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Los Alamos
NATIONAL LABORATORY
EST. 1943

Environmental Programs
P.O. Box 1663, MS M991
Los Alamos, New Mexico 87545
(505) 606-2337/FAX (505) 665-1812

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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: April 24, 2009
Refer To: EP2009-0198

James P. Bearzi, 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 Sampling and Analysis Plan for Direct-Push Technology at Material Disposal Area B

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the Sampling and Analysis Plan for Direct-Push Technology at Material Disposal Area B.

If you have any questions, please contact Mitch Goldberg at (505) 231-8779 (goldberg@lanl.gov) or Ed Worth at (505) 606-0389 (eworth@doeal.gov).

Sincerely,

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

Sincerely,

FOR

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

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National Nuclear Security Administration of the U.S. Department of Energy

MG/DG/AC/MG:sm

Enclosures: 1) Two hard copies with electronic files - Sampling and Analysis Plan for Direct-Push Technology at Material Disposal Area B (LA-UR-09-2338)

Cy: (w/enc.)
Mitch Goldberg, EP-TA-21, MS C349
Ed Worth, DOE-LASO, MS A316
RPF, MS M707 (with two CDs)
Public Reading Room, MS M992

Cy: (Letter and CD and/or DVD only)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-OB, White Rock, NM
Kristine Smeltz, EP-WES, MS M992
EP-TA-21 File, MS C349

Cy: (w/o enc.)
Tom Skibitski, NMED-OB, Santa Fe, NM
Keyana DeAguero, DOE-LASO (date-stamped letter emailed)
Michael J. Graham, ADEP, MS M991
Alison M. Dorries, EP-WES, MS M992
Allan Chaloupka, EP-TA-21, MS C349
IRM-RMMSO, MS A150 (date-stamped letter emailed)

Sampling and Analysis Plan for Direct-Push Technology at Material Disposal Area B

Primary Purpose	This sampling and analysis plan (SAP) is an addendum to the Investigation/Remediation Work Plan for Material Disposal Area B, Solid Waste Management Unit 21-015, at Technical Area 21, Revision 1 (LANL 2006, 095499), prepared by Los Alamos National Laboratory (LANL) in October 2006. This addendum describes the locations and methods to be used to collect samples and analytical data using direct-push technology (DPT) at Material Disposal Area (MDA) B. The MDA B DPT sampling activities are designed to provide operational data for (1) safely performing waste-retrieval and sorting activities by establishing correlations between field instrument readings and laboratory analysis before actual excavation begins; (2) revising the estimated quantity and distribution of radioactive material at risk ([MAR] Note: the quantity of radioactive MAR is measured in units of curies or grams of plutonium-239-equivalent); and (3) analyzing waste samples for hazardous materials before excavation to aid in initial waste-sorting activities. The systematic sampling data using DPT are intended to supplement, but not to replace, any sampling performed during waste excavation as described in the approved work plan (LANL 2006, 095499).
Conceptual Model	From 1944 until it closed in 1948, MDA B received contaminated materials from the earliest LANL operations and may contain both hazardous chemical and radioactive waste. MDA B was the first common disposal area for radioactive waste generated at LANL. The waste disposal units at MDA B consist of pits and/or trenches (Plate 1) constructed by progressive eastward expansion; the earliest waste disposal units on the far western end of MDA B are believed to consist of long trenches up to 12 ft deep. The far eastern end of MDA B is thought to consist of shallow pits, about 5 ft deep, that contain glass bottles with unknown chemicals as well as radioactive waste. Interstitial soil and fill material are likely present in all areas between and within the waste disposal units. The cover at MDA B consists of soil, gravel, and a local asphalt overburden. No formal disposal records for MDA B are known to exist, and the total inventory and distribution of hazardous and radioactive materials are not known. Process knowledge was derived from reports and memoranda archived from the operating groups, logbooks, aerial photographs, and personal interviews. The vast majority of waste disposed of at MDA B was contaminated with residual radioactivity, and the waste included routine laboratory waste, contaminated glassware, obsolete equipment and wooden laboratory furniture, demolition debris, building materials, clothing, paper, trash, and small amounts of chemicals from the laboratory areas that may have included cleaning solutions, such as trichloroethylene, and other chemicals, such as acids, bases, and experimental solvents generated at the bench-scale. The largest waste contributors may have been the contaminated laundry and building demolition debris as laboratory structures and equipment were upgraded after World War II. Nonroutine waste included materials from spills and accidental releases of plutonium, radium, and other radionuclides to clothing, soils, and building materials that were determined to be unrecoverable. Based on Monte Carlo analysis of limited waste data, the plutonium inventory is very conservatively estimated to be no more than 200 g. This calculation assumed a homogenous distribution that is not believed to be realistic based on the process knowledge described above. The actual distribution of plutonium is believed to vary across the landfill with very little or none in the western trenches. As an initial estimate, the Monte Carlo analysis resulted in an average plutonium concentration of 7.5×10^{-4} plutonium equivalent- (PE-) Ci/m^3.

Rationale for Sampling Locations	In order to maintain safe limits of operation, LANL has established limits for radioactive MAR in the excavation areas in accordance with requirements established by the National Nuclear Security Administration and the U.S. Department of Energy Los Alamos Site Office. The radioactive MAR limit of 0.15 PE-Ci (approximately 2.4 g of plutonium) ensures that hazards are controlled within an acceptable, safe operating envelope for the level of risk associated with waste retrieval from MDA B. This means the excavation process cannot exceed an estimated quantity of about 200 m^3 of excavated waste at any one time before materials must be containerized and moved to a storage area. DPT sampling will allow revision of the assumptions and estimates of MAR in each area as part of a series of excavation plans that are required under the LANL authorization basis. This includes identifying areas that may have higher than the average plutonium levels, so the excavation limits can be revised accordingly. To facilitate timely data acquisition while maximizing the information acquired, DPT sampling will be completed in two phases. Currently, little subsurface data are available from the MDA B disposal trenches for radionuclides, and no waste data are available for hazardous constituents. Consequently, statistical formulae are not appropriate for determining a sample size that will support the Phase I sampling activity. In addition, the landfill waste is likely to be highly variable laterally and vertically across all disposal trenches. Phase I sampling will involve the systematic sampling of trenches 1–10 (Plate 1) at locations determined on the sitewide grid. The sitewide grid will use state plane coordinates and will be established to track all activities during the removal process, including DPT samples, waste removal, and verification sampling after waste is removed. Table 1 summarizes planned quantity of Phase I samples to be collected. DPT involves a portable sampling device, such as a Geoprobe, that uses a small-diameter, steel push-tube and core collection sleeve technique rather than a rotating bit to core and extract small volume samples (Figure 1). If refusal is encountered the DPT will be moved in 2-ft increments about the initial location, and the DPT core will be driven into/through the waste until either (1) a core is obtained *or* (2) four attempts have been completed without retrieving a sample. If a core cannot be collected, the sampling location will be moved to an adjacent grid. Each sample will be field screened, and based on these results, all or part of the materials collected in the push tube will be submitted for laboratory analysis. The results of the first phase are a set of correlations between field instruments and laboratory results. The results of the Phase I field-screening and laboratory analyses will also be used to determine the need and extent of statistical sampling during Phase II. The Phase II sampling will be statistically based and will rely on field-screening methods and the correlations established during Phase I.
Field-Screening Methods	The direct-push cores will be field screened for both radiological and nonradiological contaminants. The 4-ft sample liners will not be opened in the field. The following field-screening techniques will be employed during the sampling effort as a means to monitor safe working conditions as well as to support MAR control and waste-sorting activities: • Gross field radioactivity levels using a variety of detectors (e.g., sodium iodide, alpha/beta scintillation, dose rate meters, and/or scalers for removable activity); • Volatile organic compounds (VOCs) using photoionization detectors on open ends of sample liners; and • Gamma-emitting isotopes using a high-purity germanium (HPGe) detector. Downhole gamma radiological surveys will be performed at selected locations on the basis of poor core return or other field conditions.

Laboratory Screening	The 4-ft sample liners will be split open in a sample preparation fume hood at an off-site laboratory under negative pressure to avoid the spread of contamination. Laboratory screening may include the following methodologies, as determined by industrial hygiene or radiological control: • VOCs using photoionization detectors over split open core; • Gross radioactivity levels using a variety of detectors (e.g., sodium iodide, alpha/beta scintillation, Geiger Muller); and • Metals analysis using an x-ray florescence spectrometer or equivalent instrument.
Laboratory Analysis	Core segments will be composited in the laboratory for off-site contract laboratory analysis based on field screening and visual inspection of core segments. Individual core segments or portions of segments may be selected for discrete analysis based on field laboratory screening, visual inspection, or other conditions identified during direct push core collection. Table 1 summarizes the number of Phase I samples that will be analyzed. Tables 2 and 3 list the planned laboratory analyses for the Phase I samples for radiological and hazardous constituents, respectively.
Phase II Sampling	The results of Phase I sampling and analyses will determine how Phase II of the proposed approach will proceed. If both DPT and the field methods are deemed effective, Phase II will proceed by collecting core samples from additional sitewide locations, as necessary, to achieve the required statistical confidence in the data set to support MAR control limits. DPT will then be used to collect samples on the broader sitewide grid as a means of establishing an inventory for preparing the excavation control plans. The following field-screening techniques will be used during the sampling effort as a means of monitoring safe working conditions as well as supporting MAR control limits: • Gross field radioactivity levels using a variety of detectors (e.g., sodium iodide, alpha/beta scintillation, dose rate meters, and/or scalers for removable activity); • VOCs using photoionization detectors on open ends of sample liners; and • Gamma-emitting isotopes using an HPGe detector. Downhole gamma radiological surveys will be performed at selected locations on the basis of poor core return or other field conditions.
Potential Drilling Fluids, Composition, and Use	No drilling fluids will be used at any of the sampling locations. DPT is a portable sampling device that does not use a rotating bit to extract a small volume sample in a clear, thin-wall sleeve. One manufacturer is Geoprobe, but equipment by other manufacturers is also available. This technique minimizes mixing of landfill materials during sampling.
Investigation-Derived Waste Management	Cores and other materials produced during drilling will be managed and disposed of in accordance with a waste characterization strategy form prepared for this supplemental activity in accordance with ENV-RCRA-SOP-5022, Characterization and Management of Environmental Restoration (ER) Waste.

REFERENCE

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

Copies of the master reference set are maintained at the 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), October 2006. "Investigation/Remediation Work Plan for Material Disposal Area B, Solid Waste Management Unit 21-015, at Technical Area 21, Revision 1," Los Alamos National Laboratory document LA-UR-06-6918, Los Alamos, New Mexico. (LANL 2006, 095499)

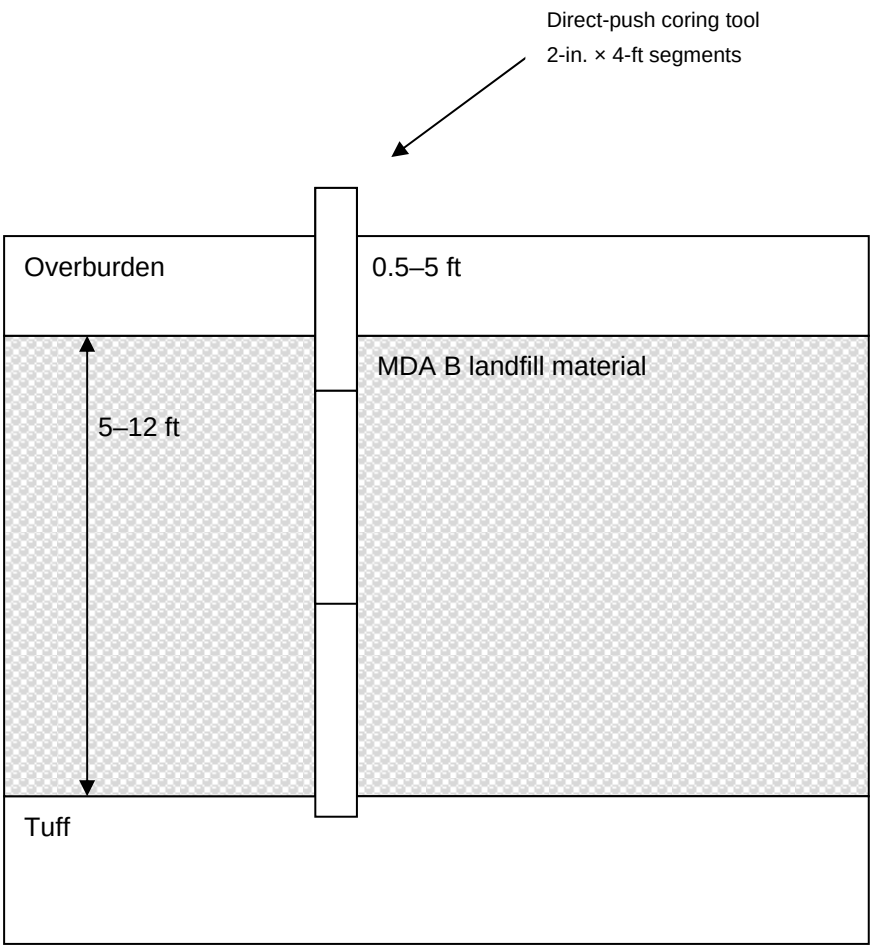

Figure 1 General DPT sampling method

Table 1
Summary of Planned Phase I Samples

Trench ID	Surface Area (ft^2)	Trench Depth (ft)	Number of Locations	Samples[a] per Location	Number of Samples[b]
1	3750	5	2	2	4
2	6600	5	3[c]	2	6
3	7000	5	3	2	6
4	18,750	12	7	3	21
5	5600	12	3	3	9
6	18,750	12	7	3	21
7	15,000	12	6	3	18
8	14,000	12	6	3	18
9	7150	5	3	2	6
10	12,500	5	5[d]	2	10
Total	109,100	n/a[e]	45	n/a	119

[a] DPT core samples will be collected in 4-ft segments.

[b] Sample collection depends on recovery of materials in the core.

[c] Trench 2 has an area under large cobbles that cannot be sampled using the DPT method; therefore, this area of the trench will not be sampled during Phase I.

[d] Trench 10 has an area under a compacted gravel road that cannot be sampled using the DPT method; therefore, this area of the trench will not be sampled during Phase I.

[e] n/a = Not applicable.

Table 2
Summary of Analytical Requirements for MDA B Radioactive Constituents

Analyte	Method	Approach
Gamma Spectroscopy	HASL-300	10% of total to verify field HPGe
Alpha Spectrometry	HASL-300	100% of samples above screening level identified by HPGe results
Strontium-90	EPA 905.0	100% of total
Tritium	EPA 906.0	Maximum 20% of total, visual liquid (random)

Table 3
Summary of Analytical Requirements for MDA B Hazardous Constituents

Analyte	Method	Approach
VOC target compound list (TCL)	EPA 8260b	100% of total
Semivolatile organic compound TCL	EPA 3545/8270d	100% of total
Target analyte list metals + uranium	EPA 3050b/6020a	100% of total
Mercury	EPA 7471b	100% of total
Toxicity characteristic leaching procedure	EPA 1311	100% of total
Dioxins/furans	EPA 8280/90	If polycyclic aromatic hydrocarbons >2 parts per million (fire + chlorinated aromatics = mechanism for TCDD formation)

Plate 1 Disposal trench designation using Electromagnetic-61 geophysical survey data

Data Sources:

Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 October 2008.

EM-61 Grid (GeoTIFF), 2008 MDA B EM-61 Survey, "Geophysical Investigation of Material Disposal Area B," ARM Geophysics, Project No. 08351; as received by Portage Inc., 26 February 2009.

Hypsography, 10, 20, and 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

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.

Materials Disposal Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; ER2004-0221; 1:2,500 Scale Data; 23 April 2004.

MDA B Trench Boundaries, Interpreted; Geophysical Investigation of Material Disposal Area B," ARM Geophysics, Project No. 08351; as received by Portage Inc., 26 February 2009.

Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 October 2008.

Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 October 2008.

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

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 October 2008.

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

10' x 10' MDA B Project Reference Grid, Unpublished Data; Portage Inc.; 25 October 2008.

Map: MDAB_DPPlan_v1.R0
April 20, 2009
Darren Green, Portage Inc.

Disclaimer: This map was created for work processes associated with the MDA B Remediation. All other uses for this map should be confirmed with the LANL Enviromental Programs Directorate.