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Date: May 12, 2005
Refer To: ER2005-0285

Mr. James Bearzi
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

RECEIVED
MAY 2005
NMED Hazardous Waste Bureau

SUBJECT: RESPONSE TO APPROVAL WITH MODIFICATIONS, INVESTIGATION WORK PLAN FOR MATERIAL DISPOSAL AREA C, SOLID WASTE MANAGEMENT UNIT 50-009, AT TECHNICAL AREA 50, REVISION 1, DATED APRIL 6, 2005

Dear Mr. Bearzi:

Enclosed please find two copies of the Los Alamos National Laboratory (LANL) and the Department of Energy (DOE) response to the 30-day request for supplemental information specified in the New Mexico Environment Department (NMED) approval with modifications letter for the investigation work plan for Material Disposal Area (MDA) C, dated April 6, 2005. The approval with modifications letter was received by the Environmental Stewardship–Environmental Remediation & Surveillance Program (ENV–ERS) on April 13, 2005. In addition to providing the supplemental information, LANL and DOE are also requesting an extension to the schedule for completing the investigation activities at MDA C. The basis for this request is provided below, along with the requested date for submitting the MDA C investigation report to NMED.

As stipulated in the approval with modifications letter in specific comment #23A, the NMED requires a total of 32 boreholes be drilled at MDA C. This requirement increases the total number of boreholes by 18 from that proposed in the January 2004 work plan update. In addition, specific comment #23E requires collecting volatile organic compound (VOC) field-screening data at specified intervals identified in specific comment #23B. This requirement will necessitate isolating the base of the borehole,

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purging the air in sufficient quantities to ensure that formation air is sampled, and screening the air for VOCs at each sampling interval. This VOC sampling procedure will take significantly longer to complete than field-screening VOCs on core samples using the headspace method specified in Section IX.B.2.d in the March 1, 2005, Consent Order. The addition of 18 boreholes and the new borehole VOC field-screening requirement will increase the drilling and sampling time for each borehole.

During the Consent Order schedule negotiations for MDA C, the amount of time needed to comply with Nuclear Environmental Site (NES) health and safety requirements was not known. Based on recent experience with the Middle Mortandad/Ten Site Aggregate Area investigation, the drilling rate at an NES is substantially slower than non-NES drilling because of the additional health and safety monitoring requirements. Exhumed material (including core and cuttings) will be evaluated for radioactive and hazardous chemicals, and the nature and extent of the material matrix will be determined immediately after the material is brought to the surface to ensure the disposal units have not been breached. If radiological or hazardous chemical criteria are exceeded, if the material is determined not to be tuff or other native material, or if unexpected conditions develop, drilling will be stopped immediately. Drilling will continue only after it is determined that a disposal unit has not been breached. If a disposal unit has been breached, drilling in that hole will be terminated permanently and the hole will be abandoned. Drilling activities will proceed at a rate of core production so field screening and matrix evaluation activities are performed before the next core run. These NES health and safety monitoring requirements will increase the drilling and sampling time for each borehole.

LANL estimates the additional time for drilling 32 boreholes, collecting borehole VOC field-screening data, complying with NES health and safety requirements, and reporting will require an additional 10 months to complete. LANL requests a new due date of December 6, 2006 for the MDA C investigation report submittal.

If you have any questions regarding this matter, please contact Kent Rich at (505) 665-4272 or Woody Woodworth at (505) 665-5820.

Sincerely,

for

David McInroy, Deputy Program Director
Environmental Stewardship
Los Alamos National Laboratory

Sincerely,

for

David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Office

DM/DG/KR/bms

Enclosures: 1) Response to Approval with Modifications, Investigation Work Plan for MDA C, SWMU 50-009, at TA-50, Revision 1, Dated April 6, 2005
2) Certification by the ENV-ERS Program Technical Representatives

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IM-9, MS A150
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S-7, MS F674
CT# 05-032

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M. Leavitt, NMED-SWQB
C. Voorhees, NMED-OB

CERTIFICATION

CERTIFICATION BY THE ENVIRONMENTAL STEWARDSHIP– ENVIRONMENTAL REMEDIATION & SURVEILLANCE PROGRAM TECHNICAL REPRESENTATIVES

Document Titles: **RESPONSE TO APPROVAL WITH MODIFICATIONS, INVESTIGATION WORK PLAN FOR MATERIAL DISPOSAL AREA C, SOLID WASTE MANAGEMENT UNIT 50-009, AT TECHNICAL AREA 50, REVISION 1, DATED APRIL 6, 2005**

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Name: _____ for Date: 05/11/05
David McInroy, Deputy Program Director
Environmental Remediation & Surveillance Program
Los Alamos National Laboratory

or

_____ Date: _____
Ken Hargis, Division Leader
Environmental Stewardship Division
Los Alamos National Laboratory

_____ for Date: 12/05/05
David Gregory, Federal Project Director
Environmental Restoration Program
Department of Energy/Los Alamos Site Office

or

_____ Date: _____
John Ordaz,
Assistant Area Manager of Environmental Projects
Department of Energy/Los Alamos Site Office

Response to Approval with Modifications,
Investigation Work Plan for
Material Disposal Area C, Solid Waste Management Unit 50-009,
at Technical Area 50, Revision 1, Dated April 13, 2005,
Los Alamos National Laboratory, EPA ID# NM0890010515

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) responses follow each NMED comment.

General Comment:

1. *The Permittees must provide a brief description of investigation, sampling or analytical methods and procedures in documents submitted to NMED that includes sufficient detail to evaluate the quality of the acquired data in accordance with Section IX.A, Standard Operating Procedures, of the March 1, 2005 Consent Order (Order).*

LANL Response

1. LANL has prepared a table summarizing the methods incorporated into the referenced SOPs (Attachment 1). The introduction to Section 5 will be revised to include a reference to this table.

Specific Comments:

NMED Comment

1. *There is no need to include the disclaimer regarding radioactive waste data in this section or on the title page of the document. As part of the Order, the Permittees agreed to voluntarily test for, and report on radionuclides, as detailed in a letter from Everet Beckner, NNSA Deputy Director, to NMED Secretary Ron Curry, dated August 26, 2004.*

LANL Response

1. In accordance with the cited letter, LANL will continue to provide NMED all radionuclide data collected. The data is provided for information purposes only. The disclaimer is appropriate and will be included on the inside cover of the work plan.

NMED Comment

2. *The Permittees must provide a map showing the location of SWMU 50-006(c) and its proximity to MDA C. The Permittees must also explain why the other surrounding SWMUs and AOCs (Figure ES-2, LANL 1992, 07672) could not or have not affected MDA C. (Submit to NMED within 30 days of receipt of this letter)*

LANL Response

2. The following text will replace Section 2.3. A map showing the locations of Solid Waste Management Units (SWMUs) near Material Disposal Area (MDA) C will be added to the work plan (Attachment 2).

SWMU 50-006(a) is located directly north of Pit 5 at the head of Ten Site Canyon (Figure 4). SWMU 50-006(a) consists of the area affected by two accidental operational releases of untreated radioactive wastes and unknown chemicals in 1974. The outfall area was partially remediated in 1981 by the removal of 70 m^3 of contaminated soil. Although SWMU 50-006(a) has impacted Ten Site Canyon, the release did not affect MDA C since the SWMU is located downgradient of MDA C.

Emissions from exhaust stacks at a number of the buildings at TA-50 were designated as SWMU 50-006(c) (Figure 4). Radioactive emissions from these stacks could potentially have been deposited on surface soils within TA-50, including MDA C after the clean crushed tuff was in place. Any surface contamination from stack emissions would be detected in the surface soil samples collected during the Phase I RFI.

The other SWMUs within TA-50 include two areas of active underground tanks [SWMUs 50-002 (a), (b)-00, and (c)], a decommissioned tank [SWMU 50-002(d)], a decommissioned septic system [SWMU 50-011(a)], a number of storage areas [SWMUs 50-003 (a), (b), (c), (d) and (e)], an active underground drainage system [SWMU 50-001(b)], and decommissioned waste lines and tanks [SWMU 50-004(a)-00] (Figure 4). These SWMUs lie 4 to 25 ft below grade, and no viable transport pathways for releases related to these SWMUs exist that may affect MDA C.

Based on the Phase I RFI data for MDA C and adjacent SWMUs at TA-50 and TA 35, the only areas in close proximity that may potentially have been affected by MDA C is Ten Site Canyon, which is considered an AOC. Eroded surface soils from MDA C, in addition to soils and contaminant releases from other SWMUs and/or AOCs at TA-50 and other TAs, have been deposited in the canyon bottom and stream banks.

NMED Comment

5. *If clean crushed tuff was placed over MDA C in 1984, there should not be any detects of radionuclides, inorganic, or organic chemicals in surface sampling data, especially from 0-6 in. Also, there would not necessarily be a consistent pattern of contaminants in fill or soils from fill. The Permittees must explain why there are detects of metals, radionuclides, SVOCs, Aroclor-1254 and Aroclor-1280 in surface samples that were collected from clean crushed tuff cover. (Submit to NMED within 30 days of receipt of this letter)*

LANL Response

5. Some detections of naturally occurring metals and radionuclides above background values (BVs) is expected. BVs are related to upper confidence limits of natural background distributions of concentrations. Therefore, when many constituents and samples are present in a data set, a few occurances of site concentrations exceeding BVs are likely to occur. For example, lead was one of the two metals exceeding BVs in surface samples. Of the nine lead concentrations exceeding BVs, only one result exceeds the maximum concentration in soil background data set (30 mg/kg vs. 28 mg/kg). The other metal exceeding BVs was silver. The BV for silver (1 mg/kg) is based on nominal detection limit because silver was not included in the background analyte list (LANL 1998, 59730, p. 11). Therefore, it is not possible to determine whether the detected concentrations (1.1 mg/kg and 6 mg/kg) actually exceed background.

The few detected concentrations of Aroclors and semivolatile organic compounds (SVOCs) (detected

at a frequency between 2% and 9%), may result from existing trace levels in the material used as cover at MDA C. It may also result from subsequent trace contamination related to airborne deposition. The location of the four Aroclor-1260 and two bis(2-ethylhexyl)phthalate detects may indicate a localized release related to Pit 6.

NMED Comment

6. *Table B-18 lists 390 samples and 57 of these samples were not field-screened. This leaves 315 total samples that were field-screened. The Permittees must explain how they determined that 333 samples were field-screened. The Permittees must also explain why there were 57 samples that were not screened at all. This information must be included in a revised Historical Investigation Report (HIR). The revised HIR must be submitted within 180 days of receipt of this letter.*

LANL Response

6. The numbers reported in the work plan are correct. A total of 390 samples were collected and 333 samples were field-screened. Of the 57 samples that were not field-screened (390 less 333), 14 of the samples were analyzed from curated core and were not screened before they were sent to the analytical laboratory. The remaining 43 samples were collected from below 210 ft in borehole 50-09100. As described in Section B-2.3.1 of the work plan, the cap from borehole 50-09100 was removed during the period of January 29 to February 5, 1996, and the borehole was extended from 210 to 316 ft to collect stratigraphic and geohydrologic data; therefore, no field-screening was performed on these samples.

NMED Comment

8. *Based on the recent discovery of perched groundwater at approximately 750 ft at TA-55 the Permittees are required to submit all borings logs associated with CMR replacement to NMED within 30 days of receipt of this letter. Based on review of the borings logs, NMED may require additional investigation pursuant to Section IV.C.3.c.iv of the Order.*

LANL Response

8. A primary objective of the investigation activities at MDA C is to determine whether perched groundwater is present beneath MDA C. A vertical borehole will be drilled to a depth of approximately 800 ft in the area north of Pit 5 near the head of Ten Site Canyon to determine if perched groundwater is present. The CMR boring log data are not relevant to the investigations at MDA C. The CMR boreholes were installed to collect geotechnical data related to a construction project at TA-55 and were not installed to determine the presence or absence of groundwater. This borehole was not a requirement of any Consent Order work plans and was not installed to fulfill any requirements of the Consent Order, nor was it installed in accordance with ENV-ERS procedures. The presence of perched goundwater directly beneath MDA C will be determined by drilling the proposed 800 ft borehole.

NMED Comment

10. *The Permittees shall include information regarding proposed activities related to Investigation-Derived Waste (IDW) management. The Permittees may reference Appendix F for detailed information, but IDW management is a key component of the Scope of Activities and must be noted in this section.*

LANL Response

10. The text in Section 4.0 will be updated to refer to Appendix F, which has been updated and is included as Attachment 3 to this response.

NMED Comment

14. NMED reminds the Permittees that the units of a photoionization detector (PID) are parts per million (ppm); not parts per million per volume (ppmv), the two are not equivalent. Concentrations reported for vapor phase monitoring are chemical-specific and are calculated using specific chemical information. A PID gives a quantitative indicator of VOCs.

The Permittees also state in this section that use of a PID would be an ineffective field screening method for VOCs. NMED recognizes that detection of VOCs in tuff using a PID is unlikely in this application at any significant distance from the disposal units; therefore, the Permittees must replace field screening of soil samples with collection and field screening of vapor samples at each sampling interval.

LANL Response

14. LANL acknowledges NMED's comment regarding the units of a photoionization detector (PID) and will amend the text in the work plan. The PID will be used to field-screen for VOCs in vapor samples collected at each sampling interval, as required by NMED.

NMED Comment

16. The Permittees shall describe all methods for conducting the proposed activities during the investigation. The work plan lists the Standard Operating Procedures (SOPs) to be followed during the investigation. See NMED general comment #2. (Submit to NMED within 30 days of receipt of this letter)

LANL Response

16. LANL will replace the table in the work plan with the table included as Attachment 1 to this response.

NMED Comment

19. The Permittees must describe the procedures and limitations of the B&K multigas monitor. (Submit to NMED within 30 days of receipt of this letter).

LANL Response

19. The Brüel and Kjaer (B&K) multigas analyzer screens air for organic gaseous concentrations. Six factory-installed optical filters within the B&K determine specific gases to be analyzed. During the MDA C field investigation activities, the B&K will be used to field-screen borehole air samples for TCA, TCE, Freon-11, PCE, CO2, and water vapor. The instrument quantifies and displays the concentrations of these six gases in units of parts per million (ppm). Before each day's sampling activities, the B&K will be tested for operational efficiency. The B&K is quick and efficient, making it an ideal instrument for determining concentrations in the field. Since TCE and PCE have been detected previously at MDA C, the B&K will provide field-screening data specifically targeted to screen for these

two chemicals. However, the B&K will be used to supplement PID measurements and will not replace PID field-screening data. The primary limitation of the B&K is that only six different chemicals can be analyzed at one time.

NMED Comment

26. The RFI Work Plan for OU 1147 notes that mercury was disposed in Pit 5, but it is not listed as a constituent in the description of Pit 5 in this section. The Permittees must explain this discrepancy. (Submit to NMED within 30 days of receipt of this letter)

LANL Response

26. According to the text of the RFI work plan for OU 1147 (Section 2.3.1, 1st paragraph), the information for Table 2-10 is "based on site logbooks." However, the text summary of contaminants in Pit 5 in Section 2.3.1.1 of the OU 1147 work plan, which also refers to site logbooks, does not mention mercury. The list of contaminants in Pit 5 provided in Appendix B of the MDA C work plan was derived from a review of the individual disposal records in logbooks 6030, 7277, and 9593, which contain the disposal records for Pit 5. These records do not describe the disposal of mercury or mercury-containing items.

NMED Comment

27. This section also notes that core samples were field tested for HE and VOCs. These results are not noted on the borehole logs nor are they included in the data submitted with the work plan. The Permittees shall provide all available screening and analytical data in the revised MDA C HIR. (The revised HIR must be submitted within 180 days of receipt of this letter.)

LANL Response

27. The field-screening results from Phase 1 borehole sampling are included in Table B-18 of the approved work plan. As indicated in the text of the work plan in Section B-2.3.1, "Results of core sample field screening using the PID showed no VOCs in the core at concentrations exceeding readings in ambient air (Table B-18). A review of sample collection log results of core samples screened with field spot-test kits indicated no high explosives (HE) detections in any of the 5-ft intervals of core collected at MDA C (Table B-18)." All Phase I RFI data were included on a data CD (Appendix E) attached to the inside back cover of the work plan.

NMED Comment

30. The Permittees shall provide a log for borehole 50-10131. NMED notes that borehole 50-10131 and borehole 50-09108 are the same; however, 50-10131 was advanced to a greater depth (315 feet total depth in 50-10131 versus 120 feet total depth in 50-09108). (Must be submitted to NMED within 30 days of receipt of this letter)

LANL Response

30. The geology of borehole 50-10131 was not recorded during drilling and a borehole log was not produced. Boreholes 50-10131 and 50-09108 are not the same as NMED stated. However, the collar location for both boreholes is the same. Borehole 50-10131 is a vertical borehole with a total depth of

250 ft (not 315 ft as stated in NMED's comment). Borehole 50-09108 is an angled borehole with a total length of 120 ft.

NMED Comment

32. *These two constituents are not discussed again in this section. The Permittees shall provide a discussion of the cyanide and mercury data in the revised MDA C HIR. (The revised HIR must be submitted within 180 days of receipt of this letter.)*

LANL Response

32. The discussion of the cyanide and mercury data was included in the MDA C historical investigation report. The sentence leading into the paragraph where these analytes were discussed in Section D-3.2.1 will be removed and the revised section will read as follows:

> As shown in the box plots, cyanide and mercury do not have a background data set for Qbt2 and Qbt3. Therefore, further statistical tests could not be performed for these two analytes. Although the DL for mercury in 11 tuff samples was slightly above the BV of 0.1 mg/kg, further evaluation of the results found that three samples collected from Qbt2 and Qbt1v had DLs of 0.05 mg/kg, which is less than the BV of 0.1 mg/kg. The 11 samples detected above the BV were reported with a DL of 0.11 mg/kg, which is equivalent to the BV of 0.1 mg/kg. The lack of detectable mercury slightly above or below the BV does not indicate a release at MDA C. Additional mercury data will be collected in proposed boreholes.
>
> Cyanide was detected in 11 samples collected from Qbt3. Because cyanide in tuff has no BV, detection status was used as a guide for further evaluation. The detected concentrations of cyanide ranged between 0.22 and 10.2 mg/kg (see Table B-21). Figure D-14 provides additional review of the cyanide data in the form of borehole concentration profiles. Cyanide was detected three times in borehole 50-09101 and five times in borehole 50-09104. Cyanide was also detected once in three additional boreholes: 50-09100, 50-09108, and 50-09110. As discussed in Section B-2.3, cyanide results were also rejected for 16 samples (a maximum of 2 samples from 9 different boreholes). Fifteen of these samples were collected from curated core; the cyanide data were rejected because the holding times had been exceeded. Additional cyanide data will be collected in the proposed boreholes.

NMED Comment

33. *NMED does not approve the Permittees' plan for handling Investigation Derived Waste (IDW). Specifically, the Permittees may not return drill cuttings, or any other IDW to their point of origin. Rather, the Permittees must contain all IDW, and characterize it to ensure proper handling, including but not limited to, final disposal in accordance with Section IX.B.2.b.iv of the Order.*

    In their description of the methods and procedures used to characterize and manage all IDW, the Permittees may not substitute a reference to their SOPs for a description of its procedures (See General Comment #2).

    Whether the waste is RCRA hazardous or low-level only, the Permittees may not return environmental media to the point of origin because, by doing so, the Permittees will change the hydraulic characteristics of the unit(s) and may provide a conduit for contaminant migration. All boreholes must be properly plugged and abandoned following Section X.D of the Order.

Drill cuttings, purge and decontamination water, PPE, and all other IDW must be containerized and characterized prior to disposal. Each container of waste generated must be properly labeled immediately following containerization. All IDW must be sampled and analyzed for contaminants that are suspected or detected prior to or during investigation activities. All suspected radioactively contaminated waste/material should be sampled or surveyed for radionuclides. All IDW must be disposed of properly at an appropriate disposal facility. The methods used to store, control, and transport each waste type and classification must be included in the investigation report. (Submit to NMED within 30 days of receipt of this letter.)

LANL Response

33. LANL has revised the IDW management appendix (Attachment 3) in response to NMED's comments. Specifically, the discussions of returning IDW to the point of origin (including drill cuttings) was deleted, and additional details were provided on how waste streams will be characterized.

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ATTACHMENT 1

Table 5

Brief Description of Field Investigation Methods

Method	Summary
Spade and Scoop Collection of Soil Samples	This method is typically used to collect shallow (i.e., approximately 0–12 in.) soil or sediment samples. The "spade-and-scoop" method involves digging a hole to the desired depth, as prescribed in the sampling and analysis plan, and collecting a discrete grab sample. The sample is typically placed in a clean stainless steel bowl for transfer into various sample containers.
Hand Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10–15 ft, but may in some cases be used for collecting samples of weathered or nonwelded tuff. The method involves hand-turning a stainless steel bucket auger (typically 3–4 in. i.d.), and creating a vertical hole that can be advanced to the desired sample depth. When the desired depth is reached, the auger is decontaminated before advancing the hole through the sample depth. The sample material is transferred from the auger bucket to a stainless steel sampling bowl before filling the sample container.
Split-Spoon Core-Barrel Sampling	In this method, a stainless steel core barrel (typically 4-in. i.d., 2.5 ft long) is advanced using a powered drilling rig. The core barrel extracts a continuous length of soil and/or rock that can be examined as a unit. The split-spoon core barrel is a cylindrical barrel split lengthwise so that the two halves can be separated to expose the core sample. Once extracted, the section of core is typically screened for radioactivity and organic vapors, photographed, and described in a geologic log. A portion of the core may then be collected as a discrete sample from the desired depth.
Handling, Packaging, and Shipping of Samples	Field team members seal and label samples before packing and ensure that the sample and the transport containers are free of external contamination. Field team members package all samples to minimize breakage during transportation. After all environmental samples are collected, packaged, and preserved, a field team member transports them to either the SMO or an SMO-approved radiation screening laboratory under chain-of-custody. The SMO arranges for shipping of samples to analytical laboratories. The field team member must inform the SMO and/or the radiation screening laboratory coordinator when levels of radioactivity are in the action-level or limited-quantity ranges.
Sample Control and Field Documentation	The collection, screening, and transport of samples are documented on standard forms generated by the SMO. These include sample collection logs, chain-of-custody forms, and sample-container labels. Collection logs are completed at the time of sample collection and are signed by the sampler and a reviewer who verifies the logs for completeness and accuracy. Corresponding labels are initialed and applied to each sample container, and custody seals are placed around container lids or openings. Chain-of-custody forms are completed and assigned to verify that the samples are not left unattended.
Field Quality-Control Samples	Field quality-control samples are collected as directed in the Consent Order as follows: Field Duplicate–At a 10% frequency; 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 decontaminated equipment with deionized water, which is collected in a sample container and submitted for laboratory analyis. Trip Blanks–Required for all field events that include the collection of samples for volatile organic compound (VOC) analysis. Trip blanks containers of certified clean sand that are opened and kept with the other sample containers during the sampling process.

Method	Summary
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination is the preferred method to minimize generating liquid waste. Dry decontamination may include using a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by using a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes. Dry decontamination may be followed by wet decontamination if necessary. Wet decontamination may include washing with a nonphosphate detergent and water, followed by a water rinse and a second rinse with deionized water. Alternatively, steam-cleaning may be used.
Containers and preservation of samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample are printed on the sample collection logs provided by the SMO (size and type of container, i.e. glass, amber glass, polyethylene, preservative, etc.). All samples are preserved by placing in insulated containers with ice to maintain a temperature of 4°C. Other requirements such as using nitric acid or other preservatives may apply to different media or analytical requests.
Sampling of Sub-Atmospheric Air	Subsurface samples will be collected from discrete zones within a borehole, selected based on investigation and field-screening results. During field measurements vapor samples will be monitored for (at a minimum) percent oxygen, carbon dioxide, and organic vapors using a PID equipped with an 11.7 eV lamp. The vapor sample collected for laboratory analyses will be analyzed for (at a minimum) percent moisture, VOCs, and tritium. Vapor samples will be collected using a SUMMA canister and analyzed by EPA Method TO-15. All instruments used during field-screening will be calibrated daily following manufacturer's specifications.
Subsurface Moisture Measurements Using a Neutron Probe	Moisture measurements are collected by lowering a probe down the borehole at a rate of 0.5 ft/min and collecting data. The data are recorded on a laptop computer connected to the probe. Calibration and operation of the neutron probe is conducted according to the manufacturer's specifications.
Monitoring Well and Borehole Abandonment	The borehole will be abandoned to prevent migration of contaminants from the ground surface. The preferred method is to completely remove any surface casing, clean out the borehole and backfill with a cement or bentonite grout. The borehole abandonment procedure will comply with current EPA well abandonment guidance.
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys will focus on obtaining survey data of acceptable quality for use during project investigations. The survey data will conform to Laboratory Information Architecture (IA) project standards IA-CB02, "GIS Horizontal Spatial Reference System," and IA-D802, "Geospatial Positioning Accuracy Standard for A/E/C/ and Facility Management." All coordinates will be expressed as SPCS 83, NM Central, US ft coordinates. All elevation data will be reported relative to the National Geodetic Vertical Datum of 1929.

Method	Summary
Drilling Methods and Drill-Site Management	Various drilling methods have been developed to achieve successful subsurface contact for retrieving suitable formation, gas, and water samples. These include, but are not limited to, solid-stem augering, hollow-stem augering, direct rotary drilling, reverse rotary drilling, and hand-augering. A detailed description of the hollow-stem auger and air rotary methods is included in Section 5.1.1. Access to the area surrounding the drill rig will be controlled using barricades (orange traffic fence and cones) with signs containing site and contact information. The area within the barricades will be designated as a HAZWOPER site and will be zoned by the proximity to potential hazards during drilling. The area directly within the site barricades will be zoned as the clean area or support zone (SZ) with the entry requirements posted at the access point. The SZ allows for an area of reduced hazard and controls where field personnel can congregate. The area beyond the support zone, but removed from the immediate area of activities, will be zoned as the contamination reduction zone (CRZ). The CRZ allows for an intermediate location between the clean and contaminated areas. The CRZ is the area where contamination monitoring of field personnel will take place to ensure that personnel do not spread contamination outside the immediate work area. The final zone will be set up directly around the area where the sampling activities will take place. This area is zoned as the exclusion zone (EZ), and only authorized personnel who meet all training and entry requirements will be allowed access. This zone is the area where most activities will take place (sampling, evaluation of retrieved material, and monitoring of the working environment, etc.).
Field Logging, Handling, and Documentation of Borehole Materials	This method includes the activities necessary to take custody of core and cuttings from drill-rig personnel; conduct field screening; remove time-sensitive analytical samples and subsamples for preliminary characterization; complete photo documentation when necessary; perform field structural and lithologic descriptions; and mark, package, and temporarily store the borehole materials at a drill-site borehole material storage trailer. Handling of the borehole materials to be curated starts from the time they are withdrawn from the borehole to the time they are ready to be transported to the RPF for curating and archiving. Borehole material staging, temporary packaging of time-sensitive analytical samples, measurement and determination of material loss, marking core (depth notation and stripes), core photography, core logging, removal of analytical samples (core), and core box loading and storing will be conducted.

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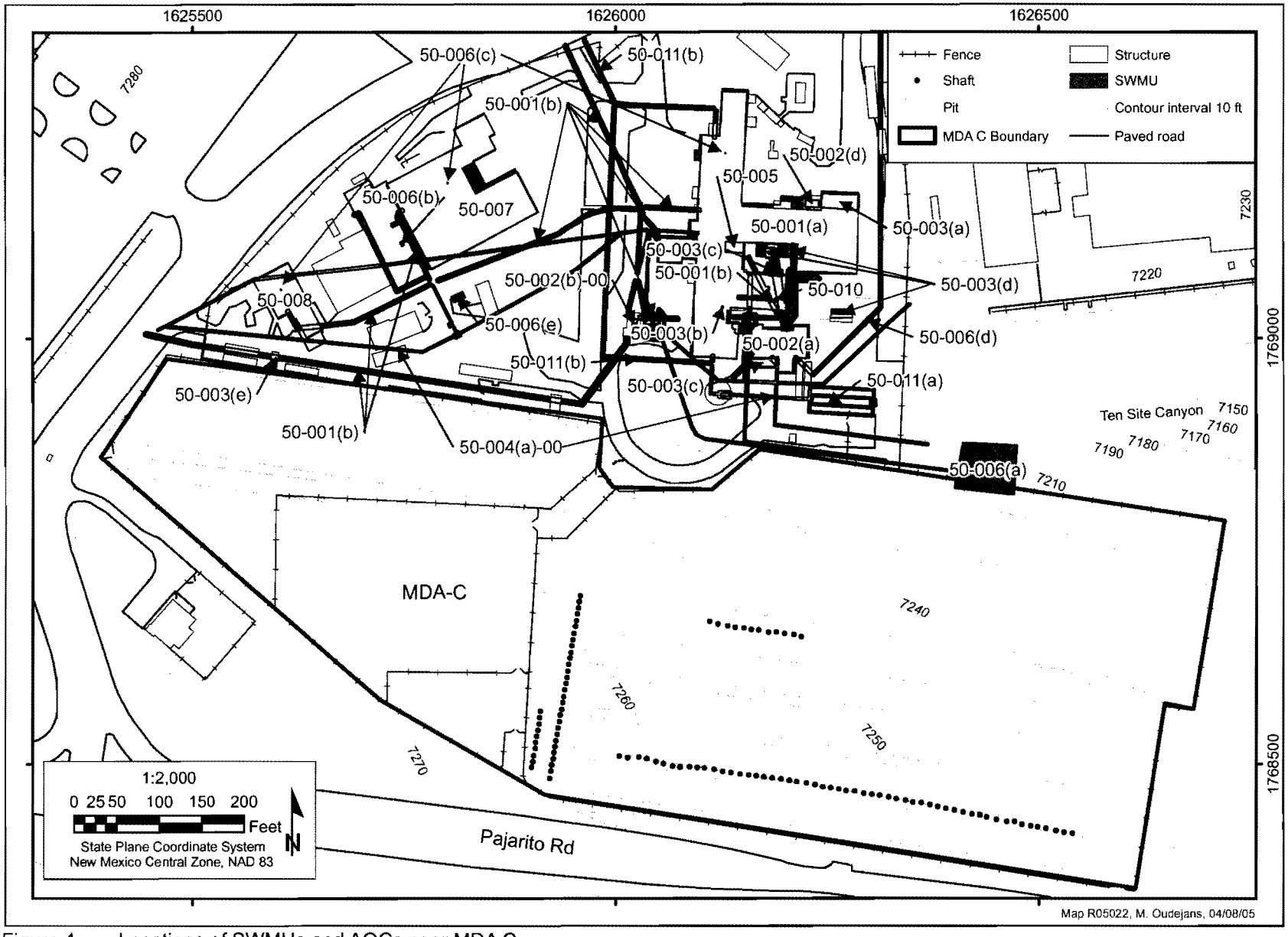

Figure 4. Locations of SWMUs and AOCs near MDA C

ATTACHMENT 2

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ATTACHMENT 3

APPENDIX F INVESTIGATION-DERIVED WASTE MANAGEMENT

This appendix to the work plan describes how investigation-derived waste (IDW) generated during the investigation of Material Disposal Area (MDA) C at Los Alamos National Laboratory (the Laboratory) will be managed. IDW is solid waste generated as a result of field investigation activities and may include, but is not limited to, drill cuttings; purge water; contaminated personal protective equipment (PPE), sampling supplies, and plastic; fluids from the decontamination of PPE and sampling equipment; and all other wastes potentially contacting contaminants. IDW generated during the investigation of MDA C will be managed to protect human health and the environment, comply with applicable regulatory requirements, and adhere to the Laboratory waste minimization goals.

All IDW generated during field investigation activities will be managed in accordance with applicable Environmental Stewardship–Remediation Services (ENV-RS) project Standard Operating Procedures (SOPs). These SOPs incorporate the requirements of all applicable EPA and New Mexico Environment Department (NMED) regulations, Department of Energy (DOE) orders, and Laboratory Implementation Requirements (LIRs). ENV-RS SOPs applicable to the characterization and management of IDW are

- LANL-ER-SOP-1.06, Management of Environmental Restoration Project Waste and
- LANL-ER-SOP-1.10, Waste Characterization.

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

The ENV-RS Waste Minimization Awareness Plan will be implemented during field investigations at MDA C to minimize waste generation.

The IDW waste streams associated with the investigation of MDA C are identified in Table F-1 and are briefly described below. Table F-1 also summarizes the waste type, estimated volume, and method of on-site management.

Drill cuttings. The drill cuttings waste stream will consist of cuttings from all boreholes drilled during field activities. Drill cuttings will be collected and containerized at the point of generation (i.e., at the drill rig). The drill cutting waste stream will be characterized with analytical results from core samples, and augmented by direct sampling of the containerized waste, if needed. The maximum detected concentrations of radionuclides will be compared with background/fallout values. If the maximum concentrations are above background/fallout values, the waste cuttings will be designated as low-level radioactive waste. The maximum concentrations of toxicity characteristic leaching procedure (TCLP) constituents will be compared with 20 times the TCLP regulatory limit. If concentrations are less than 20 times the regulatory limit, the waste cuttings will be designated nonhazardous. If the concentrations exceed 20 times the regulatory limit, the waste will be sampled and analyzed using the TCLP to determine if it is hazardous by characteristic. If listed waste constituents are detected in tuff samples, the maximum concentrations will be compared to NMED soil screening levels (SSLs). If concentrations are less than SSLs, a "no longer contained in" determination will be requested from NMED. If concentrations exceed SSLs, the wastes will be designated as hazardous waste. Based on the results of previous investigations, the Laboratory expects these wastes to be designated as nonhazardous, and it will be used for cover material at Technical Area (TA-) 54 or be disposed of at a New Mexico solid waste landfill.

Spent PPE. The spent PPE waste stream will consist of PPE that has potentially "contacted" contaminated environmental media (i.e., core and/or drill cuttings) and that cannot be decontaminated. The bulk of this waste stream will consist of protective clothing such as coveralls, gloves, and shoe covers. Spent PPE will

be collected in containers at personnel decontamination stations. Characterization of this waste stream will be performed through acceptable knowledge of the waste materials, the methods of generation, and the levels of contamination observed in the environmental media. The Laboratory expects these wastes to be designated as nonhazardous waste, and it will be disposed of at a New Mexico solid waste landfill.

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

Decontamination fluids. The decontamination fluids waste stream will consist of liquid wastes from decontamination activities (i.e., decontamination solutions and rinse waters). Consistent with waste minimization practices, the Laboratory employs dry decontamination methods to the extent possible. If dry decontamination cannot be performed, liquid decontamination wastes will be collected in containers at the point of generation and transferred to accumulation drums. If less than six gal. per day of decontamination fluids are generated and these are determined to be non-hazardous, they may be disposed of by discharge to the ground in accordance with an existing Notice of Intent (NOI) for discharge to groundwater approved by the NMED Ground Water Quality Bureau. Otherwise, the decontamination fluids waste stream will be accumulated in drums and characterized with analytical results from direct sampling of the containerized waste. The Laboratory expects these wastes would be designated as nonhazardous liquid waste, and it will be sent to the radioactive liquid waste treatment facility at TA-50 for disposal.

Prior to the start of field investigation activities, a Waste Characterization Strategy Form (WCSF) will be prepared and approved per requirements of LANL-ER-SOP 01.10. The WCSF will provide detailed information on IDW characterization, management, containerization, and possible volumes. IDW characterization will be completed through review of existing data and/or documentation, by direct sampling of the IDW, and/or by sampling the media being investigated (i.e., surface soil, subsurface soil, etc.). If sampling is necessary, it will be described in a sampling and analysis plan developed in conjunction with the WCSF.

The selection of waste containers will be based on appropriate U.S. Department of Transportation requirements, waste types, and estimated volumes of IDW to be generated. Immediately following containerization, each waste container will be individually labeled with a unique identification number and with information regarding waste classification, item(s), radioactivity (if applicable), and date generated. The wastes will be contained in clearly marked and appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements will be detailed in the WCSF and approved before any waste is generated.

Table F-1
Estimated Volumes of IDW Generation and Management of Wastes Generated

Waste Stream	Estimated Volume	On-Site Management
Drill cuttings	100 yd^3 5 roll-off containers	20 yd^3 roll-off containers
Spent PPE	2 x 55 gal.[a]	Accumulated in 55-gal. drums
Disposable sampling supplies	3 x 55 gal.[a]	Accumulated in 55-gal. drums
Decontamination fluids	<55-gal.[a]	Accumulated in 55-gal. drums.

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

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