TA-16

Environmental Restoration
University of California
Environmental Restoration Project, MS M992
Los Alamos, New Mexico 87545
505-667-0808/FAX 505-665-4747

U.S. Department of Energy
Los Alamos Area Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
505-667-7203/FAX 505-665-4504

RECEIVED 1999

Date: May 7, 1999
Refer to: EM/ER:99-120

Mr. Benito Garcia
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: SUBMITTAL OF CLASS 1 CLOSURE PLAN MODIFICATION FOR MDA-P AND RESPONSE TO COMMENTS CONTAINED IN THE MARCH 10, 1999 LETTER FROM HRMB

Dear Mr. Garcia:

The purpose of this letter is to submit a Class 1 modification of the previously approved Closure Plan for MDA-P. This modification responds to and is reflective of previous correspondence with the New Mexico Environment Department's Hazardous and Radioactive Materials Bureau (HRMB) including the following:

- July 22, 1998, letter from Julie Canepa and Theodore J. Taylor to Benito Garcia (EM/ER:98-232) regarding potential operational deviations from the MDA-P Closure Plan;

- September 18, 1998, letter from Benito Garcia to Theodore J. Taylor and Dr. John C. Brown regarding the requirement of a Class 2 modification for the potential operational deviations from the MDA-P Closure Plan;

- November 9, 1998, letter from Julie Canepa and Theodore J. Taylor to Benito Garcia (EM/ER:98-442) responding to the above letter from HRMB; and

- March 10, 1999, letter from Benito Garcia to Theodore Taylor and Dr. John C. Brown replying to the November 9, 1998, letter (EM/ER:98-442) regarding the MDA-P Closure Plan and correspondence related to operational deviations.

This modification is being submitted pursuant to Title 20 of the New Mexico Administrative Code, Chapter 4, Part 1, Subpart VI [40 CFR 265.112(c)(4)] within 60 days of the request from HRMB. The Laboratory recognizes that MDA-P is included in Module VIII of our Hazardous Waste Facility Permit as a Solid Waste Management Unit (potential release site [PRS] 16-018). Once MDA-P meets the closure performance standards and closure certification is complete, a Class III permit modification will be submitted to remove PRS 16-018 from the permit.

Enclosed please find two hard copies and one disk copy in Microsoft Word of the replacement pages for the MDA-P Closure Plan Modification to correct typographical errors, change the closure schedule, and to include an operational deviation due to a reduction of estimated volume of waste to be generated as part of closure. Additional information requested in the March 10, 1999, letter is included as Attachment A.

If you have any questions or concerns please feel free to call Dave McInroy at (505) 667-0819 or Joe Mose at (505) 667-5808.

Sincerely,

James M. Ray for

Julie A. Canepa, Program Manager
LANL/ER Project

Sincerely,

Joseph L. Vigil

Theodore J. Taylor, Program Manager
DOE/LAAO

JC/TT/HWB/gt

Enclosures:
1) Enclosure A
2) Enclosure B: Management of Remediation Waste Under RCRA
3) Certification
4) Closure Plan Amendment, MDA-P Replacement Pages

Cy (w/enc.):
K. Bostick, EES-15, MS M992
M. Buksa, EM/ER, MS M992
B. Criswell, Roy F Weston, MS M992
S. Den-Baars, The IT Group, MS K490
M. Ebinger, EES-15, MS J495
J. Ellvinger, ESH-19, MS K490
H Haynes, LAAO, MS A316
D. Hickmott, EES-1, MS D462
J. Mose, DOE/LAAO, MS A316
J. Rochelle, LC-GL, MS A187
R. Romero, ESH-19, MS K490
V. Rhodes, EM/ER, MS M992
T. Taylor, DOE/LAAO, MS A316
S. Veenis, EM/ER/ESH-18, MS M992
H. Wheeler-Benson, EM/ER/ESH-19, MS M992
J. Kieling, NMED-HRMB
G. Saums, NMED-SWQB
S. Yanicak, NMED-DOE OB, MS J993
EM/ER File (CT#C663), MS M992
RPF, MS M707

Cy (w/o enc.):
W. Neff, EM/ER, MS M992
D. McInroy, EM/ER, MS M992
T. George, EM/ER, MS M992
T. Grieggs, EM/ER/ESH-19, MS M992
M. Kirsch, EM/ER, MS M992.
J. Parker, NMED-OB EM/ER File, MS M992
EM/ER File, MS M992
Tracker, RM 604, MS M992

Rec'd from LANL
May 10, 99
Ck. #861796 in the amount
of $1,000.00
Pamela Young

ENCLOSURE A

Clarifications

NMED Comment

Reference first row of table on page six of DOE/LANL's July 22, 1998 EM/ER:98-232, potential operational deviations from the MDA-P Closure Plan. DOE/LANL shall clarify what kind of containers the soils and liquids will be staged in. Container storage is required pursuant to the approved Closure Plan.

LANL Response

Decontamination liquid is currently stored in several 20,000 gallon single walled steel tanks designed to fractionate solids from liquids. These tanks are located on a lined and bermed pad.

Storm water is stored in three 10,000 gallon single walled steel tanks (each devoted to a separate run-off trench). The tanks are located on a lined and bermed pad.

Unknown liquids are either containerized or are already in containers. These are stored in a separate lined and bermed area on spill pallets within the area of contamination until they can be characterized. Once characterized, they are managed through LANL's normal waste management system.

Soils that do not have the potential to be considered hazardous waste by field screening results are stored on lined and bermed pads in 100 yd^3 lot piles. They are sprayed with an erosion control agent (i.e. Soil Sement®) to prevent re-suspension or erosion. Once waste characterization sampling results are received, the soil is loaded directly into 20 yd^3 end-dump trucks. As previously stated in Enclosure 1 of LANL's letter dated November 9, 1998 (EM/ER:98-442) "Non-hazardous waste soil and debris staged outside of the AOC **[area of contamination]** is considered 'construction and demolition debris' pursuant to 20 NMAC 9.1 Section 105.T and does not require containerization." However, LANL is containerizing the waste in 20 yd^3 end-dump trucks.

Soils that initially have the potential to be considered hazardous waste and/or radioactively contaminated by field screening results (VOCs, radionuclides, asbestos, barium, and quantitatively analyzed for HE using approved or proposed SW-846 methodologies including 8515 and 8510) are managed as follows:

- stored on lined bermed pads within the area of contamination in 100 yd^3 lots;
- segregated from non-hazardous waste soil; and
- once the hazardous waste characterization confirms the classification of the soil (e.g., regulated hazardous waste or non-hazardous waste), it may be shipped directly from the staging area (within the area of contamination) in 20 yd^3 end-dump trucks in accordance with applicable Department of Transportation (DOT) and hazardous waste management regulations or it will be containerized at the staging area and transported out of the area of contamination to an on-site less-than-90-day accumulation area and shipped off-site before the 90 day time frame expires.

Section 6.2.4 of the approved Closure Plan indicates that waste will be excavated using a combination of several methods. This section discusses transporting excavated waste in dump trucks to the segregation area but does not specify containerization during staging activities at MDA-P. Section 6.2.6 (page 6-25 and 6-26) specifies that "Excavated waste will be placed in

lined containers such as rolloff boxes and transported to the segregation area." "All containers including rolloff boxes, drums, tanks, etc. will be properly labeled as required to 40 NMAC Section 262.34." Although LANL has not excavated any material that has the potential to be classified as regulated hazardous waste to date, once this type of material is generated, it will be managed as specified in the bullets above.

The Environmental Protection Agency has provided guidance for management of remediation waste in a document entitled Management of Remediation Waste Under RCRA (EPA530-F-98-026 dated October 1998) that allows consolidation and treatment of hazardous waste within an area of contamination without creating a new point of hazardous waste generation or triggering land disposal restrictions or minimum technology requirements. This guidance document is included as Attachment B.

NMED Comment

DOE/LANL shall describe the procedure to track waste: which quadrant each waste pile came from, waste piles, each batch of treated waste, & containers. LANL shall also describe how the waste characterization data will be managed to assure the 90 day requirement is met.

LANL Response

A map of MDA-P has been overlaid by a specific grid consisting of designated 10 meter by 10 meter quadrants that are individually numbered. Each day of excavation is tracked back to a specific quadrant(s). Once material is excavated it is segregated into 100 yd^3 lots as required in the approved Closure Plan. Each lot is assigned a specific number for tracking purposes and on-site personnel track individual lots back to a specific quadrant.

LANL has assigned a dedicated sampling team with a dedicated Team Leader to track, sample and review analytical results for all material excavated from MDA-P. This team utilizes established procedures for sampling as specified in SW-846 and in the approved Closure Plan. The team specifically tracks the following:

- Date sampled,
- Sample request number,
- Sample identification number,
- Sample area (i.e., specific 100 yd^3 lot number),
- Analytical suite,
- Date data is due back from the analytical laboratory, and
- Date analytical data is received.

In addition, each lot of soil and recyclable material (concrete and metal) is tracked on an internal release form that contains the following information:

- Lot number,
- Sample number,
- Media,
- Destination,
- Quantity,
- Date material was released for off-site shipment
- Task Leader initials, and
- Waste Management Coordinator's initials.

Each tank of storm water or decontamination water is tracked on an internal log that contains the following information:

- Lot number,
- Sample number,
- Date material was discharged for reapplication and dust suppression on-site at MDA-P,
- Quantity released,
- Task Leader initials, and
- Waste Management Coordinator's initials.

All non-hazardous waste soil that has been generated to date is tracked by individual lot number on the bill of lading that accompanies the shipment off-site. LANL has not generated any hazardous waste soil or debris or treated any barium-contaminated soil to date. Any soil that initially has the potential to be considered hazardous waste is stored on lined bermed pads (segregated from non-hazardous waste) within the area of contamination in 100 yd^3 lots. Once a hazardous waste characterization confirms the classification of the soil as hazardous waste, it may be shipped directly from the staging area (within the area of contamination) in 20 yd^3 end-dump trucks in accordance with applicable DOT and hazardous waste management regulations or it will be containerized at the staging area and transported out of the area of contamination to an on-site less-than-90-day accumulation area and shipped off-site before the 90 day time frame expires.

Waste characterization data is received before any excavated material (e.g., concrete, scrap metal, soil, and/or other debris) leaves the area of contamination. Waste is generated at the time it leaves the area of contamination; at this point, the less-than-90-day accumulation start date begins.

ENCLOSURE B

MANAGEMENT OF REMEDIATION WASTE UNDER RCRA

United States
Environmental Protection
Agency

Solid Waste and
Emergency Response
(5305W)

EPA530-F-98-026
October 1998
www.epa.gov/osw

EPA

Management of Remediation Waste Under RCRA

printed on paper that contains at least 20 percent postconsumer fiber

Federal holidays, 8:00 - 5:00, eastern standard time. Many EPA guidance memos and other documents may also be obtained through the RCRA/CERCLA hotline fax-back system. To obtain a list of documents available over the fax-back system, and fax-back system code numbers, call the RCRA/CERCLA hotline at the numbers listed above.

I hope this information will assist you as you continue to make protective, inclusive, and efficient cleanup decisions. If you have additional questions or require more information, please contact Robert Hall or Greg Madden, of our staffs, on (703) 308-8484 or (202) 564-4229 respectively.

Regulations and Policies that Apply to All Remediation Wastes

Area of Contamination Policy. In what is typically referred to as the area of contamination (AOC) policy, EPA interprets RCRA to allow certain discrete areas of generally dispersed contamination to be considered RCRA units (usually landfills). Because an AOC is equated to a RCRA land-based unit, consolidation and *in situ* treatment of hazardous waste within the AOC do not create a new point of hazardous waste generation for purposes of RCRA. This interpretation allows wastes to be consolidated or treated *in situ* within an AOC without triggering land disposal restrictions or minimum technology requirements. The AOC interpretation may be applied to any hazardous remediation waste (including non-media wastes) that is in or on the land. Note that the AOC policy only covers consolidation and other in situ waste management techniques carried out within an AOC. For *ex situ* waste management or transfer of wastes from one area of contamination to another, see discussion of corrective action management units, below.

The AOC policy was first articulated in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). See 53 FR 51444 for detailed discussion in proposed NCP preamble; 55 FR 8758-8760, March 8, 1990 for final NCP preamble discussion. See also, most recent EPA guidance, March 13, 1996 EPA memo, "Use of the Area of Contamination Concept During RCRA Cleanups."

Corrective Action Management Units (CAMUs). The corrective action management unit rule created a new type of RCRA unit – a Corrective Action Management Unit or CAMU -- specifically intended for treatment, storage and disposal of hazardous remediation waste. Under the CAMU rule, EPA and authorized states may develop and impose site-specific design, operating, closure and post-closure requirements for CAMUs in lieu of MTRs for land-based units. Although there is a strong preference for use of CAMUs to facilitate treatment, remediation waste placed in approved CAMUs does not have to meet LDR treatment standards.

The main differences between CAMUs and the AOC policy (discussed above) are that, when a CAMU is used, waste may be treated *ex situ* and then placed in a CAMU, CAMUs may be located in uncontaminated areas at a facility, and wastes may be consolidated into CAMUs from areas that are not contiguously contaminated. None of these activities are allowed under the AOC policy, which, as discussed above, covers only consolidation and *in situ* management techniques carried out within an AOC.

CERTIFICATION

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 assure 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.

Document Title: *"Closure Plan Amendment MDA-P Replacement Pages"*

Name: Julie A. Canepa Date: 5/7/99

Julie A. Canepa, Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

or

Tom Baca, Program Director
Environmental Management
Los Alamos National Laboratory

Name: _____ Date: 5/7/99

Theodore J. Taylor, Program Manager
Environmental Restoration Program
DOE-Los Alamos Area Office

or

Joseph Vozella,
Acting Assistant Area Manager of
Environmental Projects
Environment, Safety, and Health Branch
DOE-Los Alamos Area Office

CLOSURE PLAN AMENDMENT

MDA-P REPLACEMENT PAGES

accordance with EPA guidance (EPA, 1991a). Appendix C contains photographs of the waste pile and run-on control trench. Appendix D describes vadose-zone observations from 1998 at MDA-P. Appendix E provides historical records associated with TA-16 and MDA-P. Appendix F describes the composition of explosives produced at the Laboratory. Appendix G describes sampling procedures for MDA-P closure, Appendix H presents an evaluation of the 20 NMAC 4.1 Section 261, Appendix VIII (Appendix VIII) hazardous constituents for selection of analytical methods. Appendix I provides site-specific standard operating procedures. Appendix J describes the site geology and hydrology at TA-16, Area P

Compliance with specific regulatory requirements for closure are addressed in Chapter 6.0. The 20 MNAC 4.1 have incorporated, with a few minor exceptions, the Code of Federal Regulations (CFR) Title 40, Parts 2600 to 266 and 268 to 270 through July 1, 1993. Most regulatory citations in this closure will, therefore, be referenced to 20 NMAC 4.1. Table 1-1 lists the regulations applicable for closure of waste piles and identifies which sections of Chapter 6.0 address compliance with these regulations.

1.1 Closure Strategy

In the past, the disposal site at Area P was referred to as a landfill. However, RCRA regulations do not explicitly provide a clean-closure option for landfills. The U.S. Environmental Protection Agency (EPA) has addressed this problem by issuing guidance that allows a landfill, if clean closed under 40 CFR 265 standards, to make an equivalency demonstration under 40 CFR Section 270.1(c)(5),(6), by redefining the landfill as a waste pile (Lowrance 1989). Therefore, to clean close this unit and make an equivalency demonstration as described above, the Laboratory is referring to the MDA-P landfill as the MDA-P waste pile.

1.1.1 MDA-P and Nearby Potential Contaminated Sites

MDA-P is shown in Figure 1-1 (see map in pocket at the end of this chapter), which shows the area directly influenced by waste disposal activities and any possible subsequent contamination. The waste and contamination located within this area is specifically subject to the requirements outlined in this Closure Plan. Four other potentially contaminated areas are located in the vicinity of MDA-P; these areas (or sites) are PRSs 16-006(e), 16-010(a), 16-016(c) and 16-010(b). These PRSs are also depicted on Figure 1-1. Descriptions as well as regulatory status of these PRSs are briefly outlined below:

- PRS 16-006(e) is an active 385 gallon steel septic tank serving a water closet, lavatory, and a floor drain from a control shelter at the burning ground. The tank was constructed in 1963 and discharges to an associated drain field and outfall. PRS 16-006(e) is listed on Table A of the HSWA Module of the Laboratory's Hazardous Waste Facility Permit. RCRA Facility Investigation (RFI) sampling was completed in fiscal year (FY) 1995.

- PRS 16-010(a) is an inactive flash pad (TA-16-386) that was once used for flash burning high explosive (HE)-contaminated material. A large pile of barium nitrate was located within the confines of TA-16-386 (PRS 16-010[a]) during the 1950s and was removed by the early 1970s. PRSs 16-010(a) is listed on Table A of the HSWA Module in LANL's Hazardous Waste Facility Permit. RFI sampling was completed in FY 1995.

- PRS 16-016(c) is a barium nitrate storage site used after PRS 16-010(a) was decommissioned. PRS 16-016(c) is listed on Table A of the HSWA Module in the Laboratory's Hazardous Waste Facility Permit. RFI sampling was completed in FY 1995.

- PRS 16-010(b) is active flash pad TA-16-387 and is a RCRA-regulated interim status unit. The pad was constructed in 1951 and is used for flash burning high explosives (HE)-contaminated material. The burn area is constructed of concrete blocks placed on the ground surrounding three sides of the pad. Material to be flashed is placed within the concrete block-lined area with wood fuel to maintain the burn until all HE has been reacted.(LANL 1996).

Any releases and/or contamination associated with these PRSs will be addressed as part of other activities (i.e. RCRA Corrective Action, etc.) and are not subject to the requirements of this Closure Plan. However, at LANL's discretion, the remediation, waste management, and confirmation sampling activities associated with these four adjacent PRSs may coincide with MDA-P closure activities.

A fifth potentially contaminated area is the stream at the bottom of the Cañon de Valle, located north of the waste pile. The stream is contaminated with constituents similar to those potentially present in the waste pile (see Section 3.1). However, several other known sources of potential contamination are located upstream of the waste pile. These sources include the drainage from the burn pads, located approximately 60 ft upstream and the effluent from a National Pollutant Discharge Elimination System (NPDES)-permitted outfall from Building 260, located approximately 1700 ft upstream of the waste pile. The outfall is currently being monitored as required by the NPDES permit but not all of the potential contaminants identified in the RFI Work Plan are included in that monitoring. Another source is the MDA-R, a material disposal area that includes a World War II S-Site burning ground and its waste disposal area; this area is located

approximately 1,900 ft upstream of the waste pile. One or more of these sources has produced elevated concentrations of several potential contaminants in the stream and associated sediments. Because the stream continues to receive contaminants (e.g., barium) from these upstream sources, cleaning up the stream to the clean-closure performance goals would not be possible.

The RFI for 1082 will address contamination in the stream located at the bottom of Cañon de Valle within OU 1082. All of the contaminants in this section of the canyon are likely to have been derived from TA-16 programmatic activities. In addition, the principal contaminants (HE and barium) in Cañon de Valle are the principal contaminants for upstream potentially contaminated areas in OU 1082. The Laboratory has not set the date for beginning the OU 1082 Phase I investigation for Cañon de Valle.

The Laboratory will ensure that the contaminants identified for the adjacent potentially contaminated areas will include all of the contaminants detected during the closure of the MDA-P waste pile.

The MDA-P boundary to the South of the MDA-P waste pile was selected to parallel (but not include) the surface run-on control trench located upgradient of the waste pile. The western boundary was selected to coincide with a small ridge that divides the drainage from the burn pads and drainage from the waste pile. The northern boundary was selected to coincide with the approximate elevation of the 100-year flood-plain of the Cañon de Valle stream. However, the northwest corner of the waste pile project boundary is below the 100-year flood-plain boundary. The eastern boundary was selected to include the last drainage channel to the east that could possibly include contamination from the waste pile. The eastern boundary was selected to include the eastern and western sides of the natural drainage divide. Markers will be used to permanently identify the surveyed boundary of the MDA-P waste pile.

1.1.3 Technical Approach

To achieve closure, the entire waste pile, including hazardous and nonhazardous waste and soil, will be removed. Approximately 16,500 cubic yards (yd^3) of debris will be excavated. The primary decontamination technique will be steam cleaning. The waste contained within the pile is very heterogeneous; most of it appears to be structural steel and miscellaneous debris, which cannot be easily sampled or characterized because of the impracticality of drilling through the material and the physical size of the material. Chapter 3.0 of this plan describes what is known about the waste pile, both from process knowledge and from the limited number of samples that have been taken to characterize the waste pile.

During closure, the waste will be characterized during excavation as sections of the pile are removed. For safety reasons, the debris will be decontaminated using steam and hot water to remove potential high explosives (HE) contamination. If the HE materials cannot be effectively removed from the debris, the debris will be flashed at the TA-16 open burn pad. If a significant amount of debris is generated beyond the estimates of this plan, alternate waste treatment methods will be explored. After decontamination and/or flashing, most of the debris is expected to be designated as nonhazardous.

All debris will be steam cleaned prior to off-site management. Steam cleaning meets the alternative treatment standard for hazardous debris; thus, visual inspection will be used to verify that hazardous debris is no longer considered contaminated.

Soil, decontamination wastes (i.e., liquids and sludges), or free liquids (i.e., those liquids found in pockets or containers within the waste pile) that contain HE materials or exceed the regulatory levels for toxicity characteristic (TC) metals (e.g., barium, chromium, lead) may be treated onsite or offsite at a permitted facility. On-site treatment of this waste may include stabilization on a batch basis for metals, such as barium, chromium, or lead. The batches of material will be approximately 100 yd^3. Treatment that may be conducted onsite will occur inside tanks meeting the requirements of 20 NMAC 4.1, Sections 264.192 through 264.199. This treatment will occur

4.1.2 Sampling to Establish Baseline

Before any waste is removed, baseline levels will be established for the soil at the top of the mesa in the approximate location of the closure waste handling/management areas (e.g., staging, decontamination, treatment, storage, and loading areas). Baseline levels will be established by collecting 10 samples from locations distributed over the waste handling/management area. Baseline levels will reflect the possible presence of contaminants derived from nearby Laboratory operations that are not related to MDA-P. Baseline concentrations are represented by the 95% UTL calculated from concentrations of Appendix VIII hazardous constituents and radioactive constituents measured in soil from these areas.

Following the completion of all waste removal operations and final equipment decontamination, the areas on top of the mesa will be resampled and the sampling data compared with baseline UTLs concentrations to determine if any releases occurred during the waste removal operations.

4.1.3 Sampling of the Waste Pile

During waste removal operations, the waste pile will be sampled for potential contaminants to characterize the waste for selection of treatment and disposal options. The material to be sampled includes excavated soil and tuff, as well as debris within the waste pile. Before excavation, this material will be visually inspected and spot-tested for HE to ensure safe handling.

4.1.3.1 Soil and Tuff

One composite sample will be taken from each 100 yd^3 of waste soil and tuff. Based on the estimated waste-pile volume (16,500 yd^3), a total of approximately 165 composite samples will be collected. Composite sampling will provide data on the average concentration of contaminants required for selecting treatment and disposal options.

Each composite sample will consist of grab samples collected from 3 to 10 locations within the100 yd^3 of soil and tuff. A larger number of grab samples could result in excessive dilution of contaminant concentrations. Sufficient volume will be collected for each grab sample to ensure adequate composite sample volume for the prescribed analyses. The composite samples will

be collected from the soil before excavation or after the waste has been removed to the top of the mesa.

The leader of the sampling team will inspect the waste and select grab samples from any waste material that shows discoloration, elevated moisture content, or other evidence of potential contamination. Field instruments will be used to indicate if constituents are present in the waste during excavation. Contaminated soil will be segregated and sampled separately.

The number of samples was chosen to satisfy treatment, storage, and disposal requirements and is based on best professional judgement concerning the heterogeneity of the waste pile. Composite sampling allows more sample locations and better represents the total batch. Additional samples will be collected based on the judgement of the field team leader. By using systematic composite sampling combined with judgment-based sampling, the waste can be effectively segregated into and managed as unique and different wastestreams.

4.1.3.2 Debris

In accordance with 20 NMAC 4.1, Section 268.2(g), debris is defined as solid material exceeding a 60-mm particle size that is intended for disposal and that is a manufactured object, plant or animal matter, or natural geologic material. In addition, hazardous debris is defined as debris that contains a hazardous waste listed in 40 CFR Part 261, Subpart D, or that exhibits a characteristic of hazardous waste identified in 40 CFR Part 261, Subpart C.

The excavated debris is expected to consist of pieces of metal, concrete, wood, or other large items. All debris will be steam cleaned prior to off-site management. Steam cleaning meets the alternative treatment standard for hazardous debris; thus, visual inspection will be used to verify that hazardous debris is no longer considered contaminated. Results of visual inspection and decontamination will be documented.

During excavation, the debris will be visually inspected for HE, then removed and decontaminated.

4.1.3.3 Free Liquid and Containers of Liquid

During excavation, free liquid may be found in pockets of the debris or containers. This liquid will be pumped into a suitable container and sampled.

Containers of liquid that may be found during excavation will be carefully removed from the waste pile and placed in a cool, shaded area for sampling. Information will be obtained from any labels that may be present on the container to help identify the contents. If the contents are unknown, the container will be sampled at a later time under appropriate controlled conditions (e.g., a fume hood, or supplied air).

4.2 Strategy, Sample Point Location, and Number of Samples for Phase 2 Sampling and Analysis

After the waste pile is removed, Phase 2 confirmatory sampling will be conducted to assess whether the concentrations of Appendix VIII hazardous or radioactive constituents in the remaining soil and tuff are below acceptable levels and to determine that the closure performance standard as described in Section 6.1.1 and 6.1.1.2 has been met. Phase 2 sampling will include sampling of the soil and tuff within the MDA-P waste pile project boundary and sampling of the soil at the closure waste handling/management areas at the top of the mesa.

Additionally, visual inspections and spot testing for HE will be conducted as necessary to ensure safe sample management.

4.2.1 Sampling of the Soil Beneath and Downgradient of the Former Waste Pile

When all debris and obviously contaminated soil or tuff has been removed from the pile and any overexcavation has been completed, confirmatory samples will be collected from the exposed surface and downslope from the former waste pile at a depth of 0-12 in. to assess whether the concentrations of the remaining soil and tuff are below acceptable levels and the closure performance standard has been met. Discrete grab samples will be collected from locations

- Inorganic and organic compounds for which there are no analytical methods in SW-846 or standards
- General classes of compounds identified as not-otherwise-specified
- Chemicals whose common usage is inconsistent with operations at TA-16 and other TAs sending waste to the waste piles (e.g., pharmaceuticals, manufacture of organic chemicals)

Appendix H presents an evaluation of the Appendix VIII constituents. In addition, this appendix identifies the proposed methods, analytes, estimated quantitation limits, proposed RCRA Subpart S action levels, and ER Program SALs.

Test methods for chemical analysis will be performed according to procedures documented in SW-846. Minimum calibration, operation, and quality control requirements (bias, precision, blank, and matrix effects) for laboratory analyses shall be performed as listed in the individual analytical methods of SW-846 (EPA 1992).

4.7.1 Analytical Methods

The analytical methods and number of samples are identified in Table 4-2 for Phase 1 and Phase 2 sampling. The analytical methods were selected to detect the potential constituents identified in Section 3.3 and the analytes required to satisfy the most stringent waste acceptance criteria of the off-site disposal facilities under consideration. The analytes required by the off-site disposal facilities include the following:

- TCLP metals (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver)
- VOCs
- SVOCs

Table 4-2 Summary of Samples and Analyses

Analysis (EPA SW-846 Method except where otherwise noted)	Metals 6020 [a] 1311 [a]	Volatile Organics 8240A [b]	Semi-volatile Organics 3520A, 3540A/ 8270A [c]	Reactive Cyanide/ Sulfide 9010A, 9030A [d k]	Total Cyanide 9011/ 9010A 9012A [e]	High Explosives 8330	Gamma Spectro-scopy	Gross Alpha 9310 [f]	Gross Beta 9310 [f]	Asbestos NIOSH Method 7400 [g]	Organo-chlorine Pesticides and PCBs 8080A [g h]	Chlorinated Herbicides 8150B [g h]	pH 9020	Dioxin 8280 [g]
Phase 1 Number of Samples														
Background Soil and Tuff [i]	20	0	20	0	0	0	20	20	20	0	0	0	0	0
Baseline Soil (Staging Area)	10	10	10	0	10	10	10	10	10	10	10	10	10	10
Waste Pile Soil/Tuff	165	165	165	41	0	165	165	165	165	165	41	41	41	41
Duplicate [j]	26	25	26	2	17	25	26	26	26	25	7	7	7	7
Rinsate Blank [k]	26	25	26	2	17	25	26	26	26	25	7	7	7	7
Matrix Spike [l]	18	17	18	2	9	17	18	18	18	17	4	4	4	4
Total Samples, Phase I	265	242	265	47	53	242	265	265	265	242	69	69	69	69
Phase 2 Number of Samples [m]														
Soil/Tuff	94	94	94	0	94	94	94	94	94	94	94	94	0	94
Post-closure Baseline Soil (Staging Area)	6	6	6	0	6	6	6	6	6	6	6	6	0	6
Duplicate [j]	5	5	5	0	5	5	5	5	5	5	5	5	0	5
Rinsate Blank [k]	5	5	5	0	5	5	5	5	5	5	5	5	0	5
Matrix Spike [l]	5	5	5	0	5	5	5	5	5	5	5	5	0	5
Total Samples, Phase 2	115	115	115	0	115	115	115	115	115	115	115	115	0	115

[a] Method 3005A and 3050A is digestion for water and soil, 6020 is the analytical method for most total metals. Method 7740 is the analytical method for total selenium. Methods 7470 and 7471 are the analytical methods for total mercury. Other methods may also be used (Method 6010A and 7000A series methods) as described in Section 4.6.1. Method 1311 is the TCLP method.
[b] Method 8260 may be substituted for 8240A.
[c] Method 3520A and 3540A are extraction methods for water and soil, 8270A is the analytical method.
[d] Determination of reactive cyanide is described is SW-846, Chapter 7, Section 7.3.3. This determination includes portions of Method 9010A. Determination of reactive sulfide is described in Section 7.3.4. This determination includes portions of Method 9030A.
[e] Method 9011 is digestion of soil for cyanide analyses. Methods 9010A and 9012A are the analytical methods for cyanide.
[f] Method 9310 is for water samples. Soil samples will be measured using calibrated field instruments.
[g] Analyses for asbestos, organochlorine pesticides and PCB, dioxin, and chlorinated herbicides will be performed in Phase 2 only is they are detected in the Phase 1 sampling.
[h] For soil/tuff samples will be taken from every fourth 100 cubic yard batch of waste that is to be deposited.
[i] The number of background samples will be identified in the Background Sampling Plan that will be submitted separately.
[j] Duplicates will be collected at a frequency of one per 20 soil or tuff samples, and one per 10 water samples.
[k] Equipment rinsate blanks will be collected at a frequency of one per 20 soil or tuff samples, and one per 10 water samples.
[l] Matrix spike samples will be collected at a frequency of one per sample delivery group per matrix, with a maximum of 20 samples per delivery group.
[m] The number of samples is estimated based on the number of sample grids within the proposed waste pile project boundary. After the waste pile boundary is surveyed, the number of grids will be totaled and the number of samples will be changed if necessary.

- organochlorine pesticides and PCBs
- chlorinated herbicides
- reactive cyanide and sulfide
- pH

During Phase 1, all background soil and tuff samples will be analyzed for total metals, SVOCs, and radionuclides. The SVOC analyses will be used to establish background for the PAHs.

During Phase 1, all baseline soil samples from the waste management areas at the top of the mesa will be analyzed for total metals, VOCs, SVOCs, total cyanide, HE, radionuclides, asbestos, organochlorine pesticides and PCBs, dioxin, and chlorinated herbicides.

During Phase 1, all soil and tuff samples from the waste pile will be analyzed for TC metals using the TCLP, VOCs, SVOCs, HE, radionuclides, and asbestos. However, only one-fourth of the soil and tuff samples will be analyzed for reactive cyanide and sulfide, organochlorine pesticides and PCBs, dioxin, chlorinated herbicides, and pH, because these analytes are not expected to be present and are only included to meet the waste acceptance criteria. The reactive cyanide and sulfide, organochlorine pesticides and PCBs, dioxin, chlorinated herbicides, and pH samples will be selected by collecting one sample from every fourth 100-yd^3 batch of waste.

During Phase 1, decontamination liquid samples and free liquid samples collected from pockets within the debris or in containers will be analyzed for TC metals (using total analyses), VOCs, SVOCs, total cyanide, HE, radionuclides, and asbestos.

During Phase 2, two of the soil or tuff samples will be analyzed for the following constituents analyzed during Phase 1: total metals, VOCs, SVOCs, HE, radionuclides, asbestos, total cyanide, organochlorine pesticides and PCBs, dioxin, and chlorinated herbicides. The remaining Phase 2

For this project, an extension of the 90-day and 180-day closure time frames will be necessary. Removal of wastes and completion of closure activities as described in Sections 6.2.4, 6.2.5, and 6.2.6 will extend until September 2001. This extended time frame is necessary because the Laboratory was unable to meet the original project schedule for waste removal due to safe operating practices at the site having to be re-evaluated when detonable pieces of HE were observed during excavation. The extended time frame is also necessary because of the following factors:

- the logistics of removing relatively large amounts of waste from a steep incline;
- decontaminating waste in an area that is limited in size; and
- weather conditions that cannot be predicted with any high degree of accuracy.

For these reasons, the Laboratory requests that NMED approve the extended project schedule until September 2001 for final closure. The anticipated closure schedule is presented in Section 6.2.7.

6.1.2.2 Time Frame for Demonstrations or Extensions (20 NMAC 4.1, Section 265.113[c])

As indicated in Figure 6-2, removal of wastes and completion of closure activities will need to be extended until September 2001. If completion of final closure activities will take longer that September 2001 the Laboratory will submit a closure plan amendment in accordance with 265.112(c).

6.1.3 Disposal or Decontamination of Equipment, Structures, Debris and Soils (20 NMAC 4.1, Section 265.114)

During the final closure period, all equipment, structures, debris, and soil that is contaminated above acceptable levels must be properly disposed of or decontaminated. Contaminated equipment will be decontaminated in accordance with the procedures described in Section 6.3.1. Contaminated structures and soils will be identified, decontaminated, removed, and disposed of in accordance with the procedures described in Sections 6.2.4, 6.2.5, and 6.2.6. Section 6.3.2 describes how wastes generated during closure will be managed. Section 6.3.3 describes the criteria used to determine when decontamination and closure activities have met the closure performance standard. Section 6.3.4 describes the specific sampling and analysis procedures to be used to verify that all materials remaining onsite after closure meet the closure performance standard.

ID		Task Name	Duration	Start	Finish
1		Submit Closure Plan	0 days	Mon 2/6/95	Mon 2/6/95
2		Closure Plan Approved	0 days	Thu 2/20/97	Thu 2/20/97
3		Permit Modifications	90 days	Fri 5/7/99	Thu 9/9/99
4		Procure Equipment & Subcontractors	1174 days	Mon 6/3/96	Thu 11/30/00
5		Readiness Review	1 day	Wed 10/29/97	Wed 10/29/97
6		Begin Operations	0 days	Mon 5/13/96	Mon 5/13/96
7		Preliminary Construction	665 days	Mon 5/13/96	Fri 11/27/98
8		Excavate, Decontaminate & Sample	648 days	Wed 11/5/97	Fri 4/28/00
9		Waste Treatment (as needed)	217 days	Thu 7/1/99	Fri 4/28/00
10		Phase 2 Sampling	85 days	Mon 2/28/00	Fri 6/23/00
11		Final Closure Report	174 days	Mon 4/3/00	Thu 11/30/00
12		Reseed/Replant Vegetation	340 days	Mon 5/22/00	Fri 9/7/01

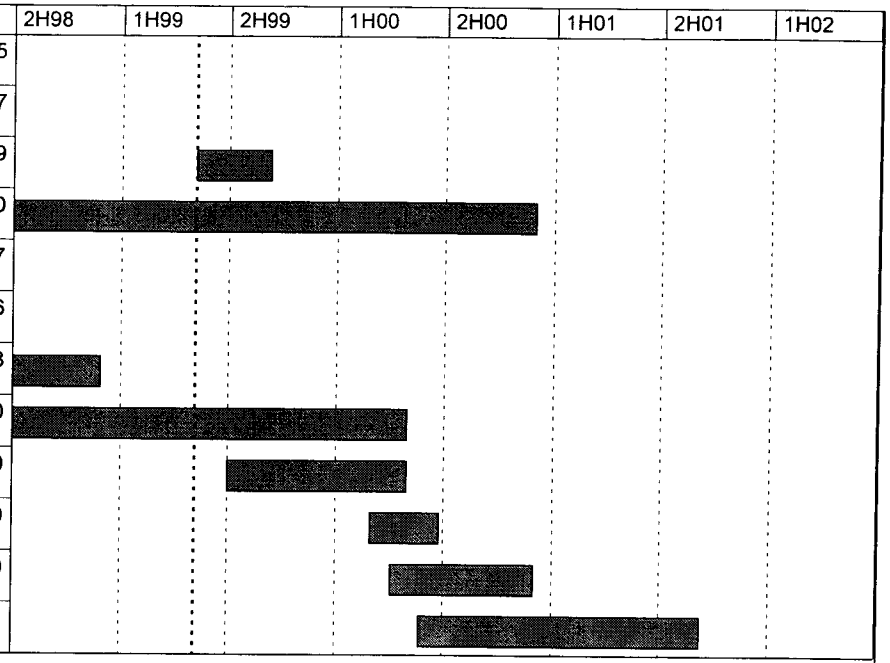


Figure 6-2:
ESTIMATED PROJECT SCHEDULE
Date: May 7, 1999

Task		Summary		Rolled Up Progress	
Split		Rolled Up Task		External Tasks	
Progress		Rolled Up Split		Project Summary	
Milestone		Rolled Up Milestone			

THIS PAGE INTENTIONALLY LEFT BLANK

a landfill as required by 20 NMAC 4.1, Section 265.258(b), and an amended closure/postclosure plan will be prepared and submitted to the NMED.

6.2.2 Identification of Maximum Extent of Operation [20 NMAC 4.1, Section 265.112(b)(2)]

The estimated maximum extent of operation of the waste pile is shown in Figure 1-1. The waste pile was operated from the early 1950's to 1984.

6.2.3 Estimate of the Maximum Inventory of Hazardous Waste [20 NMAC 4.1, Section 265.112(b)(3)]

The MDA-P waste pile contains an estimated 16,500 yd^3 of waste and debris. It is anticipated that 500 yd^3 of excavated soil will require treatment. This estimate is based on professional judgement and visual inspection of the waste pile.

6.2.4 Detailed Description of Removal of Waste Inventory [20 NMAC 4.1, Sections 265.112(b)(3) and (4)]

Prior to the excavation of the waste, several activities will occur. A staging area will be set up for the segregation of waste material (see Figure 2-4 in pocket at the end of Chapter 2.0). This staging area will be constructed on a 200-ft by 200-ft, 80-mil high-density polyethylene (HPDE) liner overlain by a protective layer of plywood or steel. Material will be placed at this staging area, inspected, sampled, and segregated based on physical characteristics. Immediately adjacent to this staging area, a decontamination pad will be constructed of concrete covered with an 80-mil HDPE liner. This liner will be overlain by a protective layer of plywood or steel. This decontamination pad will measure approximately 40 ft by 40 ft and will have 2-in. curbing to contain any liquids. During decontamination, plastic splash guards will be placed inside the curb of the decontamination pad to prevent liquids from coming into contact with surrounding soils. This decontamination pad will be placed inside a secondary containment system constructed of 80-mil HDPE with 4-in. curbing made of wood covered by the liner. During decontamination, the liquids in the decontamination pad will be vacuumed out into a container to prevent the liquid from overtopping curb levels. Nearby, two 40-ft by 40-ft evaporation ponds will be constructed

from the NMED Air Quality Bureau. During burning operations at TA-16, no personnel access will be allowed to MDA-P. TA-16 burn schedules and the contractor schedules will be coordinated to minimize project delays and TA-16 operation delays.

On-site treatment of contaminated soils or liquids will be conducted in tanks meeting the requirements of 20 NMAC 4.1, Section 264.192 through 264.199. The treatment will occur in less than 90 days and is exempted from permit requirements as described in 20 NMAC 4.1, Section 262.34. These tanks will be used for the closure of the MDA-P waste pile only. The life span of these tanks is limited to the duration of the closure which is expected to be complete by September 2001. As identified in 20 NMAC 4.1, Section 264.193(g), these tanks will be designed and operated to prevent migration of hazardous waste or constituents to the ground water or surface water. All tanks will be inspected daily to ensure no hazardous constituents can spread to the environment. All tanks will be covered with tarps at the end of each day's use. On-site treatment is expected to consist of stabilizing barium-contaminated soils. The soil will be loaded into a hopper and placed in a mixer. It is expected that 12-yd^3 batches will be mixed using mix equipment similar to a Maxon Paddle Mixer or possibly a 10-yd^3 cement mixer truck. The mixer will be placed in a secondary containment system consisting of an 80-mil HDPE liner with 4-in. curbing made of wood. The equipment will be supported with a concrete pad. The mixer and containment structure will be inspected daily and repaired as necessary to ensure no hazardous constituents can spread to the environment. All equipment will be covered with tarps after the end of each day's use. After rain events, water in treatment tanks will be pumped into containers and sampled and managed based on analytical results. The material will be mixed with a 40% solution of ammonium sulfate. An estimated 15-gal. or less of ammonium sulfate solution will be required for each cubic yard of waste. The mixture is expected to produce a moisture-free stabilized soil that will pass the paint-filter test (EPA 1992). After stabilization, the mixture will be placed in the evaporation ponds with a front-end loader for 24 hours to ensure it is dry enough to transport to the disposal facility. After successful sampling results indicate the soil no longer exhibits the TC for barium, the waste will be sent to a permitted off-site solid waste disposal facility. Water and sludge collected during decontamination will be mixed and stabilized with the soil.

Limited treatability studies will be conducted by on-site personnel or Laboratory-approved laboratories to confirm the stabilization formula prior to full-scale treatment. Two 100 mL samples

After all equipment decontamination is complete, the materials used to construct the staging, decontamination, treatment, and container storage areas will be decontaminated by steam cleaning, followed by rinsing with clean water. Next, the liners will be decontaminated in place by stream cleaning, followed by rinsing with clean water. If the liners are not radioactive and are visibly contaminated, they will be disposed of as nonradioactive, nonhazardous waste.

Decontamination wastes (i.e., liquids and sludges) will be placed in appropriate containers. The containers will be lined with material (e.g., polyethylene) that is compatible with the detergent and any contaminants expected to be present in the decontamination wastes.

After the waste containers are sealed, all visible contamination (e.g., soil) will be removed from the surface by wiping with detergent-soaked rags. If the waste is radioactive, the surface of the waste container will be radiologically surveyed to determine if total and removable contamination meets target limits. If not, additional decontamination will be performed.

6.3.2 Management of Generated Wastes [20 NMAC 4.1, Section 265.112(b)(3) and 265.114]

Wastes that may be generated during closure of the MDA-P waste pile include debris, soil and tuff, personal protective clothing, disposable sampling equipment, decontamination liquids, and construction materials (i.e., concrete pads and liners). These wastes will be characterized based on the sampling and analysis as described in Section 4.1, 4.2, and 4.3.

Based on existing waste characterization data (see Chapter 3.0), the excavated debris and equipment used during closure is expected to be easily decontaminated with steam and rendered nonhazardous. Certain generated soils and water are expected to exhibit the TC for barium and will be managed as hazardous waste.

If wastes or debris exhibit a characteristic identified in 20 NMAC 4.1, Part 261, Subpart C, or are listed waste identified in Subpart D, they will be managed as hazardous waste.

If Appendix VIII constituents are not detected in the final rinsate samples, then the decontamination pad,

CLOSURE PLAN AMENDMENT

MDA-P REPLACEMENT PAGES

accordance with EPA guidance (EPA, 1991a). Appendix C contains photographs of the waste pile and run-on control trench. Appendix D describes vadose-zone observations from 1998 at MDA-P. Appendix E provides historical records associated with TA-16 and MDA-P. Appendix F describes the composition of explosives produced at the Laboratory. Appendix G describes sampling procedures for MDA-P closure, Appendix H presents an evaluation of the 20 NMAC 4.1 Section 261, Appendix VIII (Appendix VIII) hazardous constituents for selection of analytical methods. Appendix I provides site-specific standard operating procedures. Appendix J describes the site geology and hydrology at TA-16, Area P

Compliance with specific regulatory requirements for closure are addressed in Chapter 6.0. The 20 MNAC 4.1 have incorporated, with a few minor exceptions, the Code of Federal Regulations (CFR) Title 40, Parts 2600 to 266 and 268 to 270 through July 1, 1993. Most regulatory citations in this closure will, therefore, be referenced to 20 NMAC 4.1. Table 1-1 lists the regulations applicable for closure of waste piles and identifies which sections of Chapter 6.0 address compliance with these regulations.

1.1 Closure Strategy

In the past, the disposal site at Area P was referred to as a landfill. However, RCRA regulations do not explicitly provide a clean-closure option for landfills. The U.S. Environmental Protection Agency (EPA) has addressed this problem by issuing guidance that allows a landfill, if clean closed under 40 CFR 265 standards, to make an equivalency demonstration under 40 CFR Section 270.1(c)(5),(6), by redefining the landfill as a waste pile (Lowrance 1989). Therefore, to clean close this unit and make an equivalency demonstration as described above, the Laboratory is referring to the MDA-P landfill as the MDA-P waste pile.

1.1.1 MDA-P and Nearby Potential Contaminated Sites

MDA-P is shown in Figure 1-1 (see map in pocket at the end of this chapter), which shows the area directly influenced by waste disposal activities and any possible subsequent contamination. The waste and contamination located within this area is specifically subject to the requirements outlined in this Closure Plan. Four other potentially contaminated areas are located in the vicinity of MDA-P; these areas (or sites) are PRSs 16-006(e), 16-010(a), 16-016(c) and 16-010(b). These PRSs are also depicted on Figure 1-1. Descriptions as well as regulatory status of these PRSs are briefly outlined below:

- PRS 16-006(e) is an active 385 gallon steel septic tank serving a water closet, lavatory, and a floor drain from a control shelter at the burning ground. The tank was constructed in 1963 and discharges to an associated drain field and outfall. PRS 16-006(e) is listed on Table A of the HSWA Module of the Laboratory's Hazardous Waste Facility Permit. RCRA Facility Investigation (RFI) sampling was completed in fiscal year (FY) 1995.

- PRS 16-010(a) is an inactive flash pad (TA-16-386) that was once used for flash burning high explosive (HE)-contaminated material. A large pile of barium nitrate was located within the confines of TA-16-386 (PRS 16-010[a]) during the 1950s and was removed by the early 1970s. PRSs 16-010(a) is listed on Table A of the HSWA Module in LANL's Hazardous Waste Facility Permit. RFI sampling was completed in FY 1995.

- PRS 16-016(c) is a barium nitrate storage site used after PRS 16-010(a) was decommissioned. PRS 16-016(c) is listed on Table A of the HSWA Module in the Laboratory's Hazardous Waste Facility Permit. RFI sampling was completed in FY 1995.

- PRS 16-010(b) is active flash pad TA-16-387 and is a RCRA-regulated interim status unit. The pad was constructed in 1951 and is used for flash burning high explosives (HE)-contaminated material. The burn area is constructed of concrete blocks placed on the ground surrounding three sides of the pad. Material to be flashed is placed within the concrete block-lined area with wood fuel to maintain the burn until all HE has been reacted.(LANL 1996).

Any releases and/or contamination associated with these PRSs will be addressed as part of other activities (i.e. RCRA Corrective Action, etc.) and are not subject to the requirements of this Closure Plan. However, at LANL's discretion, the remediation, waste management, and confirmation sampling activities associated with these four adjacent PRSs may coincide with MDA-P closure activities.

A fifth potentially contaminated area is the stream at the bottom of the Cañon de Valle, located north of the waste pile. The stream is contaminated with constituents similar to those potentially present in the waste pile (see Section 3.1). However, several other known sources of potential contamination are located upstream of the waste pile. These sources include the drainage from the burn pads, located approximately 60 ft upstream and the effluent from a National Pollutant Discharge Elimination System (NPDES)-permitted outfall from Building 260, located approximately 1700 ft upstream of the waste pile. The outfall is currently being monitored as required by the NPDES permit but not all of the potential contaminants identified in the RFI Work Plan are included in that monitoring. Another source is the MDA-R, a material disposal area that includes a World War II S-Site burning ground and its waste disposal area; this area is located

approximately 1,900 ft upstream of the waste pile. One or more of these sources has produced elevated concentrations of several potential contaminants in the stream and associated sediments. Because the stream continues to receive contaminants (e.g., barium) from these upstream sources, cleaning up the stream to the clean-closure performance goals would not be possible.

The RFI for 1082 will address contamination in the stream located at the bottom of Cañon de Valle within OU 1082. All of the contaminants in this section of the canyon are likely to have been derived from TA-16 programmatic activities. In addition, the principal contaminants (HE and barium) in Cañon de Valle are the principal contaminants for upstream potentially contaminated areas in OU 1082. The Laboratory has not set the date for beginning the OU 1082 Phase I investigation for Cañon de Valle.

The Laboratory will ensure that the contaminants identified for the adjacent potentially contaminated areas will include all of the contaminants detected during the closure of the MDA-P waste pile.

The MDA-P boundary to the South of the MDA-P waste pile was selected to parallel (but not include) the surface run-on control trench located upgradient of the waste pile. The western boundary was selected to coincide with a small ridge that divides the drainage from the burn pads and drainage from the waste pile. The northern boundary was selected to coincide with the approximate elevation of the 100-year flood-plain of the Cañon de Valle stream. However, the northwest corner of the waste pile project boundary is below the 100-year flood-plain boundary. The eastern boundary was selected to include the last drainage channel to the east that could possibly include contamination from the waste pile. The eastern boundary was selected to include the eastern and western sides of the natural drainage divide. Markers will be used to permanently identify the surveyed boundary of the MDA-P waste pile.

1.1.3 Technical Approach

To achieve closure, the entire waste pile, including hazardous and nonhazardous waste and soil, will be removed. Approximately 16,500 cubic yards (yd^3) of debris will be excavated. The primary decontamination technique will be steam cleaning. The waste contained within the pile is very heterogeneous; most of it appears to be structural steel and miscellaneous debris, which cannot be easily sampled or characterized because of the impracticality of drilling through the material and the physical size of the material. Chapter 3.0 of this plan describes what is known about the waste pile, both from process knowledge and from the limited number of samples that have been taken to characterize the waste pile.

During closure, the waste will be characterized during excavation as sections of the pile are removed. For safety reasons, the debris will be decontaminated using steam and hot water to remove potential high explosives (HE) contamination. If the HE materials cannot be effectively removed from the debris, the debris will be flashed at the TA-16 open burn pad. If a significant amount of debris is generated beyond the estimates of this plan, alternate waste treatment methods will be explored. After decontamination and/or flashing, most of the debris is expected to be designated as nonhazardous.

All debris will be steam cleaned prior to off-site management. Steam cleaning meets the alternative treatment standard for hazardous debris; thus, visual inspection will be used to verify that hazardous debris is no longer considered contaminated.

Soil, decontamination wastes (i.e., liquids and sludges), or free liquids (i.e., those liquids found in pockets or containers within the waste pile) that contain HE materials or exceed the regulatory levels for toxicity characteristic (TC) metals (e.g., barium, chromium, lead) may be treated onsite or offsite at a permitted facility. On-site treatment of this waste may include stabilization on a batch basis for metals, such as barium, chromium, or lead. The batches of material will be approximately 100 yd^3. Treatment that may be conducted onsite will occur inside tanks meeting the requirements of 20 NMAC 4.1, Sections 264.192 through 264.199. This treatment will occur

Figure 1-1

MDA-P Project Area and Adjacent PRSs

4.1.2 Sampling to Establish Baseline

Before any waste is removed, baseline levels will be established for the soil at the top of the mesa in the approximate location of the closure waste handling/management areas (e.g., staging, decontamination, treatment, storage, and loading areas). Baseline levels will be established by collecting 10 samples from locations distributed over the waste handling/management area. Baseline levels will reflect the possible presence of contaminants derived from nearby Laboratory operations that are not related to MDA-P. Baseline concentrations are represented by the 95% UTL calculated from concentrations of Appendix VIII hazardous constituents and radioactive constituents measured in soil from these areas.

Following the completion of all waste removal operations and final equipment decontamination, the areas on top of the mesa will be resampled and the sampling data compared with baseline UTLs concentrations to determine if any releases occurred during the waste removal operations.

4.1.3 Sampling of the Waste Pile

During waste removal operations, the waste pile will be sampled for potential contaminants to characterize the waste for selection of treatment and disposal options. The material to be sampled includes excavated soil and tuff, as well as debris within the waste pile. Before excavation, this material will be visually inspected and spot-tested for HE to ensure safe handling.

4.1.3.1 Soil and Tuff

One composite sample will be taken from each 100 yd^3 of waste soil and tuff. Based on the estimated waste-pile volume (16,500 yd^3), a total of approximately 165 composite samples will be collected. Composite sampling will provide data on the average concentration of contaminants required for selecting treatment and disposal options.

Each composite sample will consist of grab samples collected from 3 to 10 locations within the100 yd^3 of soil and tuff. A larger number of grab samples could result in excessive dilution of contaminant concentrations. Sufficient volume will be collected for each grab sample to ensure adequate composite sample volume for the prescribed analyses. The composite samples will

be collected from the soil before excavation or after the waste has been removed to the top of the mesa.

The leader of the sampling team will inspect the waste and select grab samples from any waste material that shows discoloration, elevated moisture content, or other evidence of potential contamination. Field instruments will be used to indicate if constituents are present in the waste during excavation. Contaminated soil will be segregated and sampled separately.

The number of samples was chosen to satisfy treatment, storage, and disposal requirements and is based on best professional judgement concerning the heterogeneity of the waste pile. Composite sampling allows more sample locations and better represents the total batch. Additional samples will be collected based on the judgement of the field team leader. By using systematic composite sampling combined with judgment-based sampling, the waste can be effectively segregated into and managed as unique and different wastestreams.

4.1.3.2 Debris

In accordance with 20 NMAC 4.1, Section 268.2(g), debris is defined as solid material exceeding a 60-mm particle size that is intended for disposal and that is a manufactured object, plant or animal matter, or natural geologic material. In addition, hazardous debris is defined as debris that contains a hazardous waste listed in 40 CFR Part 261, Subpart D, or that exhibits a characteristic of hazardous waste identified in 40 CFR Part 261, Subpart C.

The excavated debris is expected to consist of pieces of metal, concrete, wood, or other large items. All debris will be steam cleaned prior to off-site management. Steam cleaning meets the alternative treatment standard for hazardous debris; thus, visual inspection will be used to verify that hazardous debris is no longer considered contaminated. Results of visual inspection and decontamination will be documented.

During excavation, the debris will be visually inspected for HE, then removed and decontaminated.

4.1.3.3 Free Liquid and Containers of Liquid

During excavation, free liquid may be found in pockets of the debris or containers. This liquid will be pumped into a suitable container and sampled.

Containers of liquid that may be found during excavation will be carefully removed from the waste pile and placed in a cool, shaded area for sampling. Information will be obtained from any labels that may be present on the container to help identify the contents. If the contents are unknown, the container will be sampled at a later time under appropriate controlled conditions (e.g., a fume hood, or supplied air).

4.2 Strategy, Sample Point Location, and Number of Samples for Phase 2 Sampling and Analysis

After the waste pile is removed, Phase 2 confirmatory sampling will be conducted to assess whether the concentrations of Appendix VIII hazardous or radioactive constituents in the remaining soil and tuff are below acceptable levels and to determine that the closure performance standard as described in Section 6.1.1 and 6.1.1.2 has been met. Phase 2 sampling will include sampling of the soil and tuff within the MDA-P waste pile project boundary and sampling of the soil at the closure waste handling/management areas at the top of the mesa.

Additionally, visual inspections and spot testing for HE will be conducted as necessary to ensure safe sample management.

4.2.1 Sampling of the Soil Beneath and Downgradient of the Former Waste Pile

When all debris and obviously contaminated soil or tuff has been removed from the pile and any overexcavation has been completed, confirmatory samples will be collected from the exposed surface and downslope from the former waste pile at a depth of 0-12 in. to assess whether the concentrations of the remaining soil and tuff are below acceptable levels and the closure performance standard has been met. Discrete grab samples will be collected from locations

- Inorganic and organic compounds for which there are no analytical methods in SW-846 or standards
- General classes of compounds identified as not-otherwise-specified
- Chemicals whose common usage is inconsistent with operations at TA-16 and other TAs sending waste to the waste piles (e.g., pharmaceuticals, manufacture of organic chemicals)

Appendix H presents an evaluation of the Appendix VIII constituents. In addition, this appendix identifies the proposed methods, analytes, estimated quantitation limits, proposed RCRA Subpart S action levels, and ER Program SALs.

Test methods for chemical analysis will be performed according to procedures documented in SW-846. Minimum calibration, operation, and quality control requirements (bias, precision, blank, and matrix effects) for laboratory analyses shall be performed as listed in the individual analytical methods of SW-846 (EPA 1992).

4.7.1 Analytical Methods

The analytical methods and number of samples are identified in Table 4-2 for Phase 1 and Phase 2 sampling. The analytical methods were selected to detect the potential constituents identified in Section 3.3 and the analytes required to satisfy the most stringent waste acceptance criteria of the off-site disposal facilities under consideration. The analytes required by the off-site disposal facilities include the following:

- TCLP metals (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver)
- VOCs
- SVOCs

Table 4-2 Summary of Samples and Analyses

Analysis (EPA SW-846 Method except where otherwise noted)	Metals 6020 [a] 1311 [a]	Volatile Organics 8240A [b]	Semi-volatile Organics 3520A, 3540A/ 8270A [c]	Reactive Cyanide/ Sulfide 9010A, 9030A [d k]	Total Cyanide 9011/ 9010A 9012A [e]	High Explosives 8330	Gamma Spectro-scopy	Gross Alpha 9310 [f]	Gross Beta 9310 [f]	Asbestos NIOSH Method 7400 [g]	Organo-chlorine Pesticides and PCBs 8080A [g h]	Chlorinated Herbicides 8150B [g h]	pH 9020	Dioxin 8280 [g]
Phase 1 Number of Samples														
Background Soil and Tuff [i]	20	0	20	0	0	0	20	20	20	0	0	0	0	0
Baseline Soil (Staging Area)	10	10	10	0	10	10	10	10	10	10	10	10	10	10
Waste Pile Soil/Tuff	165	165	165	41	0	165	165	165	165	165	41	41	41	41
Duplicate [j]	26	25	26	2	17	25	26	26	26	25	7	7	7	7
Rinsate Blank [k]	26	25	26	2	17	25	26	26	26	25	7	7	7	7
Matrix Spike [l]	18	17	18	2	9	17	18	18	18	17	4	4	4	4
Total Samples, Phase I	265	242	265	47	53	242	265	265	265	242	69	69	69	69
Phase 2 Number of Samples [m]														
Soil/Tuff	94	94	94	0	94	94	94	94	94	94	94	94	0	94
Post-closure Baseline Soil (Staging Area)	6	6	6	0	6	6	6	6	6	6	6	6	0	6
Duplicate [j]	5	5	5	0	5	5	5	5	5	5	5	5	0	5
Rinsate Blank [k]	5	5	5	0	5	5	5	5	5	5	5	5	0	5
Matrix Spike [l]	5	5	5	0	5	5	5	5	5	5	5	5	0	5
Total Samples, Phase 2	115	115	115	0	115	115	115	115	115	115	115	115	0	115

[a] Method 3005A and 3050A is digestion for water and soil, 6020 is the analytical method for most total metals. Method 7740 is the analytical method for total selenium. Methods 7470 and 7471 are the analytical methods for total mercury. Other methods may also be used (Method 6010A and 7000A series methods) as described in Section 4.6.1. Method 1311 is the TCLP method.
[b] Method 8260 may be substituted for 8240A.
[c] Method 3520A and 3540A are extraction methods for water and soil, 8270A is the analytical method.
[d] Determination of reactive cyanide is described is SW-846, Chapter 7, Section 7.3.3. This determination includes portions of Method 9010A. Determination of reactive sulfide is described in Section 7.3.4. This determination includes portions of Method 9030A.
[e] Method 9011 is digestion of soil for cyanide analyses. Methods 9010A and 9012A are the analytical methods for cyanide.
[f] Method 9310 is for water samples. Soil samples will be measured using calibrated field instruments.
[g] Analyses for asbestos, organochlorine pesticides and PCB, dioxin, and chlorinated herbicides will be performed in Phase 2 only is they are detected in the Phase 1 sampling.
[h] For soil/tuff samples will be taken from every fourth 100 cubic yard batch of waste that is to be deposited.
[i] The number of background samples will be identified in the Background Sampling Plan that will be submitted separately.
[j] Duplicates will be collected at a frequency of one per 20 soil or tuff samples, and one per 10 water samples.
[k] Equipment rinsate blanks will be collected at a frequency of one per 20 soil or tuff samples, and one per 10 water samples.
[l] Matrix spike samples will be collected at a frequency of one per sample delivery group per matrix, with a maximum of 20 samples per delivery group.
[m] The number of samples is estimated based on the number of sample grids within the proposed waste pile project boundary. After the waste pile boundary is surveyed, the number of grids will be totaled and the number of samples will be changed if necessary.

- organochlorine pesticides and PCBs
- chlorinated herbicides
- reactive cyanide and sulfide
- pH

During Phase 1, all background soil and tuff samples will be analyzed for total metals, SVOCs, and radionuclides. The SVOC analyses will be used to establish background for the PAHs.

During Phase 1, all baseline soil samples from the waste management areas at the top of the mesa will be analyzed for total metals, VOCs, SVOCs, total cyanide, HE, radionuclides, asbestos, organochlorine pesticides and PCBs, dioxin, and chlorinated herbicides.

During Phase 1, all soil and tuff samples from the waste pile will be analyzed for TC metals using the TCLP, VOCs, SVOCs, HE, radionuclides, and asbestos. However, only one-fourth of the soil and tuff samples will be analyzed for reactive cyanide and sulfide, organochlorine pesticides and PCBs, dioxin, chlorinated herbicides, and pH, because these analytes are not expected to be present and are only included to meet the waste acceptance criteria. The reactive cyanide and sulfide, organochlorine pesticides and PCBs, dioxin, chlorinated herbicides, and pH samples will be selected by collecting one sample from every fourth 100-yd^3 batch of waste.

During Phase 1, decontamination liquid samples and free liquid samples collected from pockets within the debris or in containers will be analyzed for TC metals (using total analyses), VOCs, SVOCs, total cyanide, HE, radionuclides, and asbestos.

During Phase 2, two of the soil or tuff samples will be analyzed for the following constituents analyzed during Phase 1: total metals, VOCs, SVOCs, HE, radionuclides, asbestos, total cyanide, organochlorine pesticides and PCBs, dioxin, and chlorinated herbicides. The remaining Phase 2

For this project, an extension of the 90-day and 180-day closure time frames will be necessary. Removal of wastes and completion of closure activities as described in Sections 6.2.4, 6.2.5, and 6.2.6 will extend until September 2001. This extended time frame is necessary because the Laboratory was unable to meet the original project schedule for waste removal due to safe operating practices at the site having to be re-evaluated when detonable pieces of HE were observed during excavation. The extended time frame is also necessary because of the following factors:

- the logistics of removing relatively large amounts of waste from a steep incline;
- decontaminating waste in an area that is limited in size; and
- weather conditions that cannot be predicted with any high degree of accuracy.

For these reasons, the Laboratory requests that NMED approve the extended project schedule until September 2001 for final closure. The anticipated closure schedule is presented in Section 6.2.7.

6.1.2.2 Time Frame for Demonstrations or Extensions (20 NMAC 4.1, Section 265.113[c])

As indicated in Figure 6-2, removal of wastes and completion of closure activities will need to be extended until September 2001. If completion of final closure activities will take longer that September 2001 the Laboratory will submit a closure plan amendment in accordance with 265.112(c).

6.1.3 Disposal or Decontamination of Equipment, Structures, Debris and Soils (20 NMAC 4.1, Section 265.114)

During the final closure period, all equipment, structures, debris, and soil that is contaminated above acceptable levels must be properly disposed of or decontaminated. Contaminated equipment will be decontaminated in accordance with the procedures described in Section 6.3.1. Contaminated structures and soils will be identified, decontaminated, removed, and disposed of in accordance with the procedures described in Sections 6.2.4, 6.2.5, and 6.2.6. Section 6.3.2 describes how wastes generated during closure will be managed. Section 6.3.3 describes the criteria used to determine when decontamination and closure activities have met the closure performance standard. Section 6.3.4 describes the specific sampling and analysis procedures to be used to verify that all materials remaining onsite after closure meet the closure performance standard.

ID		Task Name	Duration	Start	Finish
1		Submit Closure Plan	0 days	Mon 2/6/95	Mon 2/6/95
2		Closure Plan Approved	0 days	Thu 2/20/97	Thu 2/20/97
3		Permit Modifications	90 days	Fri 5/7/99	Thu 9/9/99
4		Procure Equipment & Subcontractors	1174 days	Mon 6/3/96	Thu 11/30/00
5		Readiness Review	1 day	Wed 10/29/97	Wed 10/29/97
6		Begin Operations	0 days	Mon 5/13/96	Mon 5/13/96
7		Preliminary Construction	665 days	Mon 5/13/96	Fri 11/27/98
8		Excavate, Decontaminate & Sample	648 days	Wed 11/5/97	Fri 4/28/00
9		Waste Treatment (as needed)	217 days	Thu 7/1/99	Fri 4/28/00
10		Phase 2 Sampling	85 days	Mon 2/28/00	Fri 6/23/00
11		Final Closure Report	174 days	Mon 4/3/00	Thu 11/30/00
12		Reseed/Replant Vegetation	340 days	Mon 5/22/00	Fri 9/7/01

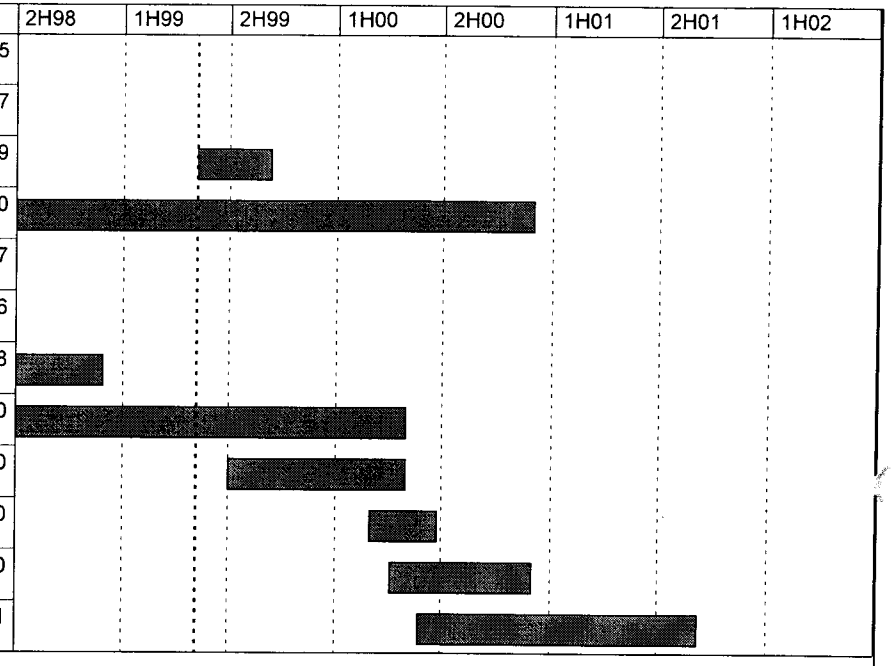


Figure 6-2:
ESTIMATED PROJECT SCHEDULE
Date: May 7, 1999

Task		Summary		Rolled Up Progress	
Split		Rolled Up Task		External Tasks	
Progress		Rolled Up Split		Project Summary	
Milestone		Rolled Up Milestone			

THIS PAGE INTENTIONALLY LEFT BLANK

a landfill as required by 20 NMAC 4.1, Section 265.258(b), and an amended closure/postclosure plan will be prepared and submitted to the NMED.

6.2.2 Identification of Maximum Extent of Operation [20 NMAC 4.1, Section 265.112(b)(2)]

The estimated maximum extent of operation of the waste pile is shown in Figure 1-1. The waste pile was operated from the early 1950's to 1984.

6.2.3 Estimate of the Maximum Inventory of Hazardous Waste [20 NMAC 4.1, Section 265.112(b)(3)]

The MDA-P waste pile contains an estimated 16,500 yd^3 of waste and debris. It is anticipated that 500 yd^3 of excavated soil will require treatment. This estimate is based on professional judgement and visual inspection of the waste pile.

6.2.4 Detailed Description of Removal of Waste Inventory [20 NMAC 4.1, Sections 265.112(b)(3) and (4)]

Prior to the excavation of the waste, several activities will occur. A staging area will be set up for the segregation of waste material (see Figure 2-4 in pocket at the end of Chapter 2.0). This staging area will be constructed on a 200-ft by 200-ft, 80-mil high-density polyethylene (HPDE) liner overlain by a protective layer of plywood or steel. Material will be placed at this staging area, inspected, sampled, and segregated based on physical characteristics. Immediately adjacent to this staging area, a decontamination pad will be constructed of concrete covered with an 80-mil HDPE liner. This liner will be overlain by a protective layer of plywood or steel. This decontamination pad will measure approximately 40 ft by 40 ft and will have 2-in. curbing to contain any liquids. During decontamination, plastic splash guards will be placed inside the curb of the decontamination pad to prevent liquids from coming into contact with surrounding soils. This decontamination pad will be placed inside a secondary containment system constructed of 80-mil HDPE with 4-in. curbing made of wood covered by the liner. During decontamination, the liquids in the decontamination pad will be vacuumed out into a container to prevent the liquid from overtopping curb levels. Nearby, two 40-ft by 40-ft evaporation ponds will be constructed

from the NMED Air Quality Bureau. During burning operations at TA-16, no personnel access will be allowed to MDA-P. TA-16 burn schedules and the contractor schedules will be coordinated to minimize project delays and TA-16 operation delays.

On-site treatment of contaminated soils or liquids will be conducted in tanks meeting the requirements of 20 NMAC 4.1, Section 264.192 through 264.199. The treatment will occur in less than 90 days and is exempted from permit requirements as described in 20 NMAC 4.1, Section 262.34. These tanks will be used for the closure of the MDA-P waste pile only. The life span of these tanks is limited to the duration of the closure which is expected to be complete by September 2001. As identified in 20 NMAC 4.1, Section 264.193(g), these tanks will be designed and operated to prevent migration of hazardous waste or constituents to the ground water or surface water. All tanks will be inspected daily to ensure no hazardous constituents can spread to the environment. All tanks will be covered with tarps at the end of each day's use. On-site treatment is expected to consist of stabilizing barium-contaminated soils. The soil will be loaded into a hopper and placed in a mixer. It is expected that 12-yd^3 batches will be mixed using mix equipment similar to a Maxon Paddle Mixer or possibly a 10-yd^3 cement mixer truck. The mixer will be placed in a secondary containment system consisting of an 80-mil HDPE liner with 4-in. curbing made of wood. The equipment will be supported with a concrete pad. The mixer and containment structure will be inspected daily and repaired as necessary to ensure no hazardous constituents can spread to the environment. All equipment will be covered with tarps after the end of each day's use. After rain events, water in treatment tanks will be pumped into containers and sampled and managed based on analytical results. The material will be mixed with a 40% solution of ammonium sulfate. An estimated 15-gal. or less of ammonium sulfate solution will be required for each cubic yard of waste. The mixture is expected to produce a moisture-free stabilized soil that will pass the paint-filter test (EPA 1992). After stabilization, the mixture will be placed in the evaporation ponds with a front-end loader for 24 hours to ensure it is dry enough to transport to the disposal facility. After successful sampling results indicate the soil no longer exhibits the TC for barium, the waste will be sent to a permitted off-site solid waste disposal facility. Water and sludge collected during decontamination will be mixed and stabilized with the soil.

Limited treatability studies will be conducted by on-site personnel or Laboratory-approved laboratories to confirm the stabilization formula prior to full-scale treatment. Two 100 mL samples

After all equipment decontamination is complete, the materials used to construct the staging, decontamination, treatment, and container storage areas will be decontaminated by steam cleaning, followed by rinsing with clean water. Next, the liners will be decontaminated in place by stream cleaning, followed by rinsing with clean water. If the liners are not radioactive and are visibly contaminated, they will be disposed of as nonradioactive, nonhazardous waste.

Decontamination wastes (i.e., liquids and sludges) will be placed in appropriate containers. The containers will be lined with material (e.g., polyethylene) that is compatible with the detergent and any contaminants expected to be present in the decontamination wastes.

After the waste containers are sealed, all visible contamination (e.g., soil) will be removed from the surface by wiping with detergent-soaked rags. If the waste is radioactive, the surface of the waste container will be radiologically surveyed to determine if total and removable contamination meets target limits. If not, additional decontamination will be performed.

6.3.2 Management of Generated Wastes [20 NMAC 4.1, Section 265.112(b)(3) and 265.114]

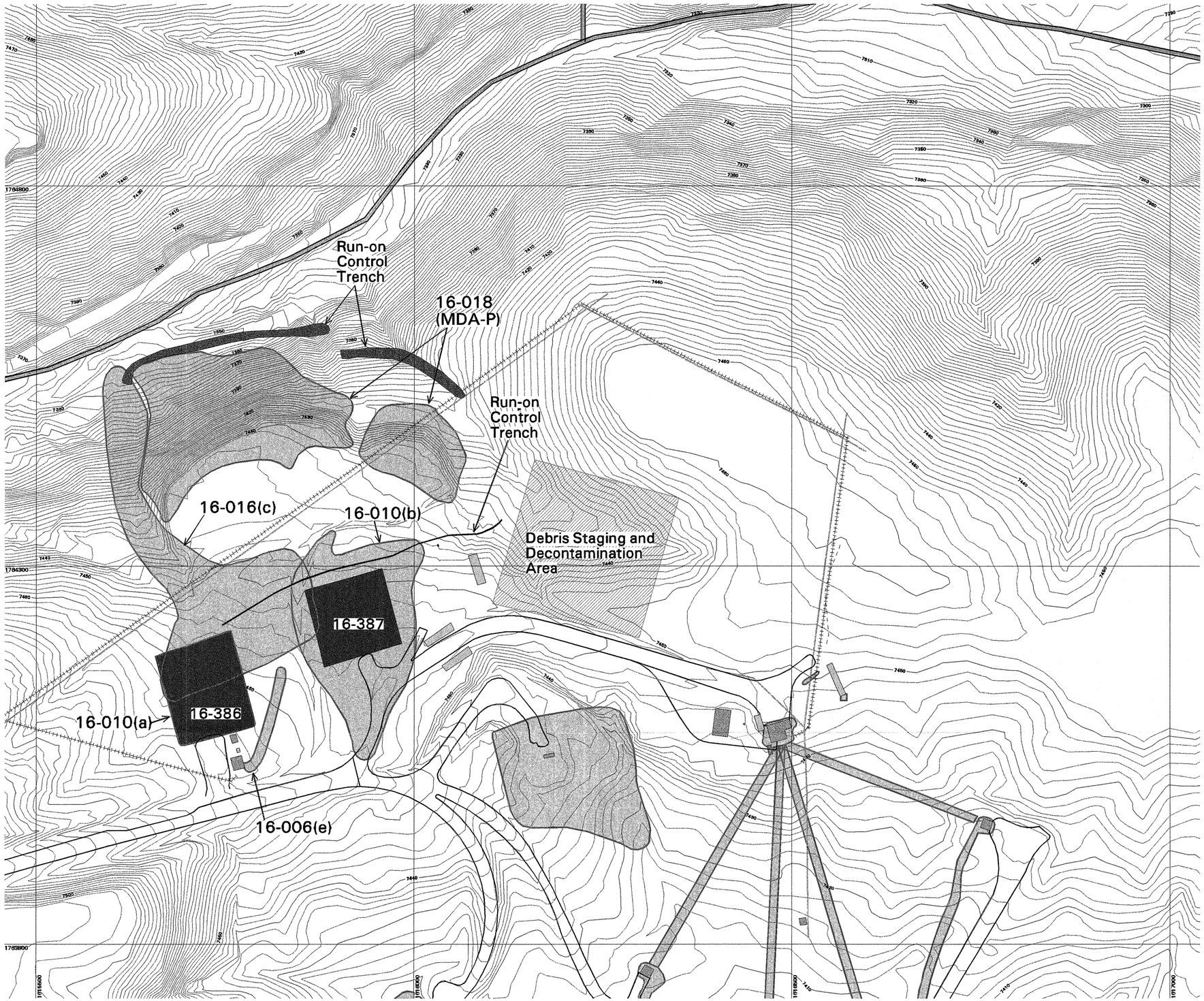
Wastes that may be generated during closure of the MDA-P waste pile include debris, soil and tuff, personal protective clothing, disposable sampling equipment, decontamination liquids, and construction materials (i.e., concrete pads and liners). These wastes will be characterized based on the sampling and analysis as described in Section 4.1, 4.2, and 4.3.

Based on existing waste characterization data (see Chapter 3.0), the excavated debris and equipment used during closure is expected to be easily decontaminated with steam and rendered nonhazardous. Certain generated soils and water are expected to exhibit the TC for barium and will be managed as hazardous waste.

If wastes or debris exhibit a characteristic identified in 20 NMAC 4.1, Part 261, Subpart C, or are listed waste identified in Subpart D, they will be managed as hazardous waste.

If Appendix VIII constituents are not detected in the final rinsate samples, then the decontamination pad,

MDA-P Project Area and adjacent PRSs



FIMAD Plot ID: G107621 29 Apr 99

LEGEND

- Contours, 10 ft
- Contours, 2 ft
- Boundary, OU
- Boundary, TA
- Contours, 10 foot
- Contours, 100 foot
- Electrical > 13.2 kV
- Electrical < 13.2 kV
- Roads, Dirt
- Roads, Paved
- Road/Trail
- Telephone Line
- Burn Pad
- Potential Release Site
- Structure, Permanent
- Structure, Temporary
- TA-16

FACILITY for INFORMATION, MANAGEMENT, ANALYSIS and DISPLAY

EARTH & ENVIRONMENTAL SCIENCES DIVISION (EES-5)
LOS ALAMOS NATIONAL LABORATORY, Los Alamos, New Mexico

Produced by: Doug Walther
Date: April 29, 1999 FIMAD Plot ID: G107621

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 500
Feet per inch on map = 100

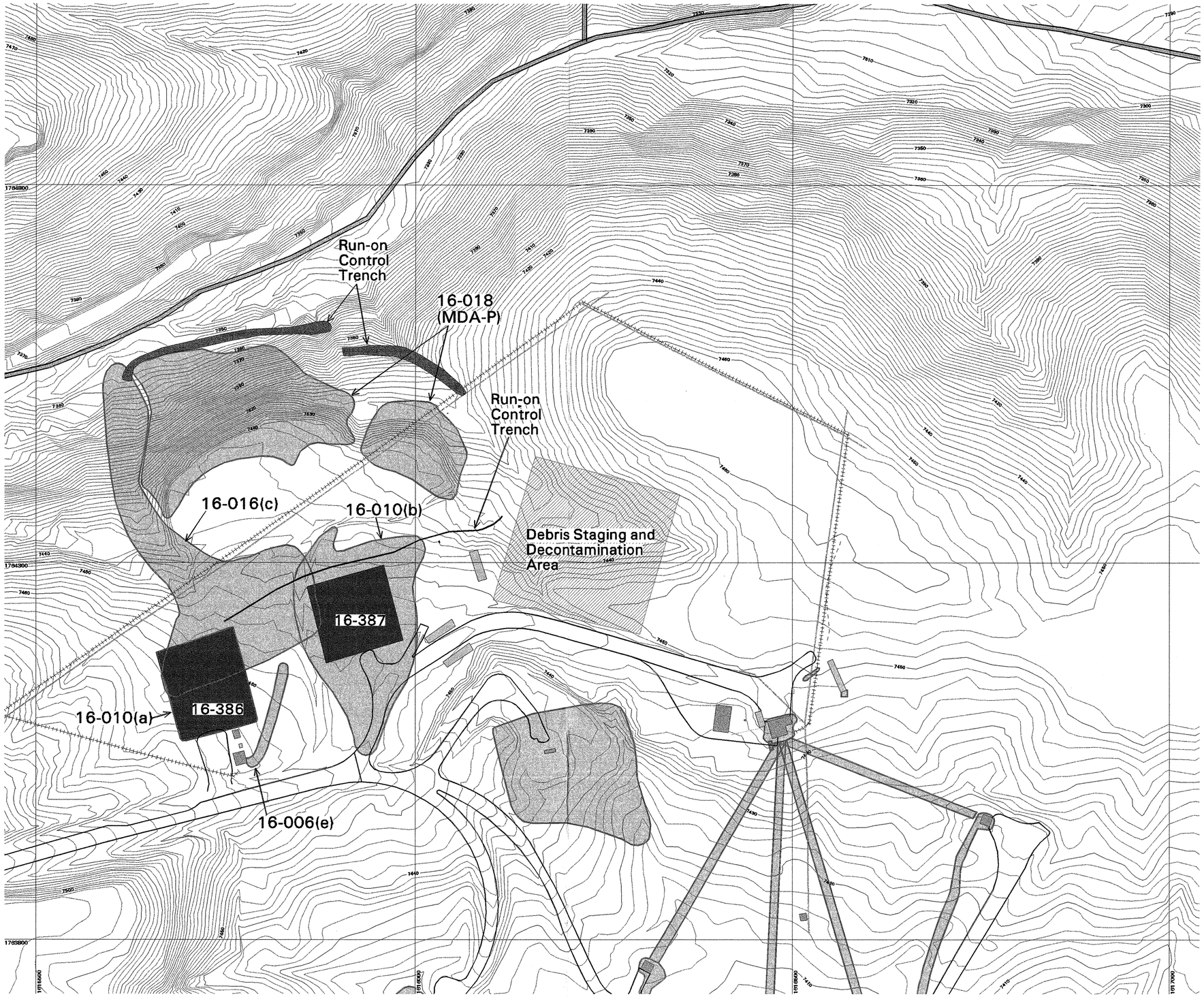
SCALE 1:1200

0 30 60 90 120
METERS

0 100 200 300 400
FEET

Notice: The information on this map is provisional and the accuracy has not been confirmed. Feature locations are dependent on scale and symbology and should not be relied upon to establish legal claims. Basemap Sources: Boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data is from Los Alamos National Laboratory Environmental Restoration Program aerial survey, September 1991.

MDA-P Project Area and adjacent PRSs



FIMAD Plot ID: G107621 29 Apr 99

LEGEND

- Contours, 10 ft
- Contours, 2 ft
- Boundary, OU
- Boundary, TA
- Contours, 10 foot
- Contours, 100 foot
- Electrical >13.2 kV
- Electrical <13.2 kV
- Roads, Dirt
- Roads, Paved
- Road/Trail
- Telephone Line
- Burn Pad
- Potential Release Site
- Structure, Permanent
- Structure, Temporary
- TA-16

FACILITY for INFORMATION, MANAGEMENT, ANALYSIS and DISPLAY
EARTH & ENVIRONMENTAL SCIENCES DIVISION (EES-5)
LOS ALAMOS NATIONAL LABORATORY, Los Alamos, New Mexico

Produced by: Doug Walther
Date: April 29, 1999 FIMAD Plot ID: G107621

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 500
Feet per inch on map = 100
SCALE 1:1200

0 30 60 90 120
METERS
0 100 200 300 400
FEET

Notice: The information on this map is provisional and the accuracy has not been confirmed. Feature locations are dependent on scale and symbology and should not be relied upon to establish legal claims. Basemap Sources: Boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departmente. Contour data is from Los Alamos National Laboratory Environmental Restoration Program aerial survey, September 1991.