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Date: July 21, 2005
Refer to: ER2005-0494

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

SUBJECT: RESPONSE TO NOTICE OF DISAPPROVAL FOR THE INVESTIGATION WORK PLAN FOR CONSOLIDATED SOLID WASTE MANAGEMENT UNITS 16-007(A)-99 (30S LINE) AND 16-008(A)-99 (90S LINE), TECHNICAL AREA 16

Dear Mr. Bearzi:

This letter and enclosures make up the Los Alamos National Laboratory's Environmental Stewardship-Environmental Remediation and Surveillance (ERS) Program's response to the notice of disapproval (NOD) for the Investigation Work Plan for Consolidated Solid Waste Management Units 16-007(a)-99 (30s Line) and 16-008(a)-99 (90s Line) at Technical Area 16. The ERS Program office received the NOD from the New Mexico Environment Department's Hazardous Waste Bureau on June 22, 2005. Enclosed are the certification (Enclosure 1); Response to each NMED NOD comment (Enclosure 2); and an electronic copy of the latter enclosure (Enclosure 3 – CD).

If you have any questions, please contact Don Hickmott at (505) 667-8753 or Lance Woodworth at (505) 665-5820.

Sincerely,

David McInroy, Deputy Program Director
Environmental Remediation & Surveillance
Los Alamos National Laboratory

Sincerely,

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

DH/jk

Enclosures: 1) Response to Notice of Disapproval or the Investigation Work Plan for Consolidated Solid Waste Management Units 16-007(A)-99 (30s Line) and 16-008(A)-99 (90s Line) at Technical Area 16
2) Certification by the ENV-ERS Program Technical Representatives
3) CD- Electronic version of response

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CERTIFICATION

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

Document Title: **RESPONSE TO NOTICE OF DISAPPROVAL FOR THE INVESTIGATION WORK PLAN FOR CONSOLIDATED SOLID WASTE MANAGEMENT UNITS 16-007(A)-99 (30S LINE) AND 16-008(A)-99 (90S LINE) AT TECHNICAL AREA 16**

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: _____ Date: 7/20/05

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: 20/07/05

David Gregory, Federal Project Director
Environmental Restoration Program
Department of Energy/Los Alamos Site Office

or

_____ Date: _____

John Ordaz,
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Response to Notice of Disapproval for the Investigation Work Plan for Consolidated Solid Waste Management Units 16-007(a)-99 (30s Line) and 16-008(a)-99 (90s Line) at Technical Area 16, Los Alamos National Laboratory, EPA-ID #NM0890010515, HWB-LANL-05-004

INTRODUCTION

This submittal is the response by Los Alamos National Laboratory (the Laboratory) to the Notice of Disapproval on the "Investigation Work Plan for Consolidated Solid Waste Management Units 16-007(a)-99 (30s Line) and 16-008(a)-99 (90s Line) at Technical Area 16," issued by the New Mexico Environment Department (NMED) Hazardous Waste Bureau on June 17, 2005. The Investigation Work Plan, LA-UR-05-1694, was submitted by LANL to NMED in March 2005.

This response is organized similarly to NMED's notice of disapproval. NMED's comments are included verbatim, and LANL's responses follow each NMED comment.

GENERAL COMMENTS

NMED Comment

1. *Section 2.1.1, Consolidated SWMU 16-007(a)-99, page 3:*

   Solid waste management unit (SWMU) 16-024(c) is not listed as a SWMU on any of the Tables A, B and C of the Hazardous and Solid Waste Amendments (HSWA) Module of the Los Alamos National Laboratory (LANL) Permit. There are several places in the document where it has been referred to as a SWMU. The Permittees must clarify if it is a SWMU or an area of concern (AOC). If it is a SWMU, provide documentation of when it was designated a SWMU.

LANL Response

1. Site 16-024(c) is an AOC, not a SWMU, and has never been listed in Module VIII of the Laboratory's Hazardous Waste Facility Permit.

NMED Comment

2. *Section 2.3.2, TA 16-99 Area, page 6:*

   The investigation work plan states that AOC C-16-066 is administratively complete. Clarify the meaning of the term "administratively complete." The term is used a number of times in the document.

LANL Response

2. Administratively complete sites are sites that had been approved for no further action (NFA) by the appropriate administrative authority and, if necessary, removed from Module VIII of the Laboratory's Hazardous Waste Facility Permit. AOC C-16-066 is identified as previously approved for NFA in EPA's Letter to NMED dated January 21, 2005, concerning EPA's previous decisions on SWMU/AOC sites at the Laboratory.

NMED Comment

3. Section 4.2.3.3, Intermediate-Depth Boreholes, page 27 and Figure 4.2-2b, page 54:

Additional analytical samples should also be collected at the soil/tuff interface in boreholes drilled in the ponds.

LANL Response

3. One additional sample per pond borehole will be collected at the soil/tuff interface.

NMED Comment

4. Section 4.2.5, Site Restoration Decontamination, and Demobilization, page 29, and Appendix D, page D-3:

NMED does not approve the Permittees' plan for handling Investigation Derived Waste (IDW). Specifically, the Permittees may not return drill cuttings, decontamination water, or 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 Sections IX.B.2.b.iv and IX.B.5 of the Order.

Regardless of whether or not 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 in accordance with Section X.D of the Order as stated in Section IX.B.2.b.iv of the Order. It should be noted that a letter addressing a similar issue that arose during the review of Delta Prime Site Aggregate Area Workplan was sent to the Permittees on May 26, 2005.

Drill cuttings, purge and decontamination water, personal protective equipment (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 screened for radionuclides. All IDW must be disposed of properly at an appropriate disposal facility. Descriptions of the methods used to store, control, and transport each waste type and classification must be included in the investigation report.

The wastewater derived from daily decontamination of sampling equipment cannot be disposed of on-site. It should be containerized in labeled 55-gallon drums until proper characterization and disposal can be done as specified in Section IX.B.5 of the Order.

LANL Response

4. The IDW management appendix has been revised (see Attachment 1). The specific IDW management issues raised in NMED's comment are addressed below.

   Borehole cuttings—LANL will not return cuttings to boreholes (see revised IDW management appendix, Attachment 1).

   Borehole abandonment—As described above, boreholes will not be abandoned by filling them with drill cuttings. LANL proposes to abandon intermediate-depth boreholes by filling them with bentonite grout, then capping the final two feet of the borehole with concrete. For shallow boreholes (i.e., less than 20 ft) LANL requests approval to deviate from Section X.D of the Consent Order. It is proposed that shallow boreholes will be abandoned by filling them with bentonite pellets or chips or with bentonite grout (without the need for pressure grouting). Shallow holes will not be capped with concrete because this is deemed to be technically unnecessary for shallow holes.

   Waste characterization and management—The IDW management appendix has been revised to provide more detail on how IDW will be characterized and managed (see Attachment 1).

   Decontamination liquid—LANL will not discharge decontamination liquids to the ground (see Attachment 1).

NMED Comment

5. *Table 5.0-1, page 72:*

   The table developed by the Permittees to satisfy the requirements of Section IX.A of the Consent Order, dated March 1, 2005 (Order), is inadequate. The information included in the 'summary' column of the table states what the standard operating procedure (SOP) is and what it encompasses. There is no description of investigation, sampling or analytical methods and procedures in sufficient detail to evaluate the quality of acquired data, which is specifically stated in Section IX.A, Standard Operating Procedures, of the Order. The Permittees must revise and resubmit the table to include descriptions of the proposed field and laboratory methods and procedures.

LANL Response

5. Table 5.0-2 has been added to present descriptions of the methods to be used. See Attachment 2.

NMED Comment

6. *Table 5.1-1 and Table 5.2-1, page 77:*

   Please note that analysis of explosive compounds should include the entire list of explosive compounds found in Table III-1 of the Order.

LANL Response

6. LANL will analyze for all explosive compounds found in Table III-1 of the Order.

NMED Comment

7. Table B-3 & B-4, page B-34 & B-35:

Nickel is reported as detected at 13.3 mg/kg in these tables, but Table 5-61 (page 5-219) of the RFI Work Plan for OU 1082 (July 1993) reports nickel as detected at 133 mg/kg. Resolve the discrepancy.

LANL Response

7. The correct value is 13.3 mg/kg. The value in the RFI Work Plan for OU 1082 (July 1993) is incorrect. LANL has verified this with the original data output contained in sections of DOE (1989) related to the inactive pond. (DOE, 1989, Los Alamos National Laboratory sampling and analysis data document draft Volumes 1 to 3, U.S. Department of Energy document EGG-ES-8204, Los Alamos, New Mexico, 403 pp. (DOE, 1989, 15366)

NMED Comment

8. Figure B-2a, page B-21:

The figure caption reads "Bubble plot for RDX (D-Tech™) field screening results (Buildings 16-89 and 16-90), 1996 VCA," but the results from Building 90 are not included in the figure. The results for Building 90 are included in figure B-2b not figure B-2a. Revise the caption accordingly.

LANL Response

8. The figure caption will be revised to state "Bubble plot for RDX (D-Tech™) field screening results (Building 16-89), 1996 VCA."

NMED Comment

9. Figure B-2d, page B-24:

The figure caption reads "Bubble plot for TNT (D-Tech™) field screening results (Buildings 16-89 and 16-90), 1996 VCA," but the results from Building 90 are not included in the figure. The results for Building 90 are included in figure B-2e not figure B-2d. Revise the caption accordingly.

LANL Response

9. The figure caption will be revised to state "Bubble plot for RDX (D-Tech[tm]) field screening results (Building 16-89), 1996 VCA."

NMED Comment

10. Appendix D, page D-2:

The Permittees are proposing to use dry techniques for decontamination of sampling equipment. Decontamination should be carried out in accordance with methods outlined in Section IX.B.3 of the Order. Permittees must obtain approval from NMED if methods other than those stated in the Order are to be used. Permittees have not provided description of the method and procedures in sufficient detail to evaluate the method, which is specifically stated in Section IX.A, Standard Operating Procedures, of the Order.

LANL Response

10. A description of dry decontamination methods has been added to Table 5.0-2 (see Attachment 2 and response to NMED comment 5). This method is described in SOP-1.08, Field Decontamination of Drilling and Sampling Equipment.
http://erproject.lanl.gov/Common/Procedures/SOPs/SOP-01.08R1T.pdf

LANL proposes to use dry decontamination methods followed by wet decontamination using Fantastik™ spray, as described in SOP-1.08, rather than the wet decontamination methods provided in the Section IX.B.3 of the Consent Order given LANL's commitment to minimize wastes. These techniques have proven adequate to prevent sample cross-contamination in previous TA-16 investigations. In addition, rinsate blank samples will be collected to verify the effectiveness of the decontamination procedure.

ATTACHMENT 1

Revised IDW Management Appendix

This appendix to the work plan describes how investigation-derived waste (IDW) generated during the investigation of Consolidated Solid Waste Management Units 16-007(a)-99 (30s Line) and 16-008(a)-99 (90s Line) at Technical Area 16 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 SWMUs 16-007(a)-99 and 16-008(a)-99 at Technical Area 16 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–Environmental Characterization and Remediation (ENV-ECR) Group Standard Operating Procedures (SOPs). These SOPs incorporate the requirements of all applicable Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) regulations, Department of Energy (DOE) orders, and Laboratory Implementation Requirements (LIRs). ENV-ECR SOPs applicable to the characterization and management of IDW are

- ECR-SOP-01.06, Management of Environmental Restoration Project Waste and
- ECR-SOP-01.10, Waste Characterization.

These SOPs are among the SOPs applicable to the investigation at Consolidated Solid Waste Management Units 16-007(a)-99 and 16-008(a)-99 and are available at the following URL: http://erproject.lanl.gov/documents/procedures.html. Before the start of field investigation activities, a Waste Characterization Strategy Form (WCSF) will be prepared and approved, as required in ECR-SOP 01.10. The WCSF will provide detailed information on IDW characterization, management, containerization, and possible volumes. IDW characterization will be completed through the 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 direct waste characterization sampling is necessary, it will be described in the WCSF.

The Laboratory's 2004 Pollution Prevention Roadmap will be implemented during field investigations at SWMUs 16-007(a)-99 and 16-008(a)-99 to minimize waste generation. This plan is updated annually as a requirement of Module VIII of the Laboratory's Hazardous Waste Facility Permit.

The IDW waste streams associated with the investigation of Consolidated Solid Waste Management Units 16-007(a)-99 and 16-008(a)-99 are identified in Table D-1 and are briefly described below. Table D-1 also summarizes the waste type, estimated volume, and method of on-site management.

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 characterized with analytical results from direct sampling of the containerized waste. The decontamination liquids will be disposed of at a permitted wastewater treatment facility.

Acetone. Soil screening will include an extraction step using acetone as a solvent. The spent acetone is a hazardous waste. This waste stream will be contained in polyethylene bottles stored in a labeled and sealed secondary container at a registered satellite accumulation area (SAA) on site followed by disposal off-site at an appropriate permitted treatment, storage, and disposal facility (TSDF).

Spent PPE. The spent PPE waste stream will consist of PPE that has potentially contacted contaminated environmental media (i.e., soil, tuff, 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 analytical results from the sampling of the environmental media with which the materials were in contact. Spent PPE will be accumulated in 55-gallon drums with drum liners before disposal off-site at an appropriate permitted solid waste facility.

Disposable sampling supplies. The disposable sampling supplies waste stream will consist of all equipment and materials necessary for collecting 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 analytical results from the sampling of the environmental media with which the materials were in contact. Wastes will be stored in 55-gallon drums with drum liners and will be disposed of off-site at an appropriate permitted solid waste facility.

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 augmented by direct sampling of the containerized waste, if needed. Total concentrations of toxicity characteristic leaching procedure (TCLP) constituents will be compared with 20 times the TCLP regulatory level. If total concentrations are less than 20 times the TCLP regulatory level, the waste cuttings will be designated nonhazardous by characteristic. If total concentrations exceed 20 times the TCLP regulatory level, the waste cuttings will be sampled and analyzed using the TCLP to determine if it is hazardous by characteristic. If potential listed hazardous waste constituents are detected, the Laboratory will conduct a review of historical records and data in an effort to determine whether the source of each constituent was a listed hazardous waste at its point of generation. If the source is determined to be a listed hazardous waste, the cuttings will be managed as hazardous waste. Otherwise, the cuttings will be managed as nonhazardous solid waste and will be stored in 55-gallon steel drums, covered roll-off containers, or cubic yard soft-sided strong tight containers with liners. If waste is confirmed to be nonhazardous, it will be disposed of off-site at an appropriate permitted solid waste facility; otherwise, it will be disposed of at an appropriate permitted TSDF.

Empty Sodium Azide Containers. The D-Tech test kits include buffer solution bottles containing sodium azide. These components are typically completely consumed during the screening process and will likely only remain as a residue in the bottles. The empty containers are considered to be nonhazardous solid waste because they were used for their original intended purpose per the field analytical method. Containers will be placed in 55-gallon drums with drum liners to be disposed of off-site at an appropriate permitted solid waste facility.

Residual Sodium Azide Buffer Solution. Approximately 1 ml of residual sodium azide buffer solution is left over for each D-Tech screening analysis. The residual buffer solution is a hazardous waste. This material will be transferred to a 1-L polyethylene bottle and stored in a sealed secondary container at a registered SAA on-site, pending transportation to an appropriate off-site-permitted TSDF.

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), and date generated. If wastes are pending analytical results to make a final characterization determination, the containers will be labeled as such until analytical results are available. 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.

RESPONSE TO NOTICE OF DISAPPROVAL

Waste Stream	Expected Waste Type	Estimated Volume	Characterization Method	On-Site Management and Final Disposition
Decontamination Water	Liquid, Non-hazardous, Non-radioactive	< 300 gallons	Direct sampling of waste	Accumulation in 55-gallon drums with drum liners. Disposal at permitted wastewater treatment facility.
Spent Acetone	Liquid Hazardous F003, D001	< 4 liters	Acceptable knowledge	Containment in polyethylene bottles stored in a sealed secondary container at a registered SAA[a] on site. Disposal off-site at an appropriate permitted TSDF[b].
Plastics, PPE, and Sample Equipment Waste	Solid Non-hazardous, Non-radioactive	< 110 gallons	Acceptable knowledge	Accumulation in 55-gallon drums with drum liners. Disposal off-site at an appropriate permitted solid waste facility.
Borehole Drill Cuttings	Solid Non-hazardous, Non-radioactive	< 20 cubic yards	Analytical results from site characterization samples Direct sampling of waste	Accumulation in 55-gallon steel drums, covered roll-off containers, or cubic yard soft-sided strong tight containers with liners. If waste is confirmed to be non-hazardous, off-site disposal at an appropriate permitted solid waste facility; otherwise, disposal at an appropriate permitted TSDF.
Empty Sodium Azide Containers	Solid Non-hazardous, Non-radioactive	< 25 gallons	Acceptable knowledge	Accumulation in 55-gallon drums with drum liners. Disposal off-site at an appropriate permitted solid waste facility.
Residual Sodium Azide Buffer Solution	Liquid Hazardous (P105)	< 1 liter	Acceptable knowledge	Containment in polyethylene bottle stored in a sealed secondary container at a registered SAA on site. Disposal off-site at an appropriate permitted TSDF.

[a]SAA Satellite Accumulation Area.

[b]TSDFtreatment, storage, and disposal facility.

ATTACHMENT 2

Table 5.0-2: 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 analysis. Trip blanks are required for all field events that include the collection of samples for volatile organic compound (VOC) analysis. Trip blanks are 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 and VOCs. 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 the manufacturer's specifications.
HE Spot Test Sampling	The HE spot-test kit was developed to identify the presence of explosives as contaminants on equipment and in environmental media. Three reagents and a portable ultraviolet lamp are used to detect explosives including HMX, RDX, TNT, PETN and TATB. After a suspect area of material is wiped with a clean filter paper, a drop of each of the three reagents placed on different parts of the sample will change color when explosives and/or other nitrogen compounds are present. A UV light (short wavelength, 254 nm) enhances color for RDX/HMX explosives. The detection limit is approximately 100 mg/kg.
D-Tech Screening	D-Tech immunoassay test kits from Strategic Diagnostics, Inc., will be used to field screen both soil and tuff samples for RDX. This semi-quantitative filed-screening method will be used to guide drilling and sampling investigation activities and to enable estimation of the contaminated volume of tuff/soil. The field analytical method for RDX is EPA SW-846 (Update III) Method 4501. The D-Tech detection limit for RDX in soils is 1.0 mg/kg.
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 the migration of contaminants from the ground surface. Intermediate-depth boreholes will be pressure grouted with bentonite and the final two feet capped with concrete. Shallow boreholes will be abandoned by filling them with bentonite pellets or chips or with bentonite grout.

Method	Summary
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, U.S. ft coordinates. All elevation data will be reported relative to the National Geodetic Vertical Datum of 1929.
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 5.2. 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 Field Support Facility 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.