOIL	10-1307
RE01-10-11585	01-611295	0–0.25	SOIL	10-1307
RE01-10-11586	01-611296	0–0.25	SOIL	10-1307
RE01-10-11587	01-611297	0–0.25	SOIL	10-1307
CALA-10-9847	LA-610960	0–0.25	SED	10-1064
CALA-10-9848	LA-610961	0–0.25	SED	10-1064
CALA-10-9849	LA-610962	0–0.25	SED	10-1064
CALA-10-9850	LA-610963	0–0.25	SED	10-1064
CALA-10-9851	LA-610964	0–0.25	SED	10-1064
CALA-10-9852	LA-610965	0–0.25	SED	10-1064
CALA-10-9853	LA-610966	0–0.25	SED	10-1064
CALA-10-9854	LA-610967	0–0.25	SED	10-1064
CALA-10-9855	LA-610968	0–0.25	SED	10-1064
CALA-10-9856	LA-610969	0–0.25	SED	10-1064

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	PCB*
CALA-10-9857	LA-610970	0–0.25	SED	10-1064
CALA-10-9858	LA-610971	0–0.25	SED	10-1064
CALA-10-9859	LA-610972	0–0.25	SED	10-1064
CALA-10-9860	LA-610973	0–0.25	SED	10-1064
CALA-10-9862	LA-610975	0–0.25	SED	10-1064
CALA-10-9863	LA-610976	0–0.25	SED	10-1064
CALA-10-9864	LA-610977	0–0.25	SED	10-1064
CALA-10-9866	LA-610979	0–0.25	SED	10-1064
CALA-10-11201	LA-611127	0–1	SOIL	10-1308
CALA-10-11202	LA-611128	0–1	SOIL	10-1308
CALA-10-11203	LA-611126	0–0.5	QBT3	10-1691
CALA-10-11204	LA-611125	0–0.5	QBT3	10-1691
CALA-10-11205	LA-611129	0–0.5	QBT3	10-1691
CALA-10-11206	LA-611130	0–0.5	QBT3	10-1691
CALA-10-11207	LA-611131	0–0.5	QBT3	10-1691
CALA-10-11208	LA-611132	0–0.5	QBT3	10-1691
CALA-10-11209	LA-611133	0–0.5	QBT3	10-1691
CALA-10-11210	LA-611134	0–0.5	QBT3	10-1691
CALA-10-11211	LA-611135	0–0.5	QBT3	10-1691
CALA-10-11212	LA-611136	0–0.5	QBT3	10-1691
CALA-10-11213	LA-611137	0–0.5	QBT3	10-1691
CALA-10-11215	LA-611139	0–0.5	QBT3	10-1691
CALA-10-11216	LA-611140	0–0.5	QBT3	10-1691
CALA-10-11217	LA-611141	0–0.5	QBT3	10-1691
CALA-10-11218	LA-611142	0–0.5	QBT3	10-1691
CALA-10-11219	LA-611143	0–0.5	QBT3	10-1691
CALA-10-11220	LA-611144	0–0.5	QBT3	10-1691
CALA-10-11221	LA-611145	0–0.5	QBT3	10-1691
CALA-10-11226	LA-611150	0–0.5	SOIL	10-1889
CALA-10-11227	LA-611151	0–0.5	SOIL	10-1889
CALA-10-11228	LA-611152	0.5–1	SOIL	10-1889
CALA-10-11229	LA-611153	0–1	SOIL	10-1889
CALA-10-11230	LA-611154	0–0.25	SOIL	10-1889
CALA-10-11231	LA-611155	0–0.33	SOIL	10-1889
CALA-10-11232	LA-611156	0–0.33	SOIL	10-1889
CALA-10-11233	LA-611157	0–0.166	SOIL	10-1889
CALA-10-11234	LA-611158	0–0.5	SOIL	10-1889
CALA-10-11235	LA-611158	0.5–1.5	SOIL	10-1889
CALA-10-11236	LA-611160	0–0.5	SOIL	10-1889
CALA-10-11237	LA-611160	0.5–1.5	SOIL	10-1889

Table 4.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	PCB*
CALA-10-11238	LA-611162	0−0.5	SOIL	10-1889
CALA-10-11239	LA-611162	0.5−1.0	SOIL	10-1889
CALA-10-11240	LA-611164	0–0.5	QBT3	10-2100
CALA-10-11251	LA-611175	0–0.5	QBT3	10-2100
CALA-10-11252	LA-611176	0–0.5	QBT3	10-2100
CALA-10-11253	LA-611177	0–0.5	QBT3	10-2100
CALA-10-11254	LA-611178	0–0.5	QBT3	10-2100
CALA-10-11255	LA-611179	0–0.5	QBT3	10-2100
CALA-10-11256	LA-611180	0–0.5	QBT3	10-2100
CALA-10-11257	LA-611181	0–0.5	QBT3	10-2100
CALA-10-11258	LA-611182	0–0.5	QBT3	10-2100
CALA-10-11259	LA-611183	0–0.5	SED	10-2100
CALA-10-11260	LA-611184	0–0.5	QBT3	10-2100
CALA-10-11261	LA-611185	0–0.5	QBT3	10-2100
CALA-10-11262	LA-611186	0–0.5	QBT3	10-2142
CALA-10-11263	LA-611187	0–0.5	SED	10-2142
CALA-10-11264	LA-611188	0–0.5	QBT3	10-2142
CALA-10-11265	LA-611189	0–0.5	QBT3	10-2142
CALA-10-11266	LA-611190	0–0.5	QBT3	10-2142
CALA-10-11267	LA-611191	0–0.5	QBT3	10-2142
CALA-10-11268	LA-611192	0–0.5	QBT3	10-2142
CALA-10-11269	LA-611193	0–0.5	QBT3	10-2142
CALA-10-11270	LA-611194	0–0.5	QBT3	10-2142
CALA-10-4618	LA-609815	0–0.5	SOIL	10-2418
CALA-10-4619	LA-609816	0–0.5	SOIL	10-2418
RE01-10-23245	01-612620	2.9−3.0	QBT3	10-3787
RE01-10-23246	01-612621	5.0−5.1	QBT3	10-3787
RE01-10-23247	01-612622	2.5−2.6	QBT3	10-3787
RE01-10-23248	01-612623	3.0−3.1	QBT3	10-3787
RE01-10-23249	01-612624	2.9−3.0	QBT3	10-3787
RE01-10-23250	01-612625	2.9−3.0	QBT3	10-3787
RE01-10-23251	01-612626	3.4−3.5	QBT3	10-3787
RE01-10-23252	01-612627	3.4−3.5	QBT3	10-3787
RE01-10-23253	01-612628	4.0−4.1	QBT3	10-3787
RE01-10-23254	01-612629	4.0−4.1	QBT3	10-3787
RE01-10-23255	01-612630	2.5−2.6	QBT3	10-3787
RE01-10-23256	01-612631	3.0−3.1	QBT3	10-3787
RE01-10-23257	01-612632	2.9−3.0	QBT3	10-3787

Note: QBT3 is the third cooling unit of the Quaternary Bandelier Tuff; SED is sediment.

* Numbers in this column are analytical request numbers.

Table 5.1-1
PCBs Detected in Confirmation Samples from SWMU 01-001(f) Outfall and Drainage

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Recreational SSL[a]				**6.65**[b]	**10.5**
RE00-08-16146	00-603830	0–1.25	SED	5.4 (J)[c]	—[d]
RE00-08-16147	00-603830	1.25–3.25	QBT3	0.55 (J)	—
RE00-08-16150	00-603832	0–1.25	SED	0.17 (J)	0.094
RE00-08-16152	00-603833	0–1	SED	0.038 (J)	0.036
RE00-08-16153	00-603833	1–2	QBT3	0.038 (J)	—
RE00-08-16154	00-603834	0–1	SED	0.089 (J)	0.066
RE00-08-16156	00-603835	0–1	SED	0.067 (J)	0.036
RE00-08-16158	00-603836	0–1	SED	0.5 (J)	—
RE00-08-16159	00-603836	1.75–2.75	QBT3	0.82 (J)	—
RE01-10-5537	01-609992	0–5.25	SED	0.0215	0.0103
RE01-10-5538	01-609993	0–2	SED	0.0068	0.0057
RE01-10-5540	01-609995	0–4.13	SED	0.0028 (J)	0.0025 (J)
RE01-10-11577	01-611287	0–0.25	SOIL	0.36	—
RE01-10-11578	01-611288	0–0.25	SOIL	0.47	—
RE01-10-11579	01-611289	0–0.25	SOIL	0.23	—
RE01-10-11580	01-611290	0–0.25	SOIL	0.99	—
RE01-10-11581	01-611291	0–0.25	SOIL	0.32	—
RE01-10-11582	01-611292	0–0.25	SOIL	0.16	—
RE01-10-11583	01-611293	0–0.25	SOIL	5.4	—
RE01-10-11584	01-611294	0–0.25	SOIL	1.6	—
RE01-10-11585	01-611295	0–0.25	SOIL	0.26	—
RE01-10-11586	01-611296	0–0.25	SOIL	3.3	—
RE01-10-11587	01-611297	0–0.25	SOIL	5.8	—
CALA-10-4619	LA-609816	0–0.5	SOIL	2.49(J+)[e]	—
CALA-10-9847	LA-610960	0–0.25	SED	**10 (J)**	—
CALA-10-9848	LA-610961	0–0.25	SED	0.6 (J)	—
CALA-10-9849	LA-610962	0–0.25	SED	3.6 (J)	—
CALA-10-9850	LA-610963	0–0.25	SED	0.37 (J)	—
CALA-10-9851	LA-610964	0–0.25	SED	**12 (J)**	—
CALA-10-9852	LA-610965	0–0.25	SED	5.4 (J)	—
CALA-10-9853	LA-610966	0–0.25	SED	**7.8 (J)**	—
CALA-10-9854	LA-610967	0–0.25	SED	0.34 (J)	—
CALA-10-9855	LA-610968	0–0.25	SED	1.7 (J)	—
CALA-10-9856	LA-610969	0–0.25	SED	2.8 (J)	—
CALA-10-9857	LA-610970	0–0.25	SED	0.76 (J)	—
CALA-10-9858	LA-610971	0–0.25	SED	0.16 (J)	—
CALA-10-9859	LA-610972	0–0.25	SED	0.42 (J)	—
CALA-10-9860	LA-610973	0–0.25	SED	0.51 (J)	—
CALA-10-9862	LA-610975	0–0.25	SED	1.6 (J)	—

Table 5.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Recreational SSL[a]				**6.65**	**10.5**
CALA-10-9863	LA-610976	0–0.25	SED	0.12 (J)	—
CALA-10-9864	LA-610977	0–0.25	SED	1.5 (J)	—
CALA-10-9866	LA-610979	0–0.25	SED	0.24 (J)	—
CALA-10-11204	LA-611125	0–0.5	QBT3	0.23 (J)	0.1
CALA-10-11203	LA-611126	0–0.5	QBT3	0.23 (J)	0.11
CALA-10-11205	LA-611129	0–0.5	QBT3	0.38 (J)	0.15 (J)
CALA-10-11206	LA-611130	0–0.5	QBT3	0.66 (J)	0.3 (J)
CALA-10-11207	LA-611131	0–0.5	QBT3	0.033 (J)	0.014 (J)
CALA-10-11208	LA-611132	0–0.5	QBT3	0.11 (J)	0.047
CALA-10-11209	LA-611133	0–0.5	QBT3	0.1 (J)	0.043
CALA-10-11210	LA-611134	0–0.5	QBT3	0.13 (J)	0.058
CALA-10-11211	LA-611135	0–0.5	QBT3	0.13 (J)	0.06
CALA-10-11212	LA-611136	0–0.5	QBT3	3.6 (J)	2.1 (J)
CALA-10-11213	LA-611137	0–0.5	QBT3	1.5 (J)	0.63 (J)
CALA-10-11215	LA-611139	0–0.5	QBT3	3.2 (J)	1.6 (J)
CALA-10-11216	LA-611140	0–0.5	QBT3	0.031 (J)	—
CALA-10-11217	LA-611141	0–0.5	QBT3	0.01 (J)	—
CALA-10-11218	LA-611142	0–0.5	QBT3	0.56 (J)	0.23
CALA-10-11219	LA-611143	0–0.5	QBT3	4.8 (J)	1.9 (J)
CALA-10-11220	LA-611144	0–0.5	QBT3	1.5 (J)	0.62 (J)
CALA-10-11221	LA-611145	0–0.5	QBT3	1.4 (J)	0.56 (J)
CALA-10-11226	LA-611150	0–0.5	SOIL	**22**	—
CALA-10-11229	LA-611153	0–1	SOIL	1.9	—
CALA-10-11230	LA-611154	0–0.25	SOIL	0.86	—
CALA-10-11231	LA-611155	0–0.33	SOIL	1.7	0.97
CALA-10-11233	LA-611157	0–0.166	SOIL	0.98	0.47
CALA-10-11234	LA-611158	0–0.5	SOIL	3	1.4
CALA-10-11235	LA-611158	0.5–1.5	SOIL	0.64	0.31
CALA-10-11236	LA-611160	0–0.5	SOIL	6.3	3
CALA-10-11237	LA-611160	0.5–1.5	SOIL	1.6	0.72
CALA-10-11238	LA-611162	0–0.5	SOIL	2.2	0.98
CALA-10-11239	LA-611162	0.5–1	SOIL	0.85	0.4
CALA-10-11240	LA-611164	0–0.5	QBT3	3.3	1.53
CALA-10-11251	LA-611175	0–0.5	QBT3	2.28	1.06
CALA-10-11252	LA-611176	0–0.5	QBT3	1.63	0.624
CALA-10-11253	LA-611177	0–0.5	QBT3	3.04	1.65 (J)
CALA-10-11254	LA-611178	0–0.5	QBT3	**39.3**	**18.4**

Table 5.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Recreational SSL[a]				**6.65**	**10.5**
CALA-10-11255	LA-611179	0–0.5	QBT3	0.254	0.145
CALA-10-11256	LA-611180	0–0.5	QBT3	0.163	0.0848
CALA-10-11257	LA-611181	0–0.5	QBT3	0.252	0.122
CALA-10-11258	LA-611182	0–0.5	QBT3	5.88	2.48
CALA-10-11259	LA-611183	0–0.5	SED	**12.6**	5.32
CALA-10-11260	LA-611184	0–0.5	QBT3	0.541	0.322
CALA-10-11261	LA-611185	0–0.5	QBT3	**16.9**	6.61
CALA-10-11262	LA-611186	0–0.5	QBT3	0.0362	0.0248
CALA-10-11263	LA-611187	0–0.5	SED	4.27	2.31
CALA-10-11264	LA-611188	0–0.5	QBT3	0.573	0.304
CALA-10-11265	LA-611189	0–0.5	QBT3	2.48	1.34
CALA-10-11266	LA-611190	0–0.5	QBT3	0.895	0.485
CALA-10-11267	LA-611191	0–0.5	QBT3	6.31	3.21
CALA-10-11268	LA-611192	0–0.5	QBT3	0.342	0.171
CALA-10-11269	LA-611193	0–0.5	QBT3	2.27	1.2
CALA-10-11270	LA-611194	0–0.5	QBT3	0.225	0.184
RE01-10-23245	01-612620	2.9−3.0	QBT3	0.311	0.116
RE01-10-23246	01-612621	5.0−5.1	QBT3	5.29	1.72
RE01-10-23247	01-612622	2.5−2.6	QBT3	**17.8**	5.86
RE01-10-23248	01-612623	3.0−3.1	QBT3	**30.9**	10.4
RE01-10-23249	01-612624	2.9−3.0	QBT3	**14.9**	5.06
RE01-10-23250	01-612625	2.9−3.0	QBT3	**7.13**	2.49
RE01-10-23251	01-612626	3.4−3.5	QBT3	1.72	0.778
RE01-10-23252	01-612627	3.4−3.5	QBT3	**12.2**	4.13
RE01-10-23253	01-612628	4.0−4.1	QBT3	**21.6**	7.79
RE01-10-23265[f]	01-612628	4.0−4.1	QBT3	**20.6**	7.31
RE01-10-23254	01-612629	4.0−4.1	QBT3	**58.8**	**19.4**
RE01-10-23255	01-612630	2.5−2.6	QBT3	**29.2**	9.99
RE01-10-23256	01-612631	3.0−3.1	QBT3	**30.9**	**10.8**
RE01-10-23257	01-612632	2.9−3.0	QBT3	0.414	0.159

Notes: Units are in mg/kg. QBT3 is the third cooling unit of the Quaternary Bandelier Tuff; SED is sediment. Shading indicates samples were collected during the supplemental interim measure.

[a] SSLs from LANL (2010, 108613).

[b] Sample values in bold exceed the recreational SSL.

[c] J = The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.

[d] — = Not detected.

[e] J+ = The analyte was positively identified, and the result is likely to be biased high.

[f] Duplicate of sample RE01-10-23253.

Appendix A

Site Photographs

A-1.0 SUPPLEMENTAL REMOVAL OF CONTAMINATED MEDIA FROM THE SWMU 01-001(f) OUTFALL AND DRAINAGE

Excavation Area 1 within the SWMU 01-001(f) outfall

Excavation Area 1 within the SWMU 01-001(f) outfall

Collection of confirmation samples at Excavation Area 1 within the SWMU 01-001(f) outfall

Excavated area in lower portion of Area 1 directly below the SWMU 01-001(f) outfall

Use of air hammers to remove contaminated media from drainage below the SWMU 01-001(f) outfall

Use of air hammers to remove contaminated media from drainage below the SWMU 01-001(f) outfall

Shovel removal and packaging of contaminated media within the SWMU 01-001(f) outfall area

Excavation and packaging of contaminated media within the SWMU-01-001(f) outfall area

Removal of contaminated media from the drainage below the SWMU 01-001(f) outfall

Excavated Area 3 in the drainage below the SWMU 01-001(f) outfall following supplemental removal of contaminated media

Packaging of contaminated media from the drainage below the SWMU 01-001(f) outfall

Transfer of waste bags from hillside drainage to canyon bottom via zip line

Unloading waste bags from zip line in Los Alamos Canyon

A-2.0 PACKAGING AND SHIPPING OF CONTAMINATED MEDIA EXCAVATED DURING INTERIM MEASURES (IM) AT SWMU 01-001(f)

Bags of excavated media being loaded into waste box in the bottom of Los Alamos Canyon

Bags of excavated media being loaded onto trucks for transport to Energy Solutions in Clive, Utah

Trucks loaded with waste bags of excavated media from the IM leaving TA-41 for disposal at Energy Solutions in Clive, Utah

A-3.0 STORMWATER AND SEDIMENT RETENTION BASINS

View of upper retention basin in early May 2010

View of lower retention basin in early May 2010—water present is the result of groundwater infiltration

Riparian vegetation zone established east of the lower retention basin in early May 2010

Upper retention basin in early June 2010

Lower retention basin in early June 2010

View of riparian zone east of lower retention basin in early June 2010 with shallow groundwater infiltration

View of lower retention basin looking west on July 26, 2010, following three days of rain

Collection of grab sample from upper retention basin on July 26, 2010

View of riparian zone looking east on July 26, 2010, following three days of rain

Collection of grab sample within riparian zone directly east of lower retention basin on July 26, 2010

Upper and lower retention basins following significant precipitation events on August 15 and 16, 2010

View of riparian zone east of lower retention basin on August 16, 2010, following two significant precipitation events

Appendix B

Field Methods

B-1.0 INTRODUCTION

This appendix summarizes field methods used during the 2009–2010 interim measures (IM) implemented within the solid waste management unit (SWMU) 01-001(f) outfall and drainage system below the outfall. Table B-1.0-1 provides general method information, and the following sections provide additional details. All activities were conducted in accordance with the applicable Los Alamos National Laboratory (LANL or the Laboratory) Environmental Programs Directorate standard operating procedures (SOPs) and quality procedures (http://www.lanl.gov/environment/all/qa/adep.shtml).

B-2.0 FIELD-SCREENING METHODS

This section summarizes the field-screening methods used during the 2009–2010 sampling activities at the SWMU 01-001(f) outfall and drainage.

B-2.1 Field Screening for Polychlorinated Biphenyls

EPA Method SW-846:8082A was used for field screening during interim measure removal activities implemented in late 2009 and early 2010 within the SWMU 01-001(f) outfall, hillside drainage, canyon bottom. The expedited polychlorinated biphenyl (PCB) screening analyses were not used during supplemental removal and confirmation sampling activities implemented at the site in June and July 2010.

B-2.2 Field Screening Samples for Radioactivity

Samples were screened for gross-alpha and –beta/gamma radiation before delivery to the Sample Management Office (SMO). Screening was conducted by a Laboratory radiation control technician (RCT) using an Eberline E600 with SHP380AB probe in accordance with Radiation Protection (RP) 1 procedures and manufacturer's specifications. Field personnel recorded background and sample measurements for gross-alpha and -beta/gamma radiation on sample collection logs, which are included in Appendix D (on DVD).

B-3.0 FIELD INSTRUMENT CALIBRATION

Instrument calibration and function check was completed daily. Calibration of the Eberline E600 was conducted by the RCT. All calibrations were performed according to the manufacturer's specifications and RP-1 requirements.

B-3.1 Eberline E600 Instrument Calibration

The Eberline E600 was calibrated daily by the RCT before local background levels for radioactivity were measured. The instrument was calibrated using depleted uranim-238 check source for alpha and beta emissions. Inspection was performed for physical damage, battery life, response to a source of radioactivity, and background as part of the calibration procedures. All calibrations were performed in accordance with the Eberline E600 manufacturer's specifications and applicable RP-1 procedures.

B-4.0 SAMPLING AND EXCAVATION METHODS

This section summarizes the methods used for excavating soil, sediment, and tuff and for collecting samples for laboratory analysis, including surface soil, sediment, and tuff samples.

B-4.1 Excavation Methods

Air hammers and hand-digging methods were used to remove a total of 98 yd^3 of contaminated soil, sediment, and tuff from the SWMU 01-001(f) outfall area and from two additional areas within the drainage channel below SWMU 01-001(f) during supplemental IM activities conducted from June 21 to July 13, 2010. Contaminated soil, sediment, and tuff were excavated in the areas of previous confirmation sampling locations LA-609812, LA-609813, LA-609814, LA-609817, LA-611165, LA-611166, LA-611167, LA-611168, LA-611169, LA-611170, LA-611171, LA-611172, LA-611173, LA-611174, and LA-611178 (LANL 2010, 109422). Contaminated media were removed from the drainage using wrangler bags and zip lines (Appendixes A and C).

B-4.2 Surface and Shallow-Subsurface Soil-Sampling Methods

Surface and shallow-subsurface samples were collected in accordance with SOP-06-09, Spade and Scoop Method for Collection of Soil Samples, and SOP 06-10, Hand Auger and Thin-Wall Tube Sampler. A hand auger with a stainless-steel bucket was used to collect material in approximately 6-in. intervals. Samples were transferred to sample-collection jars or bags for transport to the SMO and American Radiation Services (ARS).

Samples were labeled, documented, and sealed with custody seals before transportation in accordance with SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5058, Sample Control and Field Documentation.

All sample-collection tools were decontaminated immediately before collection of each sample in accordance with SOP-5061, Field Decontamination of Equipment.

Samples were submitted for laboratory analysis of PCBs.

B-4.3 Quality Assurance/Quality Control Samples

Quality assurance/quality control samples for soils and tuff were collected in accordance with SOP-5059, Field Quality Control Samples. Field duplicate samples were collected at a frequency of at least one duplicate sample for every ten samples. Field rinsate samples were collected from sampling equipment at a frequency of at least one rinsate sample for every ten samples. Field trip blanks also were collected at a frequency of one per ten samples, if applicable.

B-4.4 Sample Documentation and Handling

Field personnel completed a sample-collection log and chain-of-custody (COC) form for each sample set. Sample containers were sealed with COC seals and placed in coolers at approximately 4°C. Samples were packaged with preservatives, as necessary, depending upon the analytical method to be used, packed, handled, and shipped in accordance with SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5056, Sample Containers and Preservation.

B-4.5 Decontamination of Excavation and Sampling Equipment

All excavation tools and equipment that came into contact with contaminated media were disposed of along with the appropriate waste stream or decontaminated and/or screened by an RCT before they were released for use at other sites. Sampling equipment was decontaminated to minimize the potential for cross-contamination between sampling locations. Decontamination was completed using a dry decontamination method with disposable paper towels and over-the-counter cleaner, such as Fantastik or equivalent. All decontamination procedures followed SOP-5061, Field Decontamination of Equipment.

B-5.0 GEODETIC SURVEYING

Geodetic surveys were conducted during the SWMU 01-001(f) supplemental IM to establish and mark all sampling locations and excavated areas in the SWMU 01-001(f) outfall and drainage. The planned sampling locations were determined based on location and results of historical borehole and surface samples. Geodetic surveys were conducted at the completion of the sampling campaign to establish the spatial coordinates for all sampling locations. Geodetic surveys were conducted in accordance with SOP 5028, Coordinating and Evaluating Geodetic Surveys, using a Trimble 5700 differential global-positioning system (DGPS). All coordinates are expressed in New Mexico State Plane Coordinate System 1983, New Mexico Central. Surveyed coordinates for all sampling locations are presented in Appendix D (on DVD).

B-6.0 INVESTIGATION-DERIVED-WASTE STORAGE AND DISPOSAL

Investigation-derived waste (IDW) was managed in accordance with the waste characterization strategy form, which is included in Appendix E. All IDW was packaged in U.S. Department of Transportation–compliant containers and staged at Technical Area 41 before truck transport to the EnergySolutions facility in Clive, Utah, for disposal. All available waste documentation is also included in Appendix E.

B-7.0 REFERENCE

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

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

LANL (Los Alamos National Laboratory), May 2010. “Interim Measure Report for Solid Waste Management Unit 01-001(f) and Los Alamos Site Monitoring Area 2,” Los Alamos National Laboratory document LA-UR-10-2641, Los Alamos, New Mexico. (LANL 2010, 109422)

Table B-1.0-1
Brief Description of Field Investigation Methods

Method	Summary
Spade and Scoop Sampling	This method is typically used to collect surface (i.e., 0–6 in.) soil or fill samples. A hole was dug to the desired depth and a discrete grab sample collected. The sample was homogenized in a decontaminated stainless-steel bowl before it was transferred to the appropriate sample containers.
Hand-Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10–15 ft but may in some cases be used for collecting samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in. inside diameter), creating a vertical hole that can be advanced to the desired sample depth. For the 2009–2010 IM, when the desired depth was reached, the auger was decontaminated before advancing the hole through the sample depth. The sample material was transferred from the auger bucket to a stainless-steel sampling bowl before filling the various required sample containers.
Handling, Packaging, and Shipping of Samples	Field team members sealed and labeled samples before packing and ensured that the sample containers and the containers used for transport were free of external contamination. Field team members packaged all samples to minimize the possibility of breakage during transportation. After all environmental samples were collected, packaged, and preserved; a field team member transported them to either the SMO or an SMO-approved radiation screening laboratory under COC. The SMO arranged for shipping of samples to analytical laboratories. The field team member informed the SMO and/or the radiation screening laboratory coordinator whenever levels of radioactivity were in the action-level or limited-quantity ranges.
Sample Control and Field Documentation	The collection, screening, and transport of samples were documented on standard forms generated by the SMO. These included sample collection logs, COC forms, and sample container labels. Collection logs were completed at the time of sample collection and were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around container lids or openings. The COC forms were completed and assigned to verify that the samples were not left unattended.
Field Quality-Control Sample Collection	Field quality-control samples were collected as directed in the Compliance Order on Consent and SOP-5059 as follows: *Field Duplicates*: at a frequency of approximately 10%; collected at the same time as a regular sample and submitted for the same analyses. *Equipment Rinsate Blank*: at a frequency of approximately 10%; collected by rinsing sampling equipment with deionized water, which was collected in a sample container and submitted for laboratory analysis.
Field Decontamination of Excavation and Sampling Equipment	Dry decontamination was the preferred method to minimize the generation of liquid waste. Dry decontamination included the use of a wire brush or other tool for removing soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes. Dry decontamination was followed by wet decontamination when necessary.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on U.S. Environmental Protection Agency guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample are printed on the sample collection logs provided by the SMO (size and type of container, e.g., glass, amber glass, or polyethylene). All samples were preserved by being placed in insulated containers with ice to maintain a temperature of 4˚C.

Table B-1.0-1 (continued)

Method	Summary
Coordination and Evaluation of Geodetic Surveys	Geodetic surveys focused on obtaining survey data of acceptable quality for use during project investigations. Geodetic surveys were conducted with a Trimble 5700 DGPS. The survey data conformed to Laboratory Information Architecture (IA) project standards IA-CB02, GIS Horizontal Spatial Reference System, and IA-D802, Geospatial Positioning Accuracy Standard for A/E/C and Facility Management. All coordinates are expressed in New Mexico State Plane Coordinate System 1983, NM Central, U.S. ft coordinates. All elevation data were reported relative to the National Geodetic Vertical Datum of 1983.
Management of Environmental Restoration Project Waste, Waste Characterization	IDW was managed, characterized, and stored in accordance with an approved waste characterization strategy form that documents site history, field activities, and the characterization approach for each waste stream managed. Waste characterization was adequate to comply with on-site or off-site waste acceptance criteria. All stored IDW was marked with appropriate signage and labels. Generators were required to reduce the volume of waste generated by as much as was technically and economically feasible. The means to store, control, and transport each potential waste type and its classification were determined before the start of field operations that generated waste. A waste storage area was established before waste was generated. Waste storage areas located in controlled areas of the Laboratory were controlled as needed to prevent inadvertent addition or management of wastes by unauthorized personnel. Each container of waste generated was individually labeled with waste classification, item identification number, and radioactivity (if applicable), immediately following containerization. All waste was segregated by classification and compatibility to prevent cross-contamination. Management of IDW is presented in Appendix E.

Appendix C

Field Forms
(on DVD included with this document)

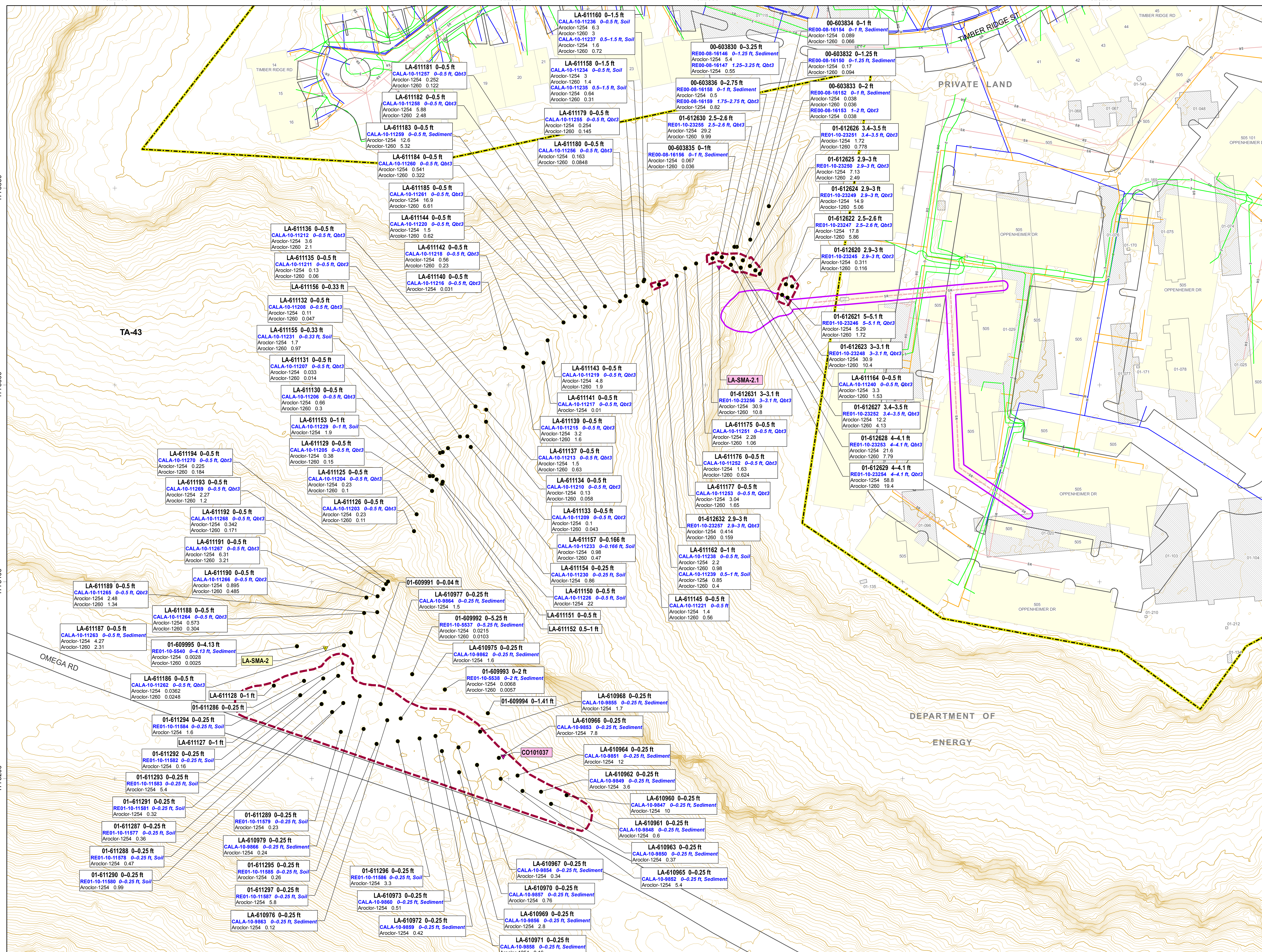
Appendix D

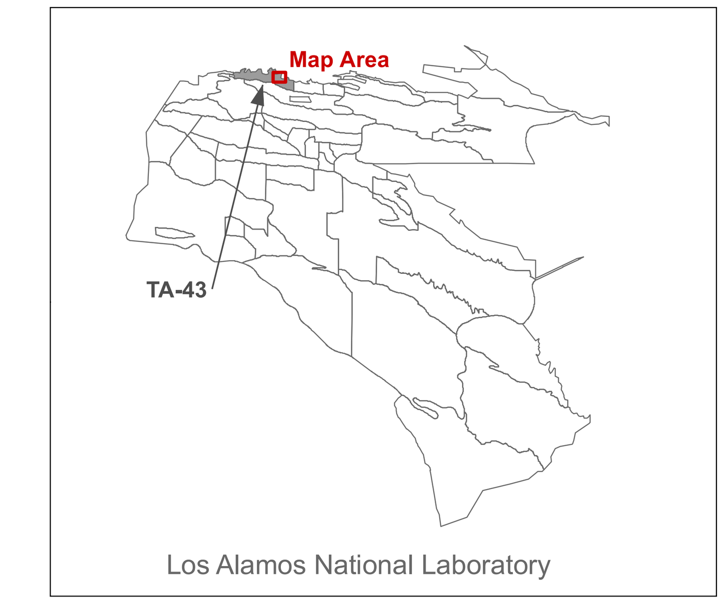
Analytical Suites and Results
(on DVD included with this document)

Appendix E

Waste Documentation
(on DVD included with this document)

Plate 1. PCBs detected in confirmation samples following interim removal activities implemented in 2009 and 2010 within the SWMU 01-001(f) outfall and drainage





Location ID Depth interval sampled
Sample ID Depth, Media
Aroclor-ID #
= Analytical lab results (mg/kg)

- Confirmation sampling location
- Stormwater sampling location
- Former FFCA sampling location
- SWMU 01-001(f)
- Electric line
- Gas line
- Sewer line
- Water line
- Former sewer line
- Paved road
- TA boundary
- LANL boundary
- Structure
- Former structure
- Approximate excavation boundary

Topographic Contour

- 2 ft contour
- 10 ft contour
- 20 ft contour
- 100 ft contour

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 25 50 100

0 5 10 20
Meters

Map: UppLA_ConfSampVR_v1.Rev0
Darren Green, Portage Inc.
Date: 03.30.2010

Analytical data added by Liz Miller
09.10.2010, LANL GISLab map #m202105
Edited 04.20.2011

Feature Data References:

Electric Utility Grid; County of Los Alamos, Information Services; as published 04 March 2009.

Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0441; 1:2,500 Scale Data; 08 August 2008.

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Hypsography, 2, 10, 20 and 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 2000.

LANL Areas Used and Occupied ; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 04 December 2008.

Natural Gas Supply Distribution; County of Los Alamos, Information Services; as published 04 March 2009.

Ownership Boundaries Around LANL Area; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 04 December 2008.

Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2010-0035; 21 January 2010.

Potential Release Sites; Los Alamos National Laboratory, ESH&Q WES Environmental Data & Analysis Group; as published 17 June 2010.

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Streets; County of Los Alamos, Information Services; as published 16 May 2006.

Structures; County of Los Alamos, Information Services; as published 29 October 2007.

Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.

Water Utility Distribution System Maintained by the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009.

Disclaimer: This map was created for work processes associated with the Upper Los Alamos Canyon PCB Remediation. All other uses for this map should be confirmed with the Environmental Programs Directorate.