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SEP 2011

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National Nuclear Security Administration
Los Alamos Site Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-4255/FAX (505) 606-2132

Date: SEP 16 2011
Refer To: EP2011-0313

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

Subject: Submittal of the Response to the Second Notice of Disapproval for the Investigation Report for Lower Sandia Canyon Aggregate Area

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the response to the second notice of disapproval for the Investigation Report for Lower Sandia Canyon Aggregate Area. Also enclosed is a redline-strikeout version of the replacement pages that includes all changes made in response to the New Mexico Environment Department's (NMED's) second notice of disapproval, dated September 8, 2011. A table detailing where revisions have been made to the report with cross-references to NMED's numbered comments is also included.

If you have any questions, please contact Kent Rich at (505) 665-4272 (krich@lanl.gov) or Ramoncita Massey at (505) 845-4675 (ramoncita.massey@nnsa.doe.gov).

Sincerely,

M. J. Graham

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

Edwin P. Worth for

George J. Rael, Assistant Manager
Environmental Projects Office
Los Alamos Site Office

34760

MG/GR/DM/KR:sm

Enclosures: Two hard copies with electronic files:

(1) Response to the Second Notice of Disapproval for the Investigation Report for Lower Sandia Canyon Aggregate Area (LA-UR-11-5335)
(2) Cross-reference table of NMED second notice of disapproval comments and revisions to the report
(3) A redline-strikeout version of the replacement pages and Appendix B that includes all changes and edits to the report
(4) Replacement pages 107–108 and 117–120 and Appendix B of the Investigation Report for Lower Sandia Canyon Aggregate Area, Revision 1 (LA-UR-11-5335)

Cy: (w/enc.)
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Ramoncita Massey, DOE-LASO, MS A316
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Response to the Second Notice of Disapproval for the Investigation Report for Lower Sandia Canyon Aggregate Area, Los Alamos National Laboratory, EPA ID No: NM0890010515, HWB-LANL-11-019, Dated September 8, 2011

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. Los Alamos National Laboratory's (LANL's or the Laboratory's) responses follow each NMED comment.

NMED Comment

3. Section 6.4.1.4, Site Contamination, Soil and Rock Sampling, page 32:

The NOD response states that the results of geophysical survey did not identify any landfill boundaries or buried waste at Solid Waste Management Unit (SWMU) 20-001(c). Because tuff was encountered at a very shallow depth (less than 1-2 ft bgs), it was decided the samples above the soil-tuff interface would not provide meaningful characterization data for the site. The sampling for SWMU 20-001(c) was not conducted in the proper locations during 1995 investigations. The results of geophysical survey conducted in 2010 did not identify the landfill boundaries. The Permittees propose to collect additional samples during a second phase of investigation to define the extent of contamination. Before collecting additional samples, the Permittees must conduct a historical document search to ensure that the samples collected during 2010 investigations are indeed from the location of former landfill.

LANL Response

3. Extensive historical research concerning the location of SWMU 20-001(c) was performed during preparation of the 1994 Operable Unit 1100 Resource Conservation and Recovery Act facility investigation work plan (LANL 1994, 034756) and the 2009 historical investigation report for Lower Sandia Canyon Aggregate Area (LANL 2009, 105078). The location investigated in 2010 represents the most likely location of the landfill, based on the historical information reviewed. The Laboratory is unaware of any additional historical documents that would change the proposed sampling locations. The locations specified in the Phase II investigation work plan will be sampled to complete the determination of extent of contamination.

NMED Comment

17. Section 9.1.1, Conclusions, Former TA-20, page 106:

NMED does not concur with the response to this comment. Polychlorinated biphenyls (PCBs) were detected at several locations at TA-20 and must be retained as chemicals of potential concern (COPCs) for risk evaluation purposes. Regardless of the source of the contamination, PCBs are present at the site and do contribute to the overall risk. If PCBs drive risk above target levels, the Permittees may wish to consider tying the remediation costs to the source area, but the fact that PCBs are present at TA-20 cannot be ignored and PCBs cannot be excluded from the site risk assessments.

LANL Response

17. Polychlorinated biphenyls will be included as chemicals of potential concern for the Technical Area 20 sites where they are detected and will be included in applicable risk-screening evaluations in the Phase II investigation report.

NMED Comment

18. Section B-5.3, Subsurface Tuff Sampling Methods, page B-4:

The response to this comment is not adequate. The Permittees have not demonstrated that appropriate methods have been used to collect samples for volatile organic compounds (VOCs) analysis. The Permittees must specifically describe the methods used to collect samples for VOCs. The Permittees must describe in detail the methods used to collect the samples from the sampling device, the procedures used to transfer the samples to sampling containers, the types of sample containers used, how the sample containers were filled to eliminate headspace, and the method of storage for the sample containers. Methods used to collect samples for different media such as soil, sediment, and tuff, must be described separately. The Permittees state that sample material had to be broken to fit into sample containers. It is not clear from the text that after samples were transferred into appropriate containers, how the samples were "broken" and whether there was any head space in the sample container after it was filled. The Permittees must describe every step of sample collection in detail so NMED can determine the validity of VOC data.

LANL Response

18. Sections B-5.1 and B-5.3 and Table B-1.0-1 have been revised to provide additional details on collection of samples for volatile organic compound (VOC) analysis. These descriptions are specific to the sampling method rather than to the media (e.g., soil samples are collected using the spade-and-scoop method in the same manner as sediment samples). As described in these revisions, containers for VOC analysis were filled as completely as possible. Because of the nature of some of the sample material (e.g., rock fragments), however, it may not have been possible to completely fill the container with no headspace.

REFERENCES

LANL (Los Alamos National Laboratory), May 1994. "RFI Work Plan for Operable Unit 1100," Los Alamos National Laboratory document LA-UR-94-1097, Los Alamos, New Mexico. (LANL 1994, 034756)

LANL (Los Alamos National Laboratory), April 2009. "Historical Investigation Report for Lower Sandia Canyon Aggregate Area," Los Alamos National Laboratory document LA-UR-09-2077, Los Alamos, New Mexico. (LANL 2009, 105078)

Cross-Reference of NMED NOD Comments and Revisions to Lower Sandia Canyon Aggregate Area Investigation Report, Revision 1

NMED NOD Comment No.	Summary of NOD Comment	Section(s)/Page(s) in Original Report	Section(s)/Page(s) in Revised Report	Nature of Revision
General Comments				
3	Conduct a historical document search to ensure samples collected during 2010 investigations are indeed from the location of the former landfill.	Section 6.4.1.4, p. 32	n/a*	Previously conducted historical document reviews and found no additional documents. No revision is necessary.
17	Do not exclude polychlorinated biphenyls (PCBs) because they are present at the site and contribute to the overall risk.	Section 9.1.1, p. 106	Section 9.1.1	Revised text and will identify PCBs as chemicals of potential concern and include them in applicable risk-screening evaluations.
18	Describe each step of sample collection for volatile organic compounds (VOCs) in detail so NMED can determine the validity of VOC data.	Section B-5.3	Sections B-5.1, B-5.3, Table B-1.0-1	Revised text and table to provide additional details on VOC sampling procedure.

*n/a = Not applicable.

9.1.1 Former TA-20

The extent of contamination has not been defined for 11 sites in former TA-20. Additional sampling is needed to define the extent of contamination for one or more inorganic chemicals, organic chemicals, or radionuclides at the following sites:

- SWMU 20-001(a)—the vertical extent of barium and perchlorate
- SWMU 20-001(b)—the vertical extent of perchlorate, uranium-234, uranium-235/236, and uranium-238; the lateral extent of barium and selenium
- SWMU 20-001(c)—the vertical extent of chromium and uranium-234; the lateral extent of chromium
- SWMU 20-002(a)—the vertical extent of barium, chromium, nitrate, uranium-235/236, and uranium-238; the lateral extent of beryllium, chromium, and selenium
- SWMU 20-002(b)—the vertical extent of barium, calcium, and perchlorate
- SWMU 20-002(c)—the lateral extent of cesium-137
- SWMU 20-002(d)—the vertical extent of aluminum, barium, uranium-235/236; the lateral extent of chromium
- AOC 20-003(b)—the vertical extent of uranium-235/236; the lateral extent of perchlorate
- AOC 20-003(c)—the vertical extent of uranium-234, uranium-235/236, and uranium-238
- AOC 20-004—the vertical extent of aluminum, barium, calcium, cobalt, copper, nickel, nitrate, selenium, and vanadium; the lateral extent of aluminum, barium, copper, nickel, and vanadium
- SWMU 20-005—the vertical extent of silver; the vertical extent of inorganic chemicals, organic chemicals, and radionuclides at locations 20-612618 and 20-612619

Although Aroclor-1254 and Aroclor-1260 were detected at low concentrations in multiple samples at SWMUs 20-002(c), 20-002(d), and 20-005, there is no indication that PCBs were used at those sites. It is likely that the detected concentrations reflect widespread but very low concentration contamination from multiple potential sources upgradient of this site, including sites at TA-03, TA-61, and TA-53 and developed areas on Laboratory and Los Alamos County or private property (LANL 2009, 107453, p. 5–8). Furthermore, PCB and other contamination in the main drainage of Sandia Canyon have been addressed as part of separate canyons investigations (LANL 2009, 107453). As indicated in NMED's notice of disapproval (NMED 2011, 204629), additional sampling to define the extent of PCBs is not necessary. PCBs will be included as COPCs for these sites for risk evaluations.

9.1.2 TA-53

The nature and extent of contamination are defined for the following three sites in TA-53:

- SWMU 53-001(b), Storage area
- AOC 53-013, Lead spill site
- AOC 53-014, Lead spill site

The extent of contamination has not been defined for six sites in TA-53. Additional sampling is needed to define the extent of contamination for one or more inorganic chemicals, organic chemicals, or radionuclides at the following sites:

- SWMU 53-001(a)—the vertical extent of copper, Aroclor-1254, and Aroclor-1260; the lateral extent of 1,2,4-trimethylbenzene
- SWMU 53-005—the vertical extent of antimony, chromium, acetone, Aroclor-1254, 2-butanone, sec-butylbenzene, 4-isopropyltoluene, 1,3,5-trimethylbenzene, 1,2-xylene, and cesium-137; the lateral extent of antimony, chromium, nickel, acetone, Aroclor-1254, 2-butanone, sec-butylbenzene, 1,1-dichloroethane, isopropylbenzene, 4-isopropyltoluene, 1,1,1-trichloroethane, trichloroethene, 1,2,4-trimethylbenzene 1,3,5-trimethylbenzene, and 1,2-xylene; the vertical extent of inorganic chemicals, organic chemicals, and radionuclides at location 53-612486
- AOC 53-008—the vertical extent of aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, total cyanide, lead, magnesium, nickel, selenium, Aroclor-1248, Aroclor-1254, ethylbenzene, cobalt-60, pl0utonium-239/240, and tritium
- AOC 53-009—the vertical extent of barium, lead, Aroclor-1242, Aroclor-1254, and Aroclor-1260.
- AOC 53-010—the vertical extent of barium, calcium, chromium, and diethylphthalate
- AOC 53-012(e)—the vertical extent of cesium-137, and uranium-235/236; the vertical extent of inorganic chemicals, organic chemicals, and radionuclides at the location of the drainline elbow

Delayed investigations are proposed for the following seven sites in TA-53:

- SWMU 53-006(b), Underground storage tank
- SWMU 53-006(c), Underground storage tank
- SWMU 53-006(d), Underground storage tank
- SWMU 53-006(e), Underground storage tank
- SWMU 53-006(f), Underground storage tank
- SWMU 53-007(a), Aboveground storage tank
- SWMU 53-015, Wastewater treatment facility

9.1.3 TA-72

The nature and extent of contamination are not defined for AOC 72-001. No sampling was proposed in the approved work plan because it is an active small-arms firing range. Delayed investigations are proposed for this site.

9.2 Summary of Risk Screening Assessments

9.2.1 Human Health Risk Screening Assessments

The human health risk-screening assessments are presented in Appendix I, section I-4.

The risk-screening assessment results indicated no potential unacceptable risks from COPCs exist for the industrial, construction worker, and residential scenarios at SWMU 53-001(b) and AOC 53-013. The total excess cancer risks were below the NMED target risk level of 1×10^{-5}, and the HIs were below or equivalent to the NMED target HI of 1.

NMED (New Mexico Environment Department), August 6, 2009. "Notice of Approval for the Response to the Notice of Disapproval for the Investigation Work Plan for Lower Sandia Canyon Aggregate Area and Revision 1," 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, 106703)

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), February 9, 2010. "Approval with Modification, Investigation Report for Sandia Canyon," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 108683)

NMED (New Mexico Environment Department), July 15, 2011. "Notice of Disapproval, Investigation Report for Lower Sandia Canyon Aggregate Area," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 204629)

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Purtymun, W.D., and A.K. Stoker, September 1990. "Perched Zone Monitoring Well Installation," Los Alamos National Laboratory document LA-UR-90-3230, Los Alamos, New Mexico. (Purtymun and Stoker 1990, 007508)

Russo, S.E., April 21, 1965. "Probable Burial Areas: Former Sandia Canyon Site, TA-20," Los Alamos Scientific Laboratory memorandum to R. Reider (H-3) from S.E. Russo (ENG-3), Los Alamos, New Mexico. (Russo 1965, 005984)

Santa Fe Engineering Ltd., November 1993. "Wastewater Stream Characterization for TA-53-1, 40, 70, 415, 416, 420, 421, 428, 450, 452, 454, 515, 524, 526, 605, 733, 809, 813, 815 and 845 at Los Alamos National Laboratory, Environmental Study, Characterization Report #29," report prepared for Los Alamos National Laboratory, Santa Fe, New Mexico. (Santa Fe Engineering, Ltd. 1993, 031756)

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Stoker, A.K., March 31, 1993. "Direct Testimony of Alan K. Stoker on Behalf of Petitioners before the New Mexico Water Quality Control Commission," Los Alamos, New Mexico. (Stoker 1993, 056021)

Vaniman, D., July 29, 1991. "Revisions to report EES1-SH90-17," Los Alamos National Laboratory memorandum (EES1-SH91-12) to J.L. Gardner (EES-1) from D. Vaniman (EES-1), Los Alamos, New Mexico. (Vaniman 1991, 009995.1)

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11.2 Data Map Sources

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

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

SWMU or AOC: er_prs_all_reg, Potential Release Sites; Los Alamos National Laboratory, ESH&Q Waste & Environmental Services Division, Environmental Data and Analysis Group, EP2010-1C; 1:2,500 Scale Data; 02 December 2010.

Structure or Building: ksl_structures_ply; Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Fence: ksl_fences_arc; Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Paved road: ksl_paved_rds_arc; Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

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Road Centerlines for the County of Los Alamos, lac_centerlin_arc; County of Los Alamos, Information Services; as published 04 March 2009.

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Contours: lanl_contour1991; Hypsography, 2, 10, 20, 100 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

Communication: ksl_comm_arc; Communication Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 08 August 2002; as published 28 May 2009.

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Steam: ksl_steam_arc; Steam Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Water: ksl_water_arc; Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Primary Industrial Waste Lines, wfm_indstrl_waste_arc; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Inset LANL Boundary: plan_ownerclip_reg; 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.

Landscape: ksl_landscape_arc; Primary Landscape Features; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Former structures: frmr_structures_ply; 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.

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

Inactive Outfall: wqh_inact_outfalls_pnt; WQH Inactive Outfalls; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; Edition 2002.01; 01 September 2003.

NPDES Outfalls: wqh_npdes_outfalls_pnt: WQH NPDES Outfalls; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; Edition 2002.01; 01 September 2003.

Outfalls: er_outfalls_pnt: Outfalls; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; Unknown publication date.

Monitoring wells: Environmental Surveillance at Los Alamos During 2006, Groundwater monitoring; LANL Report LA-14341-ENV, September 2007.

Supply Wells: Locations of Monitoring and Supply Wells at Los Alamos National Laboratory, Table A-2, 2009 General Facility Information; LANL Report LA-UR-09-1341; March 2009.

Watershed Monitoring - Environmental Surveillance at Los Alamos during 2008 - On-Site and Perimeter Monitoring Locations, Edition 2009-0A, ESR_surfwatermonsta_pnt; Los Alamos National Laboratory, Waste and Environmental Services Division, Water Stewardship Program, Corrective Actions Program, Environmental Protection Division, Ecology and Air Quality Group, and Water Quality and RCRA Group; September 2009.

SMA Monitoring Locations, sma_monitoring_pnt; Los Alamos National Laboratory, ESH&Q Waste and Environmental Services Division; 1:2,500 Scale Data; published 14 February 2011.

Drainage: wqh_drainage_arc: WQH Drainage_arc; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; 1:24,000 Scale Data; 03 June 2003.

Appendix B

Field Methods

B-1.0 INTRODUCTION

This appendix summarizes the field methods used during the 2010 investigation of the Lower Sandia Canyon Aggregate Area at Los Alamos National Laboratory (LANL or Laboratory). Table B-1.0-1 presents a summary of the field methods used, and the following sections provide more detailed descriptions of these methods. All activities were conducted in accordance with approved subcontractor procedures that are technically equivalent to Laboratory standard operating procedures (SOPs) listed in Table B-1.0-2 and are available at http://www.lanl.gov/environment/all/qa.shtml.

B-2.0 EXPLORATORY DRILLING CHARACTERIZATION

No exploratory drilling characterization was conducted during the 2010 investigation.

B-3.0 FIELD-SCREENING METHODS

This section summarizes the field-screening methods used during the investigation activities. Field screening for organic vapors was performed as necessary for health and safety purposes. Field screening for radioactivity was performed on every sample submitted to the Sample Management Office (SMO). Field-screening results for all investigation activities are described in section 3.2.3 and are presented in Table 3.2-2 of the investigation report.

B-3.1 Field Screening for Organic Vapors

Field screening for organic vapors was conducted for all samples at all locations, except when the moisture content of the material exceeded instrument detection limits. Screening was conducted using a MiniRAE 2000 photoionization detector (PID) equipped with an 11.7-electron volt lamp. Screening was performed in accordance with the manufacturer's specifications and SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector. Screening was performed on each sample collected, and screening measurements were recorded on the field sample collection logs (SCLs) and chain-of-custody (COC) forms, provided on DVD in Appendix F. The field-screening results are presented in Table 3.2-2 of the investigation report.

B-3.2 Field Screening for Radioactivity

All samples collected were field screened for radioactivity before they were submitted to the SMO, targeting alpha and beta/gamma emitters. A Laboratory radiation control technician (RCT) conducted radiological screening using an Eberline E-600 radiation meter with an SHP-380AB alpha/beta scintillation detector held within 1 in. of the sample. The Eberline E-600 with attachment SHP-380AB consists of a dual phosphor plate covered by two Mylar windows housed in a light-excluding metal body. The phosphor plate is a plastic scintillator used to detect beta and gamma emissions and is thinly coated with zinc sulfide to detect alpha emissions. The operational range varies from trace emissions to 1 million disintegrations per minute. Screening measurements were recorded on the SCLs and COC forms and are provided in Appendix F on DVD. The screening results are presented in Table 3.2-2 of the investigation report.

B-3.3 XRF Survey

A survey at Area of Concern (AOC) 53-013 was conducted using a field x-ray fluorescence (XRF) instrument to identify areas of elevated lead concentrations. The survey was conducted using a Niton XL3t 600 XRF analyzer having sufficient sensitivity (i.e., 100 mg/kg or less) to identify areas contaminated above the 800 mg/kg industrial soil screening level (SSL). The instrument was operated in accordance with the manufacturer's instructions, including collection and preparation of samples and analysis of standard samples.

The survey areas were separated into two investigation areas: the AOC 53-013 XRF Survey North/South Yard and the AOC 53-013 XRF Survey East/West Yard (see Appendix C, Attachment C-2). Within each area, sampling locations were positioned approximately 20 ft apart. At locations where lead concentrations were detected above the industrial SSL (800 mg/kg) using XRF analysis, higher resolution coverage was completed using 10-ft spacing to determine the extent of excavation activities. Details of the XRF survey and the results are presented in Appendix C.

B-4.0 FIELD INSTRUMENT CALIBRATION

All instruments were calibrated before use. Calibration of the Eberline E-600 was conducted by the RCT. All calibrations were performed according to the manufacturers' specifications and requirements.

B-4.1 MiniRAE 2000 Instrument Calibration

The MiniRAE 2000 PID was calibrated both to ambient air and a standard reference gas (100 ppm isobutylene). The ambient-air calibration determined the zero point of the instrument sensor calibration curve in ambient air. Calibration with the standard reference gas determined a second point of the sensor calibration curve. Each calibration was within 3% of 100 ppm isobutylene, qualifying the instrument for use.

The following calibration information was recorded daily on operational calibration logs:

- instrument identification number
- final span settings
- date and time
- concentration and type of calibration gas used (isobutylene at 100 ppm)
- name of the personnel performing the calibration

All daily calibration procedures for the MiniRAE 2000 PID met the manufacturer's specifications for standard reference gas calibration.

B-4.2 Eberline E-600 Instrument Calibration

The Eberline E-600 was calibrated daily by the RCT before local background levels for radioactivity were measured. The instrument was calibrated using plutonium-239 and chloride-36 sources for alpha and beta emissions, respectively. The following five checks were performed as part of the calibration procedures:

- calibration date
- physical damage

- battery
- response to a source of radioactivity
- background

All calibrations performed for the Eberline E-600 met the manufacturer's specifications; the requirements of SOP-5006, Control of Measuring and Test Equipment; and the applicable radiation detection instrument manual. Calibrations were recorded in daily activity logs.

B-4.3 Niton XL3t 600 XRF Analyzer Calibration

The XRF instrument was calibrated by the manufacturer and provided with a certification of calibration. The instrument was checked for proper function and calibration using standard aliquots of metals, including lead, as provided by the manufacturer.

B-5.0 SURFACE AND SUBSURFACE SAMPLING

This section summarizes the methods used to collect surface and subsurface samples, including soil, fill, tuff, and sediment samples, according to the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703).

B-5.1 Surface Sampling Methods

Surface samples were collected in former Technical Area 20 (TA-20) and TA-53 using either hand-auger or spade-and-scoop methods. Surface samples were collected in accordance with approved subcontractor procedures technically equivalent to SOP-06.10, Hand Auger and Thin-Wall Tube Sampler, or SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. A hand auger or spade and scoop were used to collect material in approximately 6-in. increments. Samples for volatile organic chemical (VOC) analysis were transferred immediately from the sampler to the sample container to minimize the loss of VOCs during the sample-collection process. Containers for VOC samples were completely filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. The remaining sample material was placed in a stainless-steel bowl with a stainless-steel scoop, after which it was transferred to sterile sample collection jars or bags. Samples were preserved using coolers to maintain the required temperature and chemical preservatives, such as nitric acid, in accordance with an approved subcontractor procedure technically equivalent to SOP-5056, Sample Containers and Preservation.

Samples were appropriately labeled, sealed with custody seals, and documented before it was transported to the SMO. Samples were managed according to approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5058, Sample Control and Field Documentation.

Sample collection tools were decontaminated (see section B-5.7) immediately before each sample was collected in accordance with a subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment.

B-5.2 Borehole Logging

At all locations, the required sampling depths could be reached by hand augers, and a drill rig with a hollow-stem auger was not used to collect subsurface samples. Therefore, boreholes did not require logging.

B-5.3 Subsurface Tuff Sampling Methods

Subsurface samples were collected in accordance with approved subcontractor procedures technically equivalent to SOP-06.10, Hand Auger and Thin-Wall Tube Sampler, or SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials.

Samples for volatile organic compound (VOC) analysis were collected immediately upon retrieval of the split-spoon core barrel or hand auger to minimize the loss of VOCs during the sample-collection process. Containers for VOC samples were filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. If necessary, pieces small enough to fit into the sample container were removed from the core using a decontaminated rock hammer or stainless-steel spoon. The remaining material was then field screened for radioactivity and visually inspected. After the VOC samples were collected and field screened, the remaining sample material was placed in a stainless-steel bowl, and the material was broken, if necessary, with a decontaminated rock hammer or stainless-steel spoon to fit the material into the sample containers.

A stainless-steel scoop and bowl were used to transfer samples to sterile sample collection jars or bags for transport to the SMO. The sample collection tools were decontaminated immediately before each sample was collected (see section B-5.7) in accordance with an approved subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment.

B-5.4 Quality Control Samples

Quality control (QC) samples were collected in accordance with an approved subcontractor procedure technically equivalent to SOP-5059, Field Quality Control Samples. The QC samples included field duplicates, field rinsate blanks, and field trip blanks. Field duplicate samples were collected from the same material as the regular investigation samples and submitted for the same analyses. Field duplicate samples were collected at a frequency of at least 1 duplicate sample for every 10 samples.

Field rinsate blanks were collected to evaluate field decontamination procedures. Rinsate blanks were collected by rinsing sampling equipment (i.e., auger buckets and sampling bowls and spoons) after decontamination with deionized water. The rinsate water was collected in a sample container and submitted to the SMO. Field rinsate blank samples were analyzed for target analyte list metals and were collected from sampling equipment at a frequency of at least 1 rinsate sample for every 10 solid samples.

Field trip blanks were also collected at a frequency of one per day when samples were being collected for VOC analysis. Trip blanks consisted of containers of certified clean sand opened and kept with the other sample containers during the sampling process. Trip blanks were analyzed for VOCs only.

B-5.5 Sample Documentation and Handling

Field personnel completed an SCL and COC form for each sample. Sample containers were sealed with signed custody seals and placed in coolers at approximately 4°C. Samples were handled in accordance with approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5056, Sample Containers and Preservation. Swipe samples were collected from the exterior of sample containers and analyzed by the RCT before the sample containers were removed from the site. Samples were transported to the SMO for processing and shipment to off-site contract analytical laboratories. The SMO personnel reviewed and approved the SCLs and COC forms and accepted custody of the samples. The SCLs and COC forms are provided in Appendix F (on DVD).

B-5.6 Borehole Abandonment

No boreholes were drilled during the 2010 investigation. However, hand-auger sampling locations deeper than 15 ft below ground surface (bgs) were abandoned in accordance with an approved subcontractor procedure technically equivalent to SOP-5034, Monitor Well and RFI Borehole Abandonment, by filling the boreholes with bentonite chips up to 2–3 ft from the ground surface. The chips were hydrated and clean soil was placed on top. All cuttings were managed as investigation-derived waste (IDW) as described in Appendix G.

B-5.7 Decontamination of Sampling Equipment

The split-spoon core barrels and all other sampling equipment that came (or could have come) in contact with sample material were decontaminated after each core was retrieved and logged. Decontamination included wiping the equipment with Fantastik and paper towels. Residual material adhering to equipment was removed using dry decontamination methods such as the use of wire brushes and scrapers. Decontamination activities were performed in accordance with an approved subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment. Decontaminated equipment was surveyed by an RCT before it was released from the site. Field rinsate blank samples were collected in accordance with an approved procedure technically equivalent to SOP-5059, Field Quality Control Samples.

B-5.8 Site Demobilization and Restoration

Drilling equipment was not used during the 2010 investigation. All temporary fencing and staging areas were dismantled and returned to preinvestigation conditions. All excavations were filled with base course to stabilize for erosion control and to prevent off-site transport.

B-6.0 GEODETIC SURVEYING

Geodetic surveys of all sampling locations were performed using a Trimble RTK 5700 differential global-positioning system (DGPS) referenced from published and monumented external Laboratory survey control points in the vicinity. All sampling locations were surveyed in accordance with an approved subcontractor procedure technically equivalent to SOP-5028, Coordinating and Evaluating Geodetic Surveys. Horizontal accuracy of the monumented control points is within 0.1 ft. The DGPS instrument referenced from Laboratory control points is accurate within 0.2 ft. The surveyed coordinates are presented in Table 3.2-1 of the investigation report.

B-7.0 IDW STORAGE AND DISPOSAL

All IDW generated during the field investigation was managed in accordance with an approved subcontractor procedure technically equivalent to SOP-5238, Characterization and Management of Environmental Program Waste. This procedure incorporates the requirements of all applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy orders, and Laboratory implementation requirements. IDW was also managed in accordance with the approved waste characterization strategy form and the IDW management appendix of the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). Details of IDW management for the Lower Sandia Canyon Aggregate Area investigation are presented in Appendix G.

B-8.0 DEVIATIONS FROM THE WORK PLAN

Deviations from the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703) are summarized below.

Solid Waste Management Unit (SWMU) 20-001(c): Because no anomalies were identified that could be interpreted as buried waste or landfill boundaries, samples were collected from three depths (5–6 ft, 10–11 ft, and 14–15 ft bgs) at each of 10 locations, as specified in the approved work plan. However, tuff was encountered at depths shallower than 5 ft bgs at each of the 10 locations. In that situation, the approved work plan specified that samples were to be collected above the soil-tuff interface and 2–3 ft below the interface. Samples were not collected at those depths, and all samples were collected from tuff. No additional samples will be collected at those locations because the soil-tuff interface is less than 1–2 ft bgs, and samples above the interface would not appropriately characterize the site.

AOC 20-003(b): An additional sample from the depth of 20 to 21 ft bgs was inadvertently collected and analyzed at location 20-612490.

SWMU 20-005: Because the depth of the inlet drainline could not be determined, samples should have been collected at depths of 3–4 ft and 6–7 ft bgs at locations 20-612618 and 20-612619. Instead, samples were collected from 0–1 ft and 3–4 ft bgs. Additional samples will be collected from 6–7 ft bgs at these locations during the Phase II investigation.

SWMU 53-005: The VOC field-screening result for the deepest sample collected at location 53-612484 was elevated (25.1 ppm), but the borehole was not extended to collect a deeper sample. Additional samples will be collected at this location during the Phase II investigation. The depth of the drainline could not be determined. Therefore, the sampling depths for location 53-612486 could not be determined relative to the depth of the drainline, as required by the approved work plan. Samples were collected at depths of 0–1 ft and 4–5 ft bgs. An additional sample will be collected from 7–8 ft bgs at this location during the Phase II investigation.

SWMU 53-012(e): Samples were not collected at the pipe elbow of the drainline as required. An engineering drawing located subsequent to approval of the investigation work plan indicates the drainline elbow is likely not where it was indicated in Figure 4.2-4 of the work plan (planned location M12e-1), and the elbow was not physically located in the field. Therefore, the sampled location (53-612539) was placed approximately 25 ft from the likely actual location. Samples will be collected at the actual drainline elbow during the Phase II investigation by trenching, digging potholes, or using another appropriate method to physically identify the elbow location.

B-9.0 REFERENCES

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

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

LANL (Los Alamos National Laboratory), July 2009. "Investigation Work Plan for Lower Sandia Canyon Aggregate Area, Revision 1," Los Alamos National Laboratory document LA-UR-09-4329, Los Alamos, New Mexico. (LANL 2009, 106660.14)

NMED (New Mexico Environment Department), August 6, 2009. "Notice of Approval for the Response to the Notice of Disapproval for the Investigation Work Plan for Lower Sandia Canyon Aggregate Area and Revision 1," 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, 106703)

Table B-1.0-1
Summary of Field Investigation Methods

Method	Summary
Spade and Scoop Collection of Soil Samples	This method was used to collect shallow (i.e., approximately 0-12 in.) soil or sediment samples. The spade-and-scoop method involved digging a hole to the desired depth, as prescribed in the approved work plan, and collecting a discrete grab sample. Samples for VOC analysis were transferred immediately into sample containers. Containers for VOC analysis were filled as completely as possible and sealed with Teflon-lined caps. Remaining sample material was placed in a clean stainless-steel bowl for transfer into various sample containers.
Hand Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10–15 ft, but in some cases may be used to collect samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in. inside diameter [I.D.]), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth was reached, the auger was decontaminated before advancing the hole through the sampling depth. Samples for VOC analysis were transferred immediately ionto sample containers. Containers for VOC analysis were filled as completely as possible and sealed with Teflon-lined caps. The remaining sample material was transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers were filled.
Split-Spoon Core-Barrel Sampling	A stainless-steel core barrel was advanced using a hollow-stem auger drilling rig. The core barrel extracted a continuous length of soil and/or rock. The split-spoon core barrel is a cylindrical barrel split length-wise so the two halves can be separated to expose the core sample. Once the core barrel was extracted and opened, a sample for VOC analysis was transferred immediately to a sample container. If necessary, pieces small enough to fit into the sample container were removed from the core using a decontaminated rock hammer or stainless-steel spoon. Containers for VOC analysis were filled as completely as possible and sealed with Teflon-lined caps. The section of core in the core barrel was then screened for radioactivity and organic vapors, and described in a geologic log. A portion of the core was then collected as a discrete sample from the desired depth for remaining analyses.
Handling, Packaging, and Shipping of Samples	Field team members sealed and labeled samples before packing to ensure the sample and the transport containers were free of external contamination. Field team members packaged all samples to minimize the possibility of breakage during transport. After all environmental samples were collected, packaged, and preserved, a field team member transported them to the SMO. The SMO arranged to ship the samples to the analytical laboratories.
Sample Control and Field Documentation	The collection, screening, and transport of samples were documented on standard forms generated by the SMO. These included SCLs, COC forms, and sample container labels. SCLs were completed at the time of sample collection, and the logs were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around each sample container. COC forms were completed and signed to verify that the samples were not left unattended.
Field Quality Control Samples	Field QC samples were collected as follows: *Field Duplicates*: At a frequency of 10%; collected at the same time as a regular sample and submitted for the same analyses *Equipment Rinsate Blank*: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which was collected in a sample container and submitted for laboratory analysis *Trip Blanks*: Required for all field events that include the collection of samples for VOC analysis. Trip blank containers of certified clean sand were opened and kept with the other sample containers during the sampling process

Table B-1.0-1 (continued)

Method	Summary
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination was used to minimize the generation of liquid waste. Dry decontamination included the use of a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample were printed on the SCL provided by the SMO (size and type of container [e.g., glass, amber glass, or polyethylene]). All samples were preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys focused on obtaining survey data of acceptable quality to use during project investigations. Geodetic surveys were conducted with a Trimble 5700 DGPS. The survey data conformed to Laboratory Information Architecture project standards IA-CB02, GIS Spatial Reference System, and IA-D802, Geospatial Positioning Accuracy Standards for A/E/C/ and Facility Management. All coordinates were expressed as State Plane Coordinate System 83, NM Central, U.S. feet. 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 characterization approach for each waste stream managed. During the investigation, waste characterization complied with on- or off-site waste acceptance criteria. All stored IDW was marked with appropriate signage and labels. Drummed IDW was stored on pallets to prevent deterioration of containers. A waste storage area was established before waste was generated. Waste storage areas located in controlled areas of the Laboratory were monitored 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 described in Appendix G.

Table B-1.0-2
SOPs Used for Investigation Activities Conducted at Lower Sandia Canyon Aggregate Area

SOP-5018, Integrated Fieldwork Planning and Authorization
SOP-5028, Coordinating and Evaluating Geodetic Surveys
SOP-5034, Monitor Well and RFI Borehole Abandonment
SOP-5238, Characterization and Management of Environmental Program Waste
SOP-5055, General Instructions for Field Investigations
SOP-5056, Sample Containers and Preservation
SOP-5057, Handling, Packaging, and Transporting Field Samples
SOP-5058, Sample Control and Field Documentation
SOP-5059, Field Quality Control Samples
SOP-5061, Field Decontamination of Equipment
SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities
SOP-01.12, Field Site Closeout Checklist
SOP-06.09, Spade and Scoop Method for Collection of Soil Samples
SOP-06.10, Hand Auger and Thin-Wall Tube Sampler
SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials
SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector
EP-DIR-QAP-0001, Quality Assurance Plan for the Environmental Programs

Note: Procedures used were approved subcontractor procedures technically equivalent to the procedures listed.

Decision-level data from the 1999 RFI are presented and discussed in the approved work plan (LANL 2009, 106660.14; NMED 2009, 106703). The nature and vertical extent of contamination were not defined at this site.

8.2.4 Delayed Investigation Rationale

Delayed investigation is proposed for AOC 72-001 because this site is an active small-arms firing range. The approved investigation work plan proposed that full characterization of this active firing range be delayed until operations cease. At that time, the nature and extent of contamination at AOC 72-001 will be determined and any necessary corrective actions identified and implemented (LANL 2009, 106660.14; NMED 2009, 106703).

9.0 CONCLUSIONS

9.1 Nature and Extent of Contamination

The nature and extent of contamination have been defined for three sites previously investigated or investigated during the 2010 investigation. The nature and extent of contamination have not been defined for 17 sites. A total of seven sites are proposed for delayed characterization and investigation pending D&D of certain building and structures within the aggregate area. One site is currently not subject to corrective action requirements and was not investigated in 2010. Summaries of the nature and extent of contamination and remaining characterization requirements for the sites at former TA-20, TA-53, and TA-72 are presented below.

9.1.1 Former TA-20

The extent of contamination has not been defined for 11 sites in former TA-20. Additional sampling is needed to define the extent of contamination for one or more inorganic chemicals, organic chemicals, or radionuclides at the following sites:

- SWMU 20-001(a)—the vertical extent of barium and perchlorate
- SWMU 20-001(b)—the vertical extent of perchlorate, uranium-234, uranium-235/236, and uranium-238; the lateral extent of barium and selenium
- SWMU 20-001(c)—the vertical extent of chromium and uranium-234; the lateral extent of chromium
- SWMU 20-002(a)—the vertical extent of barium, chromium, nitrate, uranium-235/236, and uranium-238; the lateral extent of beryllium, chromium, and selenium
- SWMU 20-002(b)—the vertical extent of barium, calcium, and perchlorate
- SWMU 20-002(c)—the lateral extent of cesium-137
- SWMU 20-002(d)—the vertical extent of aluminum, barium, uranium-235/236; the lateral extent of chromium
- AOC 20-003(b)—the vertical extent of uranium-235/236; the lateral extent of perchlorate
- AOC 20-003(c)—the vertical extent of uranium-234, uranium-235/236, and uranium-238
- AOC 20-004—the vertical extent of aluminum, barium, calcium, cobalt, copper, nickel, nitrate, selenium, and vanadium; the lateral extent of aluminum, barium, copper, nickel, and vanadium

- SWMU 20-005—the vertical extent of silver; the vertical extent of inorganic chemicals, organic chemicals, and radionuclides at locations 20-612618 and 20-612619

Although Aroclor-1254 and Aroclor-1260 were detected at low concentrations in multiple samples at SWMUs 20-002(c), 20-002(d), and 20-005, there is no indication that PCBs were used at those sites. It is likely that the detected concentrations reflect widespread but very low concentration contamination from multiple potential sources upgradient of this site, including sites at TA-03, TA-61, and TA-53 and developed areas on Laboratory and Los Alamos County or private property (LANL 2009, 107453, p. 5–8). Furthermore, PCB and other contamination in the main drainage of Sandia Canyon have been addressed as part of separate canyons investigations (LANL 2009, 107453). As indicated in NMED's notice of disapproval (NMED 2011, 204629), additional sampling to define the extent of PCBs is not necessary. PCBs will be included as COPCs for these sites for risk evaluations.~~Therefore, additional sampling to define the extent of PCBs at SWMUs 20-002(c), 20-002(d), and 20-005 is not recommended, and PCBs should not be considered COPCs for these sites.~~

9.1.2 TA-53

The nature and extent of contamination are defined for the following three sites in TA-53:

- SWMU 53-001(b), Storage area
- AOC 53-013, Lead spill site
- AOC 53-014, Lead spill site

The extent of contamination has not been defined for six sites in TA-53. Additional sampling is needed to define the extent of contamination for one or more inorganic chemicals, organic chemicals, or radionuclides at the following sites:

- SWMU 53-001(a)—the vertical extent of copper, Aroclor-1254, and Aroclor-1260; the lateral extent of 1,2,4-trimethylbenzene
- SWMU 53-005—the vertical extent of antimony, chromium, acetone, Aroclor-1254, 2-butanone, sec-butylbenzene, 4-isopropyltoluene, 1,3,5-trimethylbenzene, 1,2-xylene, and cesium-137; the lateral extent of antimony, chromium, nickel, acetone, Aroclor-1254, 2-butanone, sec-butylbenzene, 1,1-dichloroethane, isopropylbenzene, 4-isopropyltoluene, 1,1,1-trichloroethane, trichloroethene, 1,2,4-trimethylbenzene 1,3,5-trimethylbenzene, and 1,2-xylene; the vertical extent of inorganic chemicals, organic chemicals, and radionuclides at location 53-612486
- AOC 53-008—the vertical extent of aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, total cyanide, lead, magnesium, nickel, selenium, Aroclor-1248, Aroclor-1254, ethylbenzene, cobalt-60, pl0utonium-239/240, and tritium
- AOC 53-009—the vertical extent of barium, lead, Aroclor-1242, Aroclor-1254, and Aroclor-1260.
- AOC 53-010—the vertical extent of barium, calcium, chromium, and diethylphthalate
- AOC 53-012(e)—the vertical extent of cesium-137, and uranium-235/236; the vertical extent of inorganic chemicals, organic chemicals, and radionuclides at the location of the drainline elbow

Delayed investigations are proposed for the following seven sites in TA-53:

- SWMU 53-006(b), Underground storage tank
- SWMU 53-006(c), Underground storage tank

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Appendix B

Field Methods

B-1.0 INTRODUCTION

This appendix summarizes the field methods used during the 2010 investigation of the Lower Sandia Canyon Aggregate Area at Los Alamos National Laboratory (LANL or Laboratory). Table B-1.0-1 presents a summary of the field methods used, and the following sections provide more detailed descriptions of these methods. All activities were conducted in accordance with approved subcontractor procedures that are technically equivalent to Laboratory standard operating procedures (SOPs) listed in Table B-1.0-2 and are available at http://www.lanl.gov/environment/all/qa.shtml.

B-2.0 EXPLORATORY DRILLING CHARACTERIZATION

No exploratory drilling characterization was conducted during the 2010 investigation.

B-3.0 FIELD-SCREENING METHODS

This section summarizes the field-screening methods used during the investigation activities. Field screening for organic vapors was performed as necessary for health and safety purposes. Field screening for radioactivity was performed on every sample submitted to the Sample Management Office (SMO). Field-screening results for all investigation activities are described in section 3.2.3 and are presented in Table 3.2-2 of the investigation report.

B-3.1 Field Screening for Organic Vapors

Field screening for organic vapors was conducted for all samples at all locations, except when the moisture content of the material exceeded instrument detection limits. Screening was conducted using a MiniRAE 2000 photoionization detector (PID) equipped with an 11.7-electron volt lamp. Screening was performed in accordance with the manufacturer’s specifications and SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector. Screening was performed on each sample collected, and screening measurements were recorded on the field sample collection logs (SCLs) and chain-of-custody (COC) forms, provided on DVD in Appendix F. The field-screening results are presented in Table 3.2-2 of the investigation report.

B-3.2 Field Screening for Radioactivity

All samples collected were field screened for radioactivity before they were submitted to the SMO, targeting alpha and beta/gamma emitters. A Laboratory radiation control technician (RCT) conducted radiological screening using an Eberline E-600 radiation meter with an SHP-380AB alpha/beta scintillation detector held within 1 in. of the sample. The Eberline E-600 with attachment SHP-380AB consists of a dual phosphor plate covered by two Mylar windows housed in a light-excluding metal body. The phosphor plate is a plastic scintillator used to detect beta and gamma emissions and is thinly coated with zinc sulfide to detect alpha emissions. The operational range varies from trace emissions to 1 million disintegrations per minute. Screening measurements were recorded on the SCLs and COC forms and are provided in Appendix F on DVD. The screening results are presented in Table 3.2-2 of the investigation report.

B-3.3 XRF Survey

A survey at Area of Concern (AOC) 53-013 was conducted using a field x-ray fluorescence (XRF) instrument to identify areas of elevated lead concentrations. The survey was conducted using a Niton XL3t 600 XRF analyzer having sufficient sensitivity (i.e., 100 mg/kg or less) to identify areas contaminated above the 800 mg/kg industrial soil screening level (SSL). The instrument was operated in accordance with the manufacturer's instructions, including collection and preparation of samples and analysis of standard samples.

The survey areas were separated into two investigation areas: the AOC 53-013 XRF Survey North/South Yard and the AOC 53-013 XRF Survey East/West Yard (see Appendix C, Attachment C-2). Within each area, sampling locations were positioned approximately 20 ft apart. At locations where lead concentrations were detected above the industrial SSL (800 mg/kg) using XRF analysis, higher resolution coverage was completed using 10-ft spacing to determine the extent of excavation activities. Details of the XRF survey and the results are presented in Appendix C.

B-4.0 FIELD INSTRUMENT CALIBRATION

All instruments were calibrated before use. Calibration of the Eberline E-600 was conducted by the RCT. All calibrations were performed according to the manufacturers' specifications and requirements.

B-4.1 MiniRAE 2000 Instrument Calibration

The MiniRAE 2000 PID was calibrated both to ambient air and a standard reference gas (100 ppm isobutylene). The ambient-air calibration determined the zero point of the instrument sensor calibration curve in ambient air. Calibration with the standard reference gas determined a second point of the sensor calibration curve. Each calibration was within 3% of 100 ppm isobutylene, qualifying the instrument for use.

The following calibration information was recorded daily on operational calibration logs:

- instrument identification number
- final span settings
- date and time
- concentration and type of calibration gas used (isobutylene at 100 ppm)
- name of the personnel performing the calibration

All daily calibration procedures for the MiniRAE 2000 PID met the manufacturer's specifications for standard reference gas calibration.

B-4.2 Eberline E-600 Instrument Calibration

The Eberline E-600 was calibrated daily by the RCT before local background levels for radioactivity were measured. The instrument was calibrated using plutonium-239 and chloride-36 sources for alpha and beta emissions, respectively. The following five checks were performed as part of the calibration procedures:

- calibration date
- physical damage

- battery
- response to a source of radioactivity
- background

All calibrations performed for the Eberline E-600 met the manufacturer's specifications; the requirements of SOP-5006, Control of Measuring and Test Equipment; and the applicable radiation detection instrument manual. Calibrations were recorded in daily activity logs.

B-4.3 Niton XL3t 600 XRF Analyzer Calibration

The XRF instrument was calibrated by the manufacturer and provided with a certification of calibration. The instrument was checked for proper function and calibration using standard aliquots of metals, including lead, as provided by the manufacturer.

B-5.0 SURFACE AND SUBSURFACE SAMPLING

This section summarizes the methods used to collect surface and subsurface samples, including soil, fill, tuff, and sediment samples, according to the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703).

B-5.1 Surface Sampling Methods

Surface samples were collected in former Technical Area 20 (TA-20) and TA-53 using either hand-auger or spade-and-scoop methods. Surface samples were collected in accordance with approved subcontractor procedures technically equivalent to SOP-06.10, Hand Auger and Thin-Wall Tube Sampler, or SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. A hand auger or spade and scoop were used to collect material in approximately 6-in. increments. Samples for volatile organic chemical (VOC) analysis were transferred immediately from the sampler to the sample container to minimize the loss of VOCs during the sample-collection process. Containers for VOC samples were completely filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. The remaining sample material was placed in a stainless-steel bowl with a stainless-steel scoop, after which it was transferred to sterile sample collection jars or bags. Samples were preserved using coolers to maintain the required temperature and chemical preservatives, such as nitric acid, in accordance with an approved subcontractor procedure technically equivalent to SOP-5056, Sample Containers and Preservation.

Samples were appropriately labeled, sealed with custody seals, and documented before it was transported to the SMO. Samples were managed according to approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5058, Sample Control and Field Documentation.

Sample collection tools were decontaminated (see section B-5.7) immediately before each sample was collected in accordance with a subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment.

B-5.2 Borehole Logging

At all locations, the required sampling depths could be reached by hand augers, and a drill rig with a hollow-stem auger was not used to collect subsurface samples. Therefore, boreholes did not require logging.

B-5.3 Subsurface Tuff Sampling Methods

Subsurface samples were collected in accordance with approved subcontractor procedures technically equivalent to SOP-06.10, Hand Auger and Thin-Wall Tube Sampler, or SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials.

Samples for volatile organic compound (VOC) analysis were collected immediately upon retrieval of the split-spoon core barrel or hand auger to minimize the loss of VOCs during the sample-collection process. Containers for VOC samples were filled as completely as possible, leaving no or minimal headspace, and sealed with a Teflon-lined cap. If necessary, pieces small enough to fit into the sample container were removed from the core using a decontaminated rock hammer or stainless-steel spoon. The remaining material was then field screened for radioactivity and visually inspected. After the VOC samples were collected and field screened, the remaining sample material was placed in a stainless-steel bowl, and the material was broken, if necessary, with a decontaminated rock hammer or stainless-steel spoon to fit the material into the sample containers.

A stainless-steel scoop and bowl were used to transfer samples to sterile sample collection jars or bags for transport to the SMO. The sample collection tools were decontaminated immediately before each sample was collected (see section B-5.7) in accordance with an approved subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment.

B-5.4 Quality Control Samples

Quality control (QC) samples were collected in accordance with an approved subcontractor procedure technically equivalent to SOP-5059, Field Quality Control Samples. The QC samples included field duplicates, field rinsate blanks, and field trip blanks. Field duplicate samples were collected from the same material as the regular investigation samples and submitted for the same analyses. Field duplicate samples were collected at a frequency of at least 1 duplicate sample for every 10 samples.

Field rinsate blanks were collected to evaluate field decontamination procedures. Rinsate blanks were collected by rinsing sampling equipment (i.e., auger buckets and sampling bowls and spoons) after decontamination with deionized water. The rinsate water was collected in a sample container and submitted to the SMO. Field rinsate blank samples were analyzed for target analyte list metals and were collected from sampling equipment at a frequency of at least 1 rinsate sample for every 10 solid samples.

Field trip blanks were also collected at a frequency of one per day when samples were being collected for VOC analysis. Trip blanks consisted of containers of certified clean sand opened and kept with the other sample containers during the sampling process. Trip blanks were analyzed for VOCs only.

B-5.5 Sample Documentation and Handling

Field personnel completed an SCL and COC form for each sample. Sample containers were sealed with signed custody seals and placed in coolers at approximately 4°C. Samples were handled in accordance with approved subcontractor procedures technically equivalent to SOP-5057, Handling, Packaging, and Transporting Field Samples, and SOP-5056, Sample Containers and Preservation. Swipe samples were collected from the exterior of sample containers and analyzed by the RCT before the sample containers were removed from the site. Samples were transported to the SMO for processing and shipment to off-site contract analytical laboratories. The SMO personnel reviewed and approved the SCLs and COC forms and accepted custody of the samples. The SCLs and COC forms are provided in Appendix F (on DVD).

B-5.6 Borehole Abandonment

No boreholes were drilled during the 2010 investigation. However, hand-auger sampling locations deeper than 15 ft below ground surface (bgs) were abandoned in accordance with an approved subcontractor procedure technically equivalent to SOP-5034, Monitor Well and RFI Borehole Abandonment, by filling the boreholes with bentonite chips up to 2–3 ft from the ground surface. The chips were hydrated and clean soil was placed on top. All cuttings were managed as investigation-derived waste (IDW) as described in Appendix G.

B-5.7 Decontamination of Sampling Equipment

The split-spoon core barrels and all other sampling equipment that came (or could have come) in contact with sample material were decontaminated after each core was retrieved and logged. Decontamination included wiping the equipment with Fantastik and paper towels. Residual material adhering to equipment was removed using dry decontamination methods such as the use of wire brushes and scrapers. Decontamination activities were performed in accordance with an approved subcontractor procedure technically equivalent to SOP-5061, Field Decontamination of Equipment. Decontaminated equipment was surveyed by an RCT before it was released from the site. Field rinsate blank samples were collected in accordance with an approved procedure technically equivalent to SOP-5059, Field Quality Control Samples.

B-5.8 Site Demobilization and Restoration

Drilling equipment was not used during the 2010 investigation. All temporary fencing and staging areas were dismantled and returned to preinvestigation conditions. All excavations were filled with base course to stabilize for erosion control and to prevent off-site transport.

B-6.0 GEODETIC SURVEYING

Geodetic surveys of all sampling locations were performed using a Trimble RTK 5700 differential global-positioning system (DGPS) referenced from published and monumented external Laboratory survey control points in the vicinity. All sampling locations were surveyed in accordance with an approved subcontractor procedure technically equivalent to SOP-5028, Coordinating and Evaluating Geodetic Surveys. Horizontal accuracy of the monumented control points is within 0.1 ft. The DGPS instrument referenced from Laboratory control points is accurate within 0.2 ft. The surveyed coordinates are presented in Table 3.2-1 of the investigation report.

B-7.0 IDW STORAGE AND DISPOSAL

All IDW generated during the field investigation was managed in accordance with an approved subcontractor procedure technically equivalent to SOP-5238, Characterization and Management of Environmental Program Waste. This procedure incorporates the requirements of all applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy orders, and Laboratory implementation requirements. IDW was also managed in accordance with the approved waste characterization strategy form and the IDW management appendix of the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703). Details of IDW management for the Lower Sandia Canyon Aggregate Area investigation are presented in Appendix G.

B-8.0 DEVIATIONS FROM THE WORK PLAN

Deviations from the approved investigation work plan (LANL 2009, 106660.14; NMED 2009, 106703) are summarized below.

Solid Waste Management Unit (SWMU) 20-001(c): Because no anomalies were identified that could be interpreted as buried waste or landfill boundaries, samples were collected from three depths (5–6 ft, 10–11 ft, and 14–15 ft bgs) at each of 10 locations, as specified in the approved work plan. However, tuff was encountered at depths shallower than 5 ft bgs at each of the 10 locations. In that situation, the approved work plan specified that samples were to be collected above the soil-tuff interface and 2–3 ft below the interface. Samples were not collected at those depths, and all samples were collected from tuff. No additional samples will be collected at those locations because the soil-tuff interface is less than 1–2 ft bgs, and samples above the interface would not appropriately characterize the site.

AOC 20-003(b): An additional sample from the depth of 20 to 21 ft bgs was inadvertently collected and analyzed at location 20-612490.

SWMU 20-005: Because the depth of the inlet drainline could not be determined, samples should have been collected at depths of 3–4 ft and 6–7 ft bgs at locations 20-612618 and 20-612619. Instead, samples were collected from 0–1 ft and 3–4 ft bgs. Additional samples will be collected from 6–7 ft bgs at these locations during the Phase II investigation.

SWMU 53-005: The VOC field-screening result for the deepest sample collected at location 53-612484 was elevated (25.1 ppm), but the borehole was not extended to collect a deeper sample. Additional samples will be collected at this location during the Phase II investigation. The depth of the drainline could not be determined. Therefore, the sampling depths for location 53-612486 could not be determined relative to the depth of the drainline, as required by the approved work plan. Samples were collected at depths of 0–1 ft and 4–5 ft bgs. An additional sample will be collected from 7–8 ft bgs at this location during the Phase II investigation.

SWMU 53-012(e): Samples were not collected at the pipe elbow of the drainline as required. An engineering drawing located subsequent to approval of the investigation work plan indicates the drainline elbow is likely not where it was indicated in Figure 4.2-4 of the work plan (planned location M12e-1), and the elbow was not physically located in the field. Therefore, the sampled location (53-612539) was placed approximately 25 ft from the likely actual location. Samples will be collected at the actual drainline elbow during the Phase II investigation by trenching, digging potholes, or using another appropriate method to physically identify the elbow location.

B-9.0 REFERENCES

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

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

LANL (Los Alamos National Laboratory), July 2009. "Investigation Work Plan for Lower Sandia Canyon Aggregate Area, Revision 1," Los Alamos National Laboratory document LA-UR-09-4329, Los Alamos, New Mexico. (LANL 2009, 106660.14)

NMED (New Mexico Environment Department), August 6, 2009. "Notice of Approval for the Response to the Notice of Disapproval for the Investigation Work Plan for Lower Sandia Canyon Aggregate Area and Revision 1," 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, 106703)

Table B-1.0-1
Summary of Field Investigation Methods

Method	Summary
Spade and Scoop Collection of Soil Samples	This method was used to collect shallow (i.e., approximately 0-12 in.) soil or sediment samples. The spade-and-scoop method involved digging a hole to the desired depth, as prescribed in the approved work plan, and collecting a discrete grab sample. Samples for VOC analysis were transferred immediately into sample containers. Containers for VOC analysis were filled as completely as possible and sealed with Teflon-lined caps. Remaining sample material was placed in a clean stainless-steel bowl for transfer into various sample containers.
Hand Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10–15 ft, but in some cases may be used to collect samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in. inside diameter [I.D.]), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth was reached, the auger was decontaminated before advancing the hole through the sampling depth. Samples for VOC analysis were transferred immediately ionto sample containers. Containers for VOC analysis were filled as completely as possible and sealed with Teflon-lined caps. The remaining sample material was transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers were filled.
Split-Spoon Core-Barrel Sampling	A stainless-steel core barrel was advanced using a hollow-stem auger drilling rig. The core barrel extracted a continuous length of soil and/or rock. The split-spoon core barrel is a cylindrical barrel split length-wise so the two halves can be separated to expose the core sample. Once the core barrel was extracted and opened, a sample for VOC analysis was transferred immediately to a sample container. If necessary, pieces small enough to fit into the sample container were removed from the core using a decontaminated rock hammer or stainless-steel spoon. Containers for VOC analysis were filled as completely as possible and sealed with Teflon-lined caps. The section of core in the core barrel was then screened for radioactivity and organic vapors, and described in a geologic log. A portion of the core was then collected as a discrete sample from the desired depth for remaining analyses.
Handling, Packaging, and Shipping of Samples	Field team members sealed and labeled samples before packing to ensure the sample and the transport containers were free of external contamination. Field team members packaged all samples to minimize the possibility of breakage during transport. After all environmental samples were collected, packaged, and preserved, a field team member transported them to the SMO. The SMO arranged to ship the samples to the analytical laboratories.
Sample Control and Field Documentation	The collection, screening, and transport of samples were documented on standard forms generated by the SMO. These included SCLs, COC forms, and sample container labels. SCLs were completed at the time of sample collection, and the logs were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around each sample container. COC forms were completed and signed to verify that the samples were not left unattended.
Field Quality Control Samples	Field QC samples were collected as follows: *Field Duplicates*: At a frequency of 10%; collected at the same time as a regular sample and submitted for the same analyses *Equipment Rinsate Blank*: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which was collected in a sample container and submitted for laboratory analysis *Trip Blanks*: Required for all field events that include the collection of samples for VOC analysis. Trip blank containers of certified clean sand were opened and kept with the other sample containers during the sampling process

Table B-1.0-1 (continued)

Method	Summary
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination was used to minimize the generation of liquid waste. Dry decontamination included the use of a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample were printed on the SCL provided by the SMO (size and type of container [e.g., glass, amber glass, or polyethylene]). All samples were preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys focused on obtaining survey data of acceptable quality to use during project investigations. Geodetic surveys were conducted with a Trimble 5700 DGPS. The survey data conformed to Laboratory Information Architecture project standards IA-CB02, GIS Spatial Reference System, and IA-D802, Geospatial Positioning Accuracy Standards for A/E/C/ and Facility Management. All coordinates were expressed as State Plane Coordinate System 83, NM Central, U.S. feet. 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 characterization approach for each waste stream managed. During the investigation, waste characterization complied with on- or off-site waste acceptance criteria. All stored IDW was marked with appropriate signage and labels. Drummed IDW was stored on pallets to prevent deterioration of containers. A waste storage area was established before waste was generated. Waste storage areas located in controlled areas of the Laboratory were monitored 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 described in Appendix G.

Table B-1.0-2
SOPs Used for Investigation Activities Conducted at Lower Sandia Canyon Aggregate Area

SOP-5018, Integrated Fieldwork Planning and Authorization
SOP-5028, Coordinating and Evaluating Geodetic Surveys
SOP-5034, Monitor Well and RFI Borehole Abandonment
SOP-5238, Characterization and Management of Environmental Program Waste
SOP-5055, General Instructions for Field Investigations
SOP-5056, Sample Containers and Preservation
SOP-5057, Handling, Packaging, and Transporting Field Samples
SOP-5058, Sample Control and Field Documentation
SOP-5059, Field Quality Control Samples
SOP-5061, Field Decontamination of Equipment
SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities
SOP-01.12, Field Site Closeout Checklist
SOP-06.09, Spade and Scoop Method for Collection of Soil Samples
SOP-06.10, Hand Auger and Thin-Wall Tube Sampler
SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials
SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector
EP-DIR-QAP-0001, Quality Assurance Plan for the Environmental Programs

Note: Procedures used were approved subcontractor procedures technically equivalent to the procedures listed.