LA-UR-03-3579
June 2003

Los Alamos National Laboratory
Technical Area 54
Part B Permit Renewal Application

Revision 3.0

Prepared by:

Los Alamos National Laboratory
Risk Reduction and Environmental Stewardship Division
Solid Waste Regulatory Compliance Group (RRES-SWRC)
Los Alamos, New Mexico 87545

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ATTACHMENT	TITLE
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B	Waste Analysis Plan
C	Inspection Plan
D	Personnel Training Plan
E	Contingency Plan
F	Closure Plan for Technical Area 54 Container Storage Units
G	Container Management
H	Closure/Post-Closure Plan for the Technical Area 54 Area L Landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D)
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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CFR	Code of Federal Regulations
CSU	container storage unit
DOT	Department of Transportation
FRP	fiberglass-reinforced plywood
ft	foot/feet
ft^3	cubic feet
HRMB	Hazardous and Radioactive Materials Bureau
LANL	Los Alamos National Laboratory
MLLW	mixed low-level waste
MTRUW	mixed transuranic waste
NMED	New Mexico Environment Department
RANT	Radioassay and Nondestructive Testing Facility
RTR	real-time radiography
SWB	standard waste box
SWMU	solid waste management unit
TA	Technical Area
TDOP	ten drum overpack
TRU	transuranic
TRUPACT-II	Transuranic Package Transporter-II
WIPP	Waste Isolation Pilot Plant
yd^3	cubic yard(s)

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LIST OF ATTACHMENTS

ATTACHMENT	TITLE
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B	Waste Analysis Plan
C	Inspection Plan
D	Personnel Training Plan
E	Contingency Plan
F	Closure Plan for the Technical Area 16 Open Burning Units
G	Technical Area (TA) 16 Open Burning Units Management
H	Environmental Performance Standards

LIST OF SUPPLEMENTS

SUPPLEMENT	TITLE
4-1	Solid Waste Management Units in the Immediate Vicinity of the Technical Area 16 Burn Ground: Information Extracted from "The 2003 Solid Waste Management Unit Report"—LA-UR-03-6000

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
EPA	U.S. Environmental Protection Agency
HE	high explosives
HRMB	Hazardous and Radioactive Materials Bureau
LANL	Los Alamos National Laboratory
MDA	Material Disposal Area
NMED	New Mexico Environment Department
OB	open burning
SWMU	solid waste management unit
SWPP	Stormwater Pollution Prevention
TA	technical area

1.0 INTRODUCTION

This "Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application" is submitted to address the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00], requirements specific to hazardous and mixed waste container storage operations at Technical Area (TA) 54. This document serves as Revision 3.0 to previous applications submitted to the New Mexico Environment Department (NMED) in January 1999 (Revision 0.0; Los Alamos National Laboratory [LANL], 1999a), September 1999 (Revision 0.1; LANL, 1999b), December 1999 (Revision 1.0; LANL, 1999c), and December 2000 (Revision 2.0; LANL, 2000a), and includes revisions presented in the "Response to Notice of Deficiency: TA-54 Part B RCRA Permit Application; September 1999, Revision 0.1; December 2000, Revision 2.0; Los Alamos National Laboratory EPA ID# NM0890010515," submitted to the NMED in July 2002 (LANL, 2002a). Each application was prepared to be consistent with the permitting strategy outlined by the NMED Hazardous and Radioactive Materials Bureau (HRMB) in correspondence dated February 5, 1998.

As presented in that correspondence, TA-specific permit applications, permit modification requests, and permit renewal applications would include any details and/or requirements not addressed in the "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0 (LANL, 1998a). The most recent version of that document, hereinafter referred to as the LANL General Part B, complements this permit renewal application. Certain portions of the LANL General Part B will serve in the operating permit as "umbrella" documents, covering the requirements of the New Mexico Hazardous Waste Act and implementing regulations, specifically 20.4.1 NMAC [6-14-00], common to all TAs. Together, information provided in this application and in the LANL General Part B will meet the applicable Part B requirements specified in 20.4.1 NMAC, Subparts V and IX [6-14-00].

In accordance with HRMB's 1998 permitting strategy, LANL submitted the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0 (LANL, 1998b). That Part A consolidated information from previous site-wide and TA-specific Part A submittals into one comprehensive document, identifying all hazardous and mixed waste treatment, storage, and disposal facilities at LANL subject to 20.4.1 NMAC, Subparts V, VI, and IX [6-14-00] at that time. The Part A was subsequently revised and submitted to the NMED in November 1999 (Revision 1.0; LANL, 1999d), July 2000 (Revision 2.0; LANL, 2000b), and August 2002 (Revision 3.0; LANL,

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(1)	General facility description	Attachment A[a] (A.1)
§270.14(b)(2)	Chemical and physical analyses	Attachment B[a]
§270.14(b)(3)	Waste analysis plan	Attachment B[a]
§264.13(b)	Development and implementation of waste analysis plan	Attachment B[a]
§264.13(c)	Off-site waste analysis requirements	Attachment B[a]
§270.14(b)(4)	Security procedures and equipment	Attachment G (G.1.2, G.2.1, G.3.1, G.4.1)
§264.14	Security	Attachment G (G.1.2, G.2.1, G.3.1, G.4.1)
§270.14(b)(5)	General inspection requirements	2.7, Attachment C[a]
§264.15(b)	General inspection requirements	2.7, Attachment C[a]
§264.174	Container inspections	2.7, Attachment C[a]
§264.193(i)	Tank inspections	NA[b]
§264.195	Overfill control inspections	NA
§264.226	Surface impoundments monitoring and inspection	NA
§264.254	Waste pile monitoring and inspection	NA
§264.273	Land treatment design and operating requirements	NA
§264.303	Landfill monitoring and inspection	Attachments H and I
§264.347	Incinerator monitoring and inspection	NA
§264.602	Miscellaneous units	NA
§264.1033	Process vent standards	NA
§264.1052	Equipment leak air emission standards	NA
§264.1053	Compressor standards	NA
§264.1058	Standards for pumps, valves, pressure relief devices, flanges and connections	NA
§264.1088	Subpart CC inspection and monitoring requirements	Attachment C (C.2), Attachment G (G.1.6)
§270.14(b)(6)	Request for waiver from preparedness and prevention requirements of 264 Subpart C	NA

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(7)	Contingency plan requirements under 264 Subpart D	Attachment E[a]
§264, Subpart D	Contingency plan and emergency procedures	Attachment E[a]
§264.227	Surface impoundment emergency repairs; contingency plans	NA
§264, Subpart C	Preparedness and prevention	Attachment G (G.1.3, G.2.2, G.3.2, G.4.2)
§270.14(b)(8)	Preparedness and prevention	Attachment G (G.1.3, G.2.2, G.3.2, G.4.2)
§270.14(b)(8)(i)	Prevention of hazards in unloading operations (ramps and special forklifts)	Attachment G (G.1.4.1)
§270.14(b)(8)(ii)	Runoff prevention with berms, trenches, and dikes	2.10, Attachment G (G.1.4.2)
§270.14(b)(8)(iii)	Prevention of contamination of water supplies	Attachment G (G.1.4.3)
§270.14(b)(8)(iv)	Mitigation effects of equipment failure and power outages	Attachment G (G.1.4.4, G.2.3, G.3.3, G.4.3)
§270.14(b)(8)(v)	Prevention of undue exposure of personnel by use of personal protective equipment	Attachment G (G.1.4.5)
§270.14(b)(8)(vi)	Prevention of release to the atmosphere	Attachment G (G.1.4.6)
§270.14(b)(9)	Prevention of accidental ignition or reaction	2.8[a], Attachment G (G.1.5)
§264.17	General requirements for ignitable, reactive, or incompatible wastes	2.8, Attachment G (G.1.5)
§264.17(c)	Documentation of compliance with 264.17 (general requirements for ignitable, reactive, or incompatible wastes)	2.8[a], Attachment G (G.1.5)
§270.14(b)(10)	Traffic pattern, volume, and controls	Attachment A[a] (A.2)
	Identification of turn lanes	Attachment A
	Identification of traffic/stacking lanes	Attachment A
	Description of road surface	Attachment A[a] (A.2)
	Description of road load-bearing capacity	Attachment A[a] (A.2)

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
	Identification of type and number of traffic controls	Attachment A (A.2)
§264.18	Location standards	Attachment A (A.3)
§270.14(b)(11)	Facility/unit location information	Attachment A (A.3)
§270.14(b)(11)(i)	Seismic standard applicability [264.18(a)]	Attachment A (A.3)
§270.14(b)(11)(ii)	Seismic standard requirements	Attachment A (A.3)
§270.14(b)(11)(ii)(A)	No fault within 3,000 feet (ft) with displacement in Holocene time	NA
§270.14(b)(11)(ii)(A)(1)	Published geological studies	NA
§270.14(b)(11)(ii)(A)(2)	Aerial reconnaissance of a five-mile radius from the facility	NA
§270.14(b)(11)(ii)(A)(3)	Analysis of aerial photographs covering 3,000-ft radius from the facility/unit	NA
§270.14(b)(11)(ii)(A)(4)	Reconnaissance based on walking portions of the area within 3,000 ft of the facility	NA
§270.14(b)(11)(ii)(B)	If faults which have displacement in Holocene time are present within 3,000 ft, no faults pass within 200 ft of portions of the facility where treatment, storage, or disposal will be conducted	NA
§270.14(b)(11)(iii)	100-year floodplain standard	Attachment A[a] (A.3)
§270.14(b)(11)(iv)	If facility is within 100-year floodplain	NA
§270.14(b)(11)(iv)(A)	Engineering analyses of hydrostatic forces expected in a 100-year flood	NA
§270.14(b)(11)(iv)(B)	Structural engineering studies for flood protection to prevent washout	NA
§270.14(b)(11)(iv)(C)	Detailed description of procedures to remove hazardous waste to safety before flood reaches the waste	NA
§270.14(b)(11)(iv)(C)(1)	Timing of removal	NA
§270.14(b)(11)(iv)(C)(2)	Location to be moved to	NA
§270.14(b)(11)(iv)(C)(3)	Dedicated equipment and personnel to ensure removal	NA
§270.14(b)(11)(iv)(C)(4)	Potential for accidental discharge during movement	NA

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(11)(v)	Plan to show how the facility will be brought into compliance with 264.18(b)	NA
§270.14(b)(12)	Personnel training program	Attachment D[a]
§270.14(b)(13)	Closure and post-closure plans	2.9, Attachment F[a]
§264.112	Amendment of closure plan	Attachment F[a] (F.1.4)
§264.118	Post-closure plan; amendment of plan	Attachment F[a]
§264.178	Closure/containers	Attachment F
§264.197	Closure/tanks	NA
§264.228	Closure/post-closure/surface impoundments	NA
§264.258	Closure/post-closure/waste piles	NA
§264.280	Closure/post-closure/land treatment	NA
§264.310	Closure/post-closure/landfills	Attachments H, I, and J
§264.351	Closure/incinerators	NA
§264.601	Miscellaneous units	NA
§264.603	Post-closure care	Attachment F (F.1.9)
§270.14(b)(14)	Post-closure notices (264.119)	Attachment F[a] (F.1.9)
§270.14(b)(15)	Closure cost estimate (264.142)	Attachment F[a] (F.1.5)
	Financial assurance (264.143)	Attachment F[a] (F.1.5)
§270.14(b)(16)	Post-closure cost estimate (264.144)	Attachment F[a] (F.1.5)
	Post-closure care financial assurance (264.145)	Attachment F[a] (F.1.5)
§270.14(b)(17)	Liability insurance (264.147)	Attachment F[a] (F.1.5)
§270.14(b)(18)	Proof of financial coverage (264.149-150)	Attachment F[a] (F.1.5)
§270.14(b)(19)	Topographic map requirements	Attachment A[a, c] (A.4)
§270.14(b)(19)(i)	Map scale and date	Attachment A[a, c] (A.4)
§270.14(b)(19)(ii)	100-year floodplain	Attachment A[a] (A.4)
§270.14(b)(19)(iii)	Surface waters	Attachment A (A.4)
§270.14(b)(19)(iv)	Land use	Attachment A (A.4)
§270.14(b)(19)(v)	Wind rose	Attachment A (A.4)
§270.14(b)(19)(vi)	Map orientation	Attachment A[a, c] (A.4)

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(19)(vii)	Legal boundaries	Attachment A[a, c] (A.4)
§270.14(b)(19)(viii)	Access controls	Attachment A (A.4)
§270.14(b)(19)(ix)	Wells	Attachment A (A.4)
§270.14(b)(19)(x)	Buildings	Attachment A (A.4)
	Treatment, storage, and disposal operations	Attachment A (A.4)
	Run-on/run-off control systems	2.10, Attachment A (A.4), Attachment G (G.1.4.2)
	Storm sewer systems	Attachment A[a] (A.4)
	Sanitary sewer systems	Attachment A[a] (A.4)
	Process sewer systems	Attachment A[a] (A.4)
	Loading/unloading areas	Attachment A (A.4)
	Fire control facilities	Attachment A[a] (A.4)
§270.14(b)(19)(xi)	Drainage barriers	2.10, Attachment A (A.4)
§270.14(b)(19)(xii)	Location of operational units	Attachment A (A.4)
§270.14(b)(20)	Other federal laws	3.0[a]
§270.3(a)	Wild and Scenic Rivers Act	3.0[a]
§270.3(b)	National Historic Preservation Act	3.0[a]
§270.3(c)	Endangered Species Act	3.0[a]
§270.3(d)	Costal Zone Management	3.0[a]
§270.3(e)	Fish and Wildlife Coordination Act	3.0[a]
§270.3(f)	Executive Orders	3.0[a]
§270.14(b)(21)	Notice of extension approval for land disposal facilities	NA
§270.14(c)	Groundwater monitoring requirements	Attachment A[a] (A.5), Attachments H, I, and J
§270.14(c)(1)	Groundwater monitoring under 265.90 through 265.94	Attachments H, I, and J
§270.14(c)(2)	Identification of uppermost aquifer, groundwater flow rate and direction	Attachments H, I, and J
§270.14(c)(3)	A topographic map required under 270.14(b)(19) that identifies proposed point of compliance	Attachments H, I, and J
	Proposed location of groundwater	Attachments H, I, and J

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
	monitoring wells under 264.97.	
§270.14(c)(4)	Description of plume of contamination that has entered groundwater	Attachments H, I, and J
§270.14(c)(4)(i)	Extent of plume indicated on topographic map	Attachments H, I, and J
§270.14(c)(4)(ii)	Identification of constituents and concentration for Appendix IX of 264	Attachments H, I, and J
§270.14(c)(5)	Detailed plan and an engineering report describing proposed groundwater monitoring program under 264.97	Attachments H, I, and J
§270.14(c)(6)	No releases detected in groundwater (264.98)	Attachments H, I, and J
§270.14(c)(6)(i)	List of proposed indicator parameters	Attachments H, I, and J
§270.14(c)(6)(ii)	Proposed groundwater monitoring system	Attachments H, I, and J
§270.14(c)(6)(iii)	Background values for each proposed monitoring parameter	Attachments H, I, and J
§270.14(c)(6)(iv)	Description of proposed sampling, analyses and statistical comparisons to be used	Attachments H, I, and J
§270.14(c)(7)	Release detected at point of compliance requires corrective action under 264.100	Attachments H, I, and J
§270.14(d)	Information requirements for solid waste management units (SWMU)	4.0, Supplement 4-1
§270.14(d)(1)(i)	Location of SWMUs on topographic map	4.0, Supplement 4-1
§270.14(d)(1)(ii)	Types of SWMUs	4.0, Supplement 4-1
§270.14(d)(1)(iii)	Dimensions and descriptions of SWMUs	4.0, Supplement 4-1
§270.14(d)(1)(iv)	Dates of operation	4.0, Supplement 4-1
§270.14(d)(1)(v)	Waste types managed at SWMU	4.0, Supplement 4-1
§270.14(d)(2)	Information on releases from SWMUs	4.0, Supplement 4-1
§270.15	Containers	2.0, Attachment G
§270.16	Tank systems	NA
§270.16(a)	Written assessment and certification	NA
§270.16(b)	Capacity/dimensions	NA

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.16(c)	Systems and controls	NA
§270.16(d)	Piping and process flow	NA
§270.16(e)	External corrosion protection	NA
§270.16(f)	Installation	NA
§270.16(g)	Secondary containment system	NA
§270.16(h)	Request for variance from secondary containment	NA
§270.16(i)	Spill prevention	NA
§270.16(j)	Ignitable, reactive, or incompatible wastes	NA

[a] Requirement or information is also addressed in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," as appropriate.
[b] NA = not applicable.
[c] Some of the topographic map requirements are addressed in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application."

Refer to footnotes at end of table.

2002b). The most recent version of that document, hereinafter referred to as the LANL General Part A, serves as a companion document to the LANL General Part B and TA-specific permit applications, permit modification requests, and permit renewal applications, including this TA-54 Part B permit renewal application.

In the LANL General Part A, the LANL General Part B, and this permit renewal application, a unit to be permitted may sometimes be referred to as a "facility." The term "facility," as it appears in this context, is used only to denote building names and does not imply the regulatory meaning of "facility" as defined in 20.4.1 NMAC §260.10 [6-14-00]. However, pursuant to 20.4.1 NMAC §260.10 [6-14-00], the LANL facility as a whole does meet the regulatory definition of a facility.

This permit renewal application also includes the closure/post-closure plans for the Area L and Area G disposal units regulated as landfills. These plans, presented as Attachments H and I herein, were originally submitted to the NMED in April 2002 (LANL, 2002c; LANL, 2002d). The closure/post-closure plan for Area L addresses Shafts 1, 13-17, and 19-34 and Impoundments B and D. The closure/post-closure plan for Area G addresses Pit 29 and Shaft 124. In addition, Attachment J included in this permit renewal application is the compliance demonstration document for Material Disposal Area H, which was also submitted to the NMED in April 2002 (LANL, 2002e). LANL is not seeking operating permitted status for any of those waste management units.

Table 1-1 provides a list of regulatory references and the corresponding location in the permit renewal application, as appropriate. Where applicable, regulatory citations in this document reference 20.4.1 NMAC, which adopts, with few exceptions, all of the Code of Federal Regulations, Title 40, Parts 260 to 266, Part 268, and Part 270.

2.0 CONTAINER STORAGE

The information provided in this section is submitted to address the applicable container storage requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.15, and 20.4.1 NMAC, Subpart V, Part 264, Subpart I, revised June 14, 2000 [6-14-00]. This section presents general descriptions of the Technical Area (TA) 54 container storage units (CSU) and waste management practices. Detailed information on and figures of the CSUs at TA-54 and the waste management practices associated with them are provided in Attachment G of this permit renewal application. A summary of applicable regulatory references and the corresponding location where the requirement is addressed in this permit renewal application is located in Attachment G, Table G-1.

2.1 TA-54 CONTAINER STORAGE UNITS

TA-54 at Los Alamos National Laboratory (LANL) is presently used for storage of hazardous and mixed waste generated throughout LANL. At TA-54, containers are stored at Area L, Area G, and TA-54 West. There are two CSUs at Area L, nine CSUs at Area G, and two CSUs at TA-54 West. The following section provides brief descriptions of the CSUs and their capacities; the types of storage containers used; and the minimum aisle space for each CSU.

2.1.1 Area L

Area L is a 2.58-acre site located in the central portion of TA-54. The two CSUs at Area L are: 1) the aboveground CSU within the fence; and 2) the Storage Shafts CSU (Shafts 36 and 37). The Area L CSUs are surrounded by an 8-foot (ft) chain-link fence. The aboveground CSU within the fence includes the asphaltic concrete-covered area and the following structures: TA-54-31, TA-54-32, TA-54-35, TA-54-36, TA-54-39, TA-54-58, TA-54-68, TA-54-69, TA-54-70, TA-54-215, and TA-54-216. These structures provide waste containers with secondary containment and/or protection from the weather. The Area L CSUs are used for storage of hazardous waste and/or mixed low-level waste (MLLW) containers, which are subsequently transported to various off-site treatment, storage, and disposal facilities.

2.1.1.1 Area L CSUs and Capacities

The aboveground CSU within the fence at Area L has an overall storage capacity of 407,880 gallons, or the equivalent of 7,416 55-gallon drums. The aboveground CSU within the fence stores hazardous waste and MLLW in solid or liquid form (see Appendix B in the most recent version of

the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B, for definitions of hazardous waste and MLLW). Waste containers are stored in the storage structures or on the asphaltic concrete-covered storage area at this aboveground CSU. The storage structures and the asphaltic concrete-covered area are shown on Figure 2-1. The maximum storage capacity and total storage area of the aboveground CSU at Area L are provided in Table 2-1. The volume of waste stored in the structures and on the asphaltic-concrete area comprising this CSU will not exceed the maximum storage capacity, which is based on the maximum storage configuration within the storage structures (see Figure 2-2). No medical, infectious, or explosive wastes are accepted at Area L. The Storage Shafts CSU stores solid MLLW (lead stringers). The location of this CSU is also shown on Figure 2-1. The maximum storage capacity of this CSU is 600 gallons.

General dimensions, containment features, and materials of construction for the two Area L CSUs are described in Attachment G of this permit renewal application to satisfy the requirements of 20.4.1 NMAC §270.15(a)(1) and (2) [6-14-00].

2.1.1.2 Storage Containers

Hazardous waste and MLLW at Area L are stored in containers that comply with the packaging requirements established by the U.S. Department of Transportation (DOT) in the Code of Federal Regulations (CFR), Title 49, Parts 171 through 180, and that are specific to the hazardous material which they contain. Specifications for the containers used for storage of hazardous waste and MLLW are listed in Table 2-2.

Waste containers stored at the aboveground CSU at Area L include 5-, 14-, 30-, 55-, 85-, and 110-gallon steel, polyethylene, and fiber drums; fiberglass-reinforced plywood (FRP) boxes; steel standard waste boxes (SWB); various steel boxes; metal overpack boxes; cardboard shipping containers; gas cylinders; roll-off bins; labpacks; and some oversized, custom metal and wooden containers. Detailed information on these containers is presented in Section 2.3 of this permit renewal application.

All waste containers (including gas cylinders at Canopy 216) are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers, baskets, in structures elevated by design) to prevent contact with accumulated liquids, which meets the requirements of 20.4.1 NMAC § 264.175(b)(2) [6-

14-00]. Information regarding the presence of free liquids in containers of hazardous waste and MLLW is obtained through generator waste-characterization knowledge, visual examinations, and/or the Paint Filter Liquids Test. Waste containers bearing free liquids are stored with secondary containment.

2.1.1.3 Minimum Aisle Space and Storage Configuration

Waste containers stored at Area L are placed in rows with a minimum aisle space of 24 inches. In addition, emergency egress aisles with a minimum aisle space of 24 inches are maintained at all personnel doors. At larger structures or locations, a main aisle down the center is maintained. Containers stored in these larger structures are typically placed in rows angled from the main aisle.

The storage configuration for the aboveground CSU at Area L is shown on Figure 2-2. The storage configuration shown on Figure 2-2 reflects the maximum storage inside the structures at Area L; however, storage operations are dynamic, and the storage configuration is subject to change based on daily operations. Storage is also conducted on the asphaltic concrete-covered area within the fence. At Area L, hazardous waste and MLLW containers are arranged in rows and stacked to a maximum of 10 ft high, based on the requirements in 49 CFR § 178.606(c), “Performance-Oriented Stack Test”. Gas cylinders are stored in cylinder racks, baskets, or on specially constructed pallets that provide support and restraint.

2.1.2 Area G

Area G is located on 63 acres in the east-central portion of TA-54. It is surrounded by an 8-ft chain-link fence and includes nine CSUs that provide waste containers with secondary containment and/or protection from the weather. The nine CSUs at Area G include the following:

- Storage Domes 229, 230, 231, and 232, and Pad 9;
- TA-54-412, Storage Dome 226, and Pad 1;
- Storage Dome 48 and Pad 3;
- Pad 10 (former Pads 2 and 4) and transuranic waste characterization facilities;
- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7;
- Storage Domes 153 and 283, and Pad 6;
- Storage Shed 8;
- TA-54-33, and;

- Storage Dome 375 and Pad 11.

The Area G CSUs store hazardous waste, MLLW, and mixed transuranic waste (MTRUW) containers. The majority of the MTRUW is awaiting characterization and/or certification for shipment to the Waste Isolation Pilot Plant (WIPP).

2.1.2.1 Area G CSUs and Capacities

The Area G CSUs have an overall storage capacity of 4,506,590 gallons, or the equivalent of 81,938 55-gallon drums, and store hazardous waste and MLLW in solid or liquid form. MTRUW stored at Area G is essentially in solid form; however, waste containers with potential residual liquids are also stored at Area G. Waste containers are stored in structures or on associated asphaltic-concrete pads at the Area G CSUs. The storage structures and pads are shown on Figure 2-3. The maximum storage capacity and total storage area at each Area G CSU are provided in Table 2-3. The volume of waste stored in the structures and on the asphaltic-concrete pads comprising each CSU will not exceed the maximum storage capacity, which is based on the maximum storage configuration within the storage structures (see Figures 2-4 through 2-13). Figure 2-5 is provided to show examples of dome storage configurations based on waste container type (i.e., 55-gallon drums on metal pallets, FRP boxes, and SWBs).

General dimensions, containment features, and materials of construction for the Area G CSUs are described in Attachment G of this permit renewal application to satisfy the requirements of 20.4.1 NMAC § 270.15(a)(1) and (2) [6-14-00].

2.1.2.2 Storage Containers

Hazardous waste and MLLW stored at the Area G CSUs are stored in containers that comply with the packaging requirements established by the DOT in 49 CFR, Parts 171 through 180, and that are specific to the hazardous material which they contain. Specifications for the containers used for hazardous waste and MLLW at the Area G CSUs are listed in Table 2-2.

MTRUW is stored at the Area G CSUs in a variety of containers. The container types include any container used for storage of hazardous waste or MLLW listed in Table 2-2, and containers authorized for receipt at WIPP listed in Table 2-4. The types of waste containers used to store MTRUW at the Area G CSUs vary depending on whether the waste is newly-generated or legacy

(generated before October 1999). Newly-generated MTRUW containers include 55-gallon steel drums, 85-gallon steel drums used for overpacks, 71-inch x 54.25-inch x 37-inch SWBs, and metal overpacks for oversized waste. The types of waste containers used for legacy MTRUW include FRP boxes, 55-gallon steel drums, and overpacks.

Waste containers stored at the Area G CSUs include 5-, 14-, 30-, 55-, 85-, and 110-gallon steel, polyethylene, and fiber drums; FRP boxes; steel SWBs; various steel boxes; ten drum overpacks (TDOP); metal overpack boxes; roll-off bins; cardboard shipping containers; labpacks; gas cylinders; and some oversized, custom metal and wooden containers. Detailed information on these containers is presented in Section 2.3 of this permit renewal application.

All waste containers at the Area G CSUs are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers, in structures elevated by design) to prevent contact with accumulated liquids, which meets the requirements in 20.4.1 NMAC § 264.175(b)(2) [6-14-00]. Information regarding the presence of free liquids in containers of hazardous waste and MLLW is obtained through generator waste-characterization knowledge, visual examinations, real-time radiography (RTR), and/or the Paint Filter Liquids Test. MTRUW destined for storage at Area G must meet the following waste acceptance criteria for free liquids: 1) no more than two liters of liquid in a 55-gallon drum; 2) no more than eight liters of liquid in an SWB; and 3) no more than one inch of liquid in the bottom of any container. Waste generators are required to participate in a certification program that documents how the generators ensure that the above criteria are met. Compliance with this requirement is verified through RTR. Waste containers bearing free liquids are stored with secondary containment.

2.1.2.3 Minimum Aisle Space and Storage Configuration

Waste containers stored at the Area G CSUs are placed in rows with a minimum aisle space of 24 inches. In addition, emergency egress aisles with a minimum aisle space of 24 inches are maintained at all personnel doors. At larger structures or locations, a main aisle down the center is maintained. Containers stored in these larger structures are typically placed in rows angled from the main aisle.

The storage configurations for the CSUs at Area G are shown on Figures 2-4 through 2-13. These storage configurations reflect the maximum storage inside the structures at Area G; however, storage operations are dynamic and the storage configuration is subject to change based on daily

operations. Storage also occurs on the asphaltic-concrete pads. At Area G, hazardous waste containers are arranged in rows and stacked to a maximum of 10 ft high, based on the requirements in 49 CFR § 178.606(c), "Performance-Oriented Stack Test". Containers of MLLW and MTRUW (drums, FRP boxes, SWBs, and metal overpack boxes) are arranged in rows and stacked to a maximum of three high. For MLLW and MTRUW, the stacking limit is based on a criticality assessment, which shows that there is not a criticality concern for these containers in an infinite array stacked three high.

2.1.3 TA-54 West

TA-54 West is located on approximately two acres in the northwest corner of TA-54. It is surrounded by an 8-ft chain-link fence. TA-54 West contains the Radioassay and Nondestructive Testing (RANT) Facility and is used to receive, stage, and assemble payload containers of TRU waste and MTRUW. These payload containers are placed in Transuranic Package Transporter-II (TRUPACT-II) shipping containers for shipment to WIPP. TA-54 West is also used to store hazardous waste, MLLW, and MTRUW containers. The two CSUs at the RANT Facility at TA-54 West are: 1) the Indoor CSU; and 2) the Outdoor CSU. Storage and staging will occur at any location within the two CSUs at TA-54 West.

2.1.3.1 TA-54 West CSUs and Capacities

The two CSUs at TA-54 West have an overall storage capacity of 11,660 gallons, or the equivalent of 212 55-gallon drums, and store only MLLW and MTRUW in solid form. Waste containers are stored in either the Indoor CSU or the Outdoor CSU at TA-54 West. The CSUs are shown on Figure 2-14**.** The maximum storage capacity and total storage area at the TA-54 West CSUs are provided in Table 2-5. The volume of waste stored in the structure and on the asphaltic-concrete pad comprising the CSUs will not exceed the maximum storage capacity.

General dimensions, containment features, and materials of construction for the TA-54 West CSUs are described in Attachment G of this permit renewal application to satisfy the requirements of 20.4.1 NMAC § 270.15(a)(1) and (2) [6-14-00].

2.1.3.2 Storage Containers

MLLW stored at the TA-54 West CSUs is stored in containers that comply with the packaging requirements established by the DOT in 49 CFR, Parts 171 through 180, and that are specific to the

hazardous material which they contain. Specifications for the containers used for storage of MLLW at the TA-54 West CSUs are listed in Table 2-2.

MTRUW is stored at the TA-54 West CSUs in a variety of containers. The container types include any container used for storage of MLLW listed in Table 2-2, and containers authorized for receipt at WIPP listed in Table 2-4. The types of waste containers used to store MTRUW at the TA-54 West CSUs vary depending on whether the waste is newly-generated or legacy (generated before October 1999). Newly-generated MTRUW containers include 55-gallon steel drums, 85-gallon steel drums used for overpacks, 71-inch x 54.25-inch x 37-inch SWBs, and metal overpacks for oversized waste. The types of waste containers used for legacy MTRUW include FRP boxes, 55-gallon steel drums, and overpacks.

Waste containers stored at the TA-54 West CSUs include 30-, 55-, 85-, and 110-gallon steel, polyethylene, and fiber drums; steel SWBs; various steel boxes; TDOPs; metal overpack boxes; TRUPACT-II containers; and some oversized custom metal and wooden containers. Detailed information on these containers is presented in Section 2.3 of this permit renewal application.

All waste containers at the TA-54 West CSUs are stored in areas with sloped floors and sumps, on pallets, or are otherwise elevated (e.g., on dollies) to prevent contact with accumulated liquids. Information regarding the presence of free liquids in containers of MLLW is obtained through generator waste-characterization knowledge, visual examinations, and/or the Paint Filter Liquids Test. MTRUW is characterized to verify the absence of free liquids using RTR. Containers at the TA-54 West CSUs found to contain liquids are placed on self-containment pallets and returned to one of the Area G CSUs. These measures meet the requirements of 20.4.1 NMAC § 264.175(b)(2) [6-14-00].

2.1.3.3 Minimum Aisle Space and Storage Configuration

Waste containers stored at the TA-54 West CSUs may be placed in rows with a minimum aisle space of 24 inches. A main aisle may be maintained down the center of a storage location, as needed. In addition, emergency egress aisles with a minimum aisle space of 24 inches are maintained at all personnel doors.

The storage configurations for the CSUs at TA-54 West are shown on Figure 2-15. These storage configurations reflect the existing storage capacity at the TA-54 West CSUs; however, storage

operations are dynamic and the storage configuration is subject to change based on daily operations. Wastes contained in 55- or 85-gallon and/or other DOT-approved drums are typically stored on pallets. Prepared payloads for TRUPACT-II shipping containers consist of two 7-packs of drums or two SWBs. Each pallet of seven drums is wrapped in multiple layers of plastic, and another seven drums are wrapped on a pallet and stacked above. The entire 14-drum package is wrapped again. Prepared payloads of SWBs are stacked two high; the SWBs are ratchet-strapped together. Other containers are not stacked at the TA-54 West CSU.

2.2 AUTHORIZED WASTE IDENTIFICATION

The TA-54 hazardous and mixed waste CSUs store containers that bear hazardous constituents or hazardous wastes with the U.S. Environmental Protection Agency Hazardous Waste Numbers presented in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application."

2.3 TYPES AND CONDITION OF CONTAINERS [20.4.1 NMAC § 264.171]

Containers must be in good condition, without severe rust, dents, deep scratches, bulges, or other structural defects. Any waste container that is not in good condition (e.g., severe rusting, apparent structural defects) is overpacked or the waste is repackaged in a container in good condition and compatible with the waste, packaging material, and/or other container. In addition, the overpack container and/or new container must be resistant to environmental conditions. This meets the requirements of 20.4.1 NMAC § 264.171 [6-14-00]. The following describes storage containers considered acceptable for waste storage at the TA-54 CSUs. Tables 2-2 and 2-4 provide additional information on storage containers.

The most common container used for waste storage at TA-54 is the 55-gallon drum. Standard 55-gallon drums have a gross internal volume of 7.24 cubic ft (ft^3). The standard drum is constructed of mild steel, has an inner diameter of approximately 22 inches, and a usable inside height of approximately 33 inches. These drums may also contain rigid, molded polyethylene or other compatible material liners. These liners are procured to a DOT specification describing the functional requirements of fitting inside the drum, material thickness and tolerances, and quality controls and required testing. Another type of drum commonly used at TA-54 is the polyethylene drum. Constructed of high-density polyethylene, these drums come in various sizes and dimensions. Capacities range from 5 gallons to 55 gallons. Types of closure mechanisms include screw-type bungs (for closed-head containers), lever-lock releases, snap-on lids, and screw-on lids.

Eighty-five-gallon drum overpacks are used for overpacking 55-gallon drums and have a gross internal volume of 11.3 ft^3. They are also used for collecting and storing derived waste.

Standard-size FRP boxes measure 4 ft by 4 ft by 8 ft, for a total volume of 128 ft^3. The outer surface of FRP boxes is coated with a layer of epoxy-impregnated fiberglass. Nonstandard-size containers, including FRP boxes, are designed and constructed to contain irregular-shaped and/or oversized waste. Various types of metal boxes are used for storage. One type, the SWB, is constructed of steel and has rounded ends. It has welds on all four sides and the bottom and has a lid gasket. After waste is placed into the container, the lid is either bolted on or clamped down and welded. General dimensions include an inside height of 36.75 inches, an inner length of 68.75 inches, and an inside width of 51.875 inches, for a gross internal volume of 66.3 ft^3. A second type of metal box is also constructed of steel, but is rectangular in shape. It has welds on all four sides and the bottom, and a lid that is clamped in place and then welded. Other metal boxes (including overpacks) vary in size and typically have welds both inside and outside on all four sides and on the bottom. The metal overpack boxes are elevated by design or on pallets for ease in handling. Steel overpack boxes are constructed of welded carbon steel and are elevated by design. Metal boxes typically have lid gaskets with bolt-on, clip-pinned, or hinged lids. Custom metal and wooden boxes are constructed for oversized and/or unique wastes. Other fiber boxes are also used, as appropriate.

Gas cylinders must meet the specific criteria identified in 49 CFR Part 178, Subpart C, to be accepted for transport. The cylinders must not have welded seams, must have the appropriate valves, and must be DOT-approved for the contained material. The cylinders range in size from lecture bottles (2 inches in diameter and 12 inches tall) to large standing cylinders (9 to 12 inches in diameter and up to 58 inches tall). Cylinders containing compressed gases are stored in cylinder racks, baskets, or drums. Small gas cylinders or metal receptacles with DOT Specification 2P, 2Q, 3E, 3HT, 4BA spherical type, 4D, 4DA, or 4DS are packaged in strong outside packaging drums or crates.

Roll-off bins are larger boxes designed for bulk solid waste streams (e.g., soils) that can be rolled on and off of a transport vehicle. The bins are constructed of heavy gauge steel with capacities ranging from 7 cubic yards (yd^3) to 40 yd^3. Bin lids have several designs (e.g., roll-top, hydraulic); various types of lids are currently used. The roll-top type has two halves that can be rolled back

manually to expose either side of the bin. The hydraulic type is hinged in the middle, allowing the lid to fold up and be pulled hydraulically to one side (to allow for loading).

The use of overpacks is one option when a container's integrity is suspect. Eighty-five-gallon drums are commonly used to overpack 55-gallon drums, and 110-gallon drums are used to overpack 85-gallon drums. Rounded-end SWBs are used to overpack drums of various sizes. Another type of overpack that may be used at TA-54 is the TDOP, which consists of a steel-welded cylindrical body and typically has a gasket with a bolt-on lid. TDOPs are approximately 6 ft tall and 6 ft in diameter. They can be used to overpack up to 10 standard 55-gallon drums or one SWB. TDOPs are certified to be noncombustible. Metal boxes are generally used when overpacking FRP boxes. TRUPACT-II shipping packages are used at TA-54 West to store TRU and mixed TRU waste containers prior to shipment to WIPP. This double containment, stainless-steel shipping package can hold 14 drums, a TDOP, or up to 2 rounded-end SWBs. Additional information on container specifications is provided in Tables 2-2 and 2-4.

Waste Operating Technicians visibly inspect all incoming drums for evidence (e.g., corrosion, visible staining, bulges, ruptures, dents, leaks) that may indicate surface contamination. Visual inspections of containers are conducted at the time of waste pickup at the generator's site, at the time of receipt at TA-54, and during weekly inspections. A visual inspection of a container's overall condition is also conducted when the waste container is shipped off site. If any evidence of surface contamination is detected, the waste container is either overpacked in an appropriate container or the waste is repackaged in a new container.

MTRUW containers are vented with one or more filters. The filter vents on the containers, including overpacks, meet the specifications described in Appendix 2.5 of the TRUPACT-II Authorized Methods for Payload Control (Westinghouse, 2000). The containers are vented to allow any gases that are generated by radiolytic and microbial processes within a waste container to escape, thereby preventing over-pressurization within the container. The high-efficiency particulate air grade vent filters prevent the escape of any radioactive particulates.

2.4 COMPATIBILITY OF WASTE WITH CONTAINERS [20.4.1 NMAC § 264.172]

The TA-54 CSUs will only store containers made of or lined with materials that will not react with and are otherwise compatible with the waste stored in them. All wastes transported to the TA-54 CSUs must be packaged in full compliance with DOT requirements. DOT packaging requirements

are based on the Packing Group of the material, its vapor pressure, and the chemical compatibility between the package and the hazardous material. The DOT specifications and United Nations standards that identify any additional packaging requirements that must also be met (such as chemical compatibility) are presented in Tables 2-2 and 2-4. This fulfills the requirements of 20.4.1 NMAC § 264.172 [6-14-00].

2.5 MANAGEMENT OF CONTAINERS [20.4.1 NMAC § 264.173(a)(b)]

Waste containers stored at the TA-54 CSUs are handled in a manner that will not cause them to rupture or leak, as required in 20.4.1 NMAC § 264.173(b) [6-14-00].

All containers stored at the TA-54 Area L and Area G CSUs are kept closed during storage in accordance with 20.4.1 NMAC § 264.173(a) [6-14-00], except when waste is added to or removed from containers; when the containers are opened for visual examination, sampling, or other characterization activities; or when the contents need to be repackaged. At TA-54-412, waste containers are opened during waste segregation, volume reduction, sample collection, repackaging, coring, visual examination, and/or decontamination. Waste containers are opened within a work enclosure that provides confinement, preventing any release of waste constituents. With the exception of TRUPACT-II shipping containers, all waste containers stored at the TA-54 West CSUs are kept closed during storage in accordance with 20.4.1 NMAC § 264.173(a) [6-14-00].

When waste is transported within or between CSUs at Areas L and G and TA-54 West, the waste containers are segregated, loaded, and secured on a transport vehicle following the appropriate safety practices. When transporting waste between Area G and TA-54 West, the west entrance of the TA-54 facility is blocked while the transport vehicle travels between the two areas, thus denying access by other vehicles and personnel. Examples of transport vehicles used for inter-site waste transport include stake bed trucks, forklifts, and cranes.

2.6 CONTAINMENT SYSTEMS [20.4.1 NMAC §§ 264.175(b)(3) and (5); 20.4.1 NMAC §§ 270.15(a)(3) and (5)]

Liquid that might accumulate at the TA-54 CSUs is contained within a secondary containment system (e.g., sump, berms, or secondary containment pallet) at each storage location or structure until the liquid is removed. All secondary containment systems are designed to contain at least 10% of the volume of potential liquid-bearing waste containers or the volume of the largest container, whichever is greater, pursuant to the requirements of 20.4.1 NMAC § 264.175(b)(3) [6-

14-00] (see Supplement 2-1). Any accumulated liquids are removed in as timely a manner as is necessary to prevent overflow of the collection system, pursuant to 20.4.1 NMAC § 264.175(b)(5). Any accumulated liquids are removed with a vacuum truck, a high-efficiency particulate air vacuum, a portable pump, or by other means, as appropriate and depending on the waste type and volume. The collected liquids are then transferred to appropriate containers and characterized. If the accumulated liquids are from an identified source or from precipitation, snowmelt, or water generated during fire-suppression activities, the resulting material will be characterized as a newly-generated waste using acceptable knowledge or will be analyzed, as applicable, for the hazardous waste constituents known to be components of the source. If the accumulated liquids are from an unidentified source, the resulting material will be analyzed for the appropriate potential parameters listed in Table E-3 of Appendix E in the LANL General Part B. Containers of collected liquids are stored with secondary containment, pending analytical results that determine how the liquids will be managed. This method of removal and analysis of accumulated liquids fulfills the requirements of 20.4.1 NMAC § 270.15(a)(5) [6-14-00], for prevention of overflow.

2.7 INSPECTION SCHEDULES AND PROCEDURES [20.4.1 NMAC § 264.174]

The purpose of CSU inspections is to identify leaking containers, deterioration of containers, and loss of integrity of a containment system, as required by 20.4.1 NMAC § 264.174 [6-14-00]. The inspections include checking the structural integrity of the containers (e.g., for bulging or warping) and the secondary containment structures for integrity and the presence of accumulated liquids. Inspections will follow the Inspection Plan in Appendix C of the LANL General Part B and in Attachment C of this permit renewal application.

2.8 SPECIAL REQUIREMENTS FOR IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTE [20.4.1 NMAC §§ 264.17(a) and (b), 264.176, and 264.177(a),(b), and (c); 20.4.1 NMAC §§ 270.14(b)(9) and 270.15(d)]

Containers holding ignitable or reactive wastes are located at least 50 ft from the facility's property line at all times (see Figures 2-1, 2-3, and 2-14) and are protected from sources of ignition or reaction. The distance to the nearest facility boundary is approximately 780 feet. Waste management practices at the TA-54 CSUs minimize the possibility of accidental ignition. There are no sources of open flames allowed at the CSUs. Cutting and welding activities are never conducted in the vicinity of waste containers. Ignitable and reactive wastes are segregated and separated by distance to minimize the possibility of spontaneous ignition and can be stored inside structures at the CSUs to minimize exposure to hot surfaces and radiant heat. Only non-sparking tools are used in handling waste containers, and lightning rods are located on storage structures.

Smoking is not allowed in any of the CSUs. "No Smoking" signs are conspicuously placed wherever there is a potential hazard from ignitable or reactive waste, as required by 20.4.1 NMAC § 264.17(a) [6-14-00]. Precautions taken to prevent reactions that may generate extreme heat or pressure, fire or explosions, or violent reactions and to prevent reactions that may damage the structural integrity of the CSU include segregating and separating (by distance) ignitable and reactive wastes stored in the structures. Precautions taken to prevent reactions that may produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment, or produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions include keeping containers closed during storage and venting containers of MTRUW. Together, these measures meet the requirements of 20.4.1 NMAC §§ 264.17(a) and (b) and 264.176 [6-10-00].

Incompatible wastes are segregated and separated during storage in accordance with 20.4.1 NMAC § 264.177(c) [6-14-00]. All waste is segregated and stored in accordance with DOT compatibility groups. These DOT compatibility groups are: flammables (Class 3), oxidizers (Class 5.1), combustible and noncombustible miscellaneous hazardous material (Class 9), corrosives (Class 8), poisons (Class 6), radioactive (Class 7), acids (Class 8), reactives (Class 4), and non-regulated materials. Incompatible wastes are separated and segregated from other wastes and materials by means of a berm, dike, wall, or other specific means (e.g., secondary containment pallets, modular sheds, distance). In addition, no incompatible wastes will be mixed, and no waste will be placed in a container that previously held an incompatible waste, as required by 20.4.1 NMAC §§ 264.177(a) and (b), and 20.4.1 NMAC § 270.15(d) [6-14-00].

2.9 CLOSURE [20.4.1 NMAC §§ 264.111 and 264.178]

Partial closure activities at the TA-54 CSUs will include removal of hazardous and/or mixed waste from the CSU to be closed and decontamination or removal of structures and equipment that have been contaminated by waste materials. Closure will minimize the need for further maintenance, preclude the release of hazardous waste or constituents to environmental media, and be protective of human health. A consolidated closure plan for the TA-54 CSUs is presented in Attachment F of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC §§ 264.111 and 264.178 [6-14-00]. The consolidated closure plan meets the applicable requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G.

2.10 CONTROL OF RUN-ON AND RUNOFF [20.4.1 NMAC § 264.175(b)(4); 20.4.1 NMAC § 270.14(b)(8)(ii)]

At TA-54, controlling run-on and runoff at the locations where waste management operations regularly occur is accomplished by appropriate contouring of surface areas and the use of control structures such as drainage channels, berms, and culverts. Canopies, dome structures, and other buildings are used to eliminate or minimize contact between run-on and waste containers. In addition, all stored waste containers are elevated or are placed in areas with sloped floors and sumps to provide protection from liquids that could be introduced through fire-suppression activities. Run-on/runoff management methods specific to the Area L, Area G, and TA-54 West CSUs are discussed below. This information is provided to meet the requirements of 20.4.1 NMAC § 264.175(b)(4), and 20.4.1 NMAC § 270.14(b)(8)(ii) [6-14-00].

2.10.1 Area L

The Area L CSUs rely on structural and operational controls that are designed to divert storm water to a single outfall. They include asphaltic-concrete channels, a 12-inch corrugated pipe storm drain to convey storm water to a single outfall at the northeast corner of Area L, and a contoured paved surface to direct storm water to the conveyances. Drainage control features at Area L are shown on Figure 2-1; these features are subject to change. Operational controls include inspecting run-on and runoff controls (see Item 16 on Figure C-1 [and instructions] in Appendix C of the General Part B) and maintaining the structural run-on/runoff controls, as necessary. Snow removal is also performed to minimize run-on and runoff.

2.10.2 Area G

In certain drainage areas at Area G, structures have been provided to efficiently channel storm water to the ephemeral streams draining the mesa. These structures include asphaltic-concrete and concrete drainage channels, a weir, riprap-lined channels, a retention dam, berms, and culverts. Roads and drive pads are configured, by grading and paving, to carry storm water away from the areas of active vehicular and loading operations. Silt fences and other erosion control structures are established throughout the drainage areas in locations prone to erosion or affected by heavy runoff during storm events. Drainage control features at Area G are shown on Figure 2-3; these features are subject to change.

2.10.3 TA-54 West

The foundation at the RANT Facility (TA-54-38) is above grade to prevent run-on of storm water. Storm drains and trenches are included in the building design to collect any precipitation or snowmelt that may enter the facility through the loading bays. The Outdoor CSU storage pad is sloped away from the RANT Facility building towards the edges of the pad, allowing storm water to flow to the edges of the pad. All containers of waste stored at the TA-54 West CSUs are located in areas with sloped floors and sumps or are elevated by design, on dollies, or on pallets. This prevents the containers from coming into contact with liquids. All waste-containing drums and SWBs on the Outdoor CSU storage pad are covered by a canopy or tarp to prevent contact with precipitation. Loaded TRUPACT-II containers may also be stored on the Outdoor CSU storage pad until shipment to WIPP occurs. TRUPACT-II containers are leak-resistant containers with an acceptable leak rate of 2.6×10^{-7} cubic centimeters of helium per second, which prevents the containerized waste within the TRUPACT-II containers from contact with precipitation. Positive surface drainage throughout TA-54 West directs potential run-on away from the TA-54 West CSUs. A drainage swale and curbing direct storm water runoff toward an outfall on the northeast side of the storage pad. Drainage control features at TA-54 West are shown on Figure 2-14; these features are subject to change.

Table 2-1

Maximum Storage Capacity and Total Storage Area at the Area L Container Storage Units

Container Storage Unit (CSU)	Storage Structure	Structure Maximum Storage Capacity	CSU Total Maximum Storage Capacity	Structure Storage Area (Square Feet)	CSU Total Storage Area (Square Feet)
Aboveground CSU Within the Fenced Area	TA-54-31	1,320 gallons (24 55-gallon drum equivalents [DE])	407,880 gallons	179	28,913
	TA-54-32	17,160 gallons (312 55-gallon DE)		1,806	
	TA-54-35	15,840 gallons (288 55-gallon DE)		1,056	
	TA-54-36	13,200 gallons (240 55-gallon DE)		1,056	
	TA-54-39	40,920 gallons (744 55-gallon DE)		3,456	
	TA-54-58	15,840 gallons (288 55-gallon DE)		1,056	
	TA-54-68	1,760 gallons (32 55-gallon DE)		128	
	TA-54-69	1,760 gallons (32 55-gallon DE)		128	
	TA-54-70	1,760 gallons (32 55-gallon DE)		128	
	TA-54-215	261,360 gallons (4,752 55-gallon DE)		15,960	
	TA-54-216	36,960 gallons (672 55-gallon DE)		3,960	
Storage Shafts CSU (Shafts 36 & 37)	TA-54-36	300 gallons	600 gallons	4.9	9.8
	TA-54-37	300 gallons		4.9	

Table 2-2

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Non-Bulk Performance-Oriented Packaging for Which the Manufacturer has Provided the Required UN Marking in Accordance with 49 CFR § 178.503	Intermediate Bulk Performance-Oriented Containers for Which the Container has been Marked by the Manufacturer in Accordance with 49 CFR § 178.703	Cylinders for Which the Cylinder has been Properly Marked with the Applicable DOT Specification Number in Accordance with 49 CFR § 178.35	Containers Used for Transport of Radioactive Materials
Steel drums meeting the standards of 49 CFR § 178.504. Maximum capacity will not exceed 119 gallons (gal); maximum net mass will not exceed 882 pounds (lbs). If materials used for body, heads, closures, and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments must be applied. These coatings or treatments must retain their protective properties under normal conditions of transport.	Metal intermediate bulk containers meeting the standards of 49 CFR § 178.705.	Seamless steel cylinders meeting the requirements of DOT Specification 3A, 3AX, 3AA, 3AAX, 3B, 3E, or 3T in 49 CFR, Part 178, Subpart C.	Containers meeting the requirements of DOT Specification 7A in 49 CFR § 178.350.
Aluminum drums meeting the standards of 49 CFR § 178.505. Maximum capacity will not exceed 119 gal; maximum net mass will not exceed 882 lbs.	Rigid plastic intermediate bulk containers meeting the standards of 49 CFR § 178.706.	Welded or brazed steel cylinders meeting the requirements of DOT Specification 4B, 4BA, 4B240ET, 4AA480, 4L, or 4BW in 49 CFR, Part 178, Subpart C.	Containers meeting the requirement of Industrial Packaging IP-1, IP-2, or IP-3 in 49 CFR § 173.411.
Metal drums other than steel or aluminum meeting the standards of 49 CFR § 178.506. Maximum capacity will not exceed 119 gal; maximum net mass will not exceed 882 lbs.	Composite intermediate bulk containers meeting the standards of 49 CFR § 178.707.	Seamless or welded aluminum cylinders meeting the requirements of DOT Specification 3AL or 4E in 49 CFR, Part 178, Subpart C.	Containers meeting the requirements of excepted packaging and the requirements of 49 CFR § 173.410.

Table 2-2 (continued)

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Non-Bulk Performance-Oriented Packaging for Which the Manufacturer has Provided the Required UN Marking in Accordance with 49 CFR § 178.503	Intermediate Bulk Performance-Oriented Containers for Which the Container has been Marked by the Manufacturer in Accordance with 49 CFR § 178.703	Cylinders for Which the Cylinder has been Properly Marked with the Applicable DOT Specification Number in Accordance with 49 CFR § 178.35	Containers Used for Transport of Radioactive Materials
Fiber drums meeting the standards of 49 CFR § 178.508. Maximum capacity will not exceed 119 gal; maximum net mass will not exceed 882 lbs.	Fiberboard intermediate bulk containers meeting the standards of 49 CFR § 178.708. The strength of the material used and the construction of the liner must be appropriate to the capacity and intended use of the container. Joints and closures must be sift-proof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and transport. Joints must be made with appropriate overlap and if metal staples are used for fastening, they must pass completely through all pieces and be formed or protected so that any inner liner cannot be abraded or punctured by them.	Seamless nickel cylinders meeting the requirements of DOT Specification 3BN in 49 CFR, Part 178, Subpart C.	
Plastic drums meeting the standards of 49 CFR § 178.509. Maximum capacity will not exceed 119 gal; maximum net mass will not exceed 882 lbs.	Wooden intermediate bulk containers meeting the standards of 49 CFR § 178.709. The strength of the material used and the construction of the liner must be appropriate to the capacity and intended use of the container. Joints and closures must be sift-proof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and transport.		

Table 2-2 (continued)

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Non-Bulk Performance-Oriented Packaging for Which the Manufacturer has Provided the Required UN Marking in Accordance with 49 CFR § 178.503	Intermediate Bulk Performance-Oriented Containers for Which the Container has been Marked by the Manufacturer in Accordance with 49 CFR § 178.703	Cylinders for Which the Cylinder has been Properly Marked with the Applicable DOT Specification Number in Accordance with 49 CFR § 178.35	Containers Used for Transport of Radioactive Materials
Plastic Jerricans meeting the standards of 49 CFR § 178.509. Maximum capacity will not exceed 16 gal; maximum net mass will not exceed 265 lbs.	Flexible intermediate bulk containers meeting the standards of 49 CFR § 178.710. Flexible intermediate bulk containers are intended to contain solid hazardous materials. The types with liners or coatings are designated: 13H2, woven plastic, coated; 13H3,woven plastic with liner; 13H4, woven plastic, coated with liner; 13L2, textile, coated; 13L3, textile with liner; and 13L4 textile, coated with liner.		
Steel or aluminum boxes meeting the standards of 49 CFR § 178.512. Maximum net mass will not exceed 882 lbs. Boxes must be lined with fiberboard or felt packing pieces or must have an inner liner or coating of suitable material in accordance with 49 CFR 173 Subpart C. If a double seamed metal liner is used, steps must be taken to prevent the ingress of materials, particularly explosives, into the recesses of the seams.			

Table 2-2 (continued)

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Non-Bulk Performance-Oriented Packaging for Which the Manufacturer has Provided the Required UN Marking in Accordance with 49 CFR § 178.503	Intermediate Bulk Performance-Oriented Containers for Which the Container has been Marked by the Manufacturer in Accordance with 49 CFR § 178.703	Cylinders for Which the Cylinder has been Properly Marked with the Applicable DOT Specification Number in Accordance with 49 CFR § 178.35	Containers Used for Transport of Radioactive Materials
Aluminum or steel Jerricans meeting the standards of 49 CFR 178.511. Maximum capacity will not exceed 16 gal; maximum net mass will not exceed 265 lbs.). If materials used for body, heads, closures, and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments must be applied. These coatings or treatments must retain their protective properties under normal conditions of transport.			
Plywood boxes meeting the standards of 49 CFR § 178.514. Maximum net mass will not exceed 882 lbs.			
Fiberboard boxes meeting the standards of 49 CFR § 178.516. Maximum net mass will not exceed 882 lbs.			
Composite packaging with inner receptacles meeting the standards of 49 CFR § 178.522. Maximum capacity is 66 gal; maximum net mass is 882 lbs.			
Composite packaging with inner glass, porcelain, or stone receptacles meeting the standards of 49 CFR § 178.523. Maximum net capacity for liquids is 16 gal; maximum net mass for solids is 165 lbs.			

Table 2-2 (continued)

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Table 2-3

Maximum Storage Capacity and Total Storage Area at the Area G Container Storage Units

Container Storage Unit (CSU)	Storage Structure/Pad	Structure/Pad Maximum Storage Capacity	CSU Total Maximum Storage Capacity	CSU Total Storage Area (Square Feet)
Storage Shed 8	TA-54-8	11,880 gallons (gal.) (216 55-gal. drum equivalents [DE])	11,880 gal.	698
TA-54-33	TA-54-33	108,240 gal. (1,968 55-gal. DE)	108,240 gal.	5,000
Storage Dome 48 and Pad 3	TA-54-48 and Pad 3	213,840 gal. (3,888 55-gal. DE)	213,840 gal.	19,250
Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7	TA-54-49 and Pad 5	520,080 gal. (9,456 55-gal. DE)	623,480 gal.	59,933
	TA-54-224 and Pad 8	95,040 gal. (1,728 55-gal. DE)		
	TA-54-144, TA-54-145, TA-54-146, TA-54-177	1,320 gal. (24 55-gal. DE) [330 gal./shed; 6 55-gal. DE/shed]		
	TA-54-1027, TA-54-1028, TA-54-1030, TA-54-1041, and Pad 7	7,040 gal. (128 55-gal. DE) [1,760 gal./shed; 32 55-gal. DE/shed]		
Storage Domes 153 and 283 and Pad 6	TA-54-153 and Pad 6	316,140 gal. (5,748 55-gal. DE)	597,300 gal.	68,310
	TA-54-283 and Pad 6	281,160 gal. (5,112 55-gal. DE)		
TA-54-412, Storage Dome 226, and Pad 1	TA-54-412 and Pad 1	91,080 gal. (1,656 55-gal. DE)	502,920 gal.	13,180
	TA-54-226 and Pad 1	411,840 gal. (7,488 55-gal. DE)		22,250
Storage Domes 229, 230, 231, and 232, and Pad 9	TA-54-229 and Pad 9	330,000 gal. (6,000 55-gal. DE)	1,446,720 gal.	158,460
	TA-54-230 and Pad 9	330,000 gal. (6,000 55-gal. DE)		
	TA-54-231 and Pad 9	393,360 gal. (7,152 55-gal. DE)		
	TA-54-232 and Pad 9	393,360 gal. (7,152 55-gal. DE)		
Storage Dome 375 and Pad 11	TA-54-375 and Pad 11	682,440 gal. (12,408 55-gal. DE)	682,440 gal.	30,000
Pad 10 (former Pads 2 and 4) and transuranic waste characterization facilities	Pad 10 (former Pads 2 and 4)	313,830 gal. (5,706 55-gal. DE)	319,770 gal.	120,122
	Transuranic Waste Characterization Facilities	5,940 gal. (108 55-gal. DE)		

Table 2-4

Storage Containers Used at the Area G Container Storage Units for Mixed Transuranic Waste Awaiting Processing, Characterization, and Transport to the Waste Isolation Pilot Plant (WIPP) and Authorized for Receipt at WIPP

Standard 55-gallon (208-liter) Drum	Standard Waste Box	Standard 85-gallon (322-liter) Drum Overpack
Gross internal volume of 7.3 cubic feet (ft^3) (0.21 cubic meters [m^3]) constructed of mild steel. May also contain ridge, molded polyethylene (or other compatible material) liner. Must meet requirements of DOT Specification 7A in 49 CFR § 178.350.	Gross internal volume of 66 ft^3 (1.88 m^3). Must meet requirements of DOT Specification 7A in 49 CFR § 178.350.	Gross internal volume of 11.3 ft^3 (0.32 m^3). Used for overpacking contaminated 55-gallon drums containing mixed transuranic (TRU) waste.
One or more filter vents installed on top of the container. Vents are high-efficiency particulate air (HEPA) grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 millimeters [mm]) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).	One or more filter vents installed on top of the container. Vents are HEPA-grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 mm) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).	One or more filter vents installed on top of the container. Vents are HEPA-grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 mm) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).

Table 2-4 (continued)

Storage Containers Used at the Area G Container Storage Units for Mixed Transuranic Waste Awaiting Processing, Characterization, and Transport to the Waste Isolation Pilot Plant (WIPP) and Authorized for Receipt at WIPP

Ten-Drum Overpack (TDOP)	Staging Containers
The ten-drum overpack is a metal container (similar to the SWB) that meets DOT specification 7A and is certified to meet all applicable requirements for Type A packaging. The TDOP is a welded-steel, right circular cylinder, approximately 74 inches high and 71 inches in diameter. The maximum loaded weight is 6,700 pounds. A bolted lid on one end is removable; sealing is accomplished by clamping a neoprene gasket between the lid and the body. A TDOP may contain up to 10 standard 55-gallon drums or one SWB.	As a result of facility modifications over the years, a large amount of equipment and other materials have been removed from TRU operations throughout the Laboratory. This equipment is currently staged in Area G for eventual processing through the Decontamination and Volume Reduction System Facility. After processing, the waste will be placed into authorized WIPP containers for characterization and transport to WIPP. The staging containers are custom designed containers made to specifically hold the contents for which they were made. The containers are constructed of fiberglass-reinforced plywood or metal. A number of these containers are made of raw plywood and are overpacked in metal containers. The size and weight of these containers vary depending on their contents; however, all containers meet the requirements of 49 CFR 173.410.
One or more filter vents installed on top of the container. Vents are HEPA-grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 mm) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).	

Table 2-5

Storage Capacity and Total Storage Area at the TA-54 West Container Storage Units

Container Storage Unit (CSU)	Storage Structure/Pad	Structure/Pad Storage Capacity	CSU Total Storage Capacity	Structure/Pad Storage Area (Square Feet)	CSU Total Storage Area (Square Feet)
Indoor CSU	TA-54-38, Low Bay	880 gallons (16 55-gallon drum equivalents)	3,080 gallons	1,330	4,056
	TA-54-38, High Bay	2,200 gallons (40 55-gallon drum equivalents)		2,726	
Outdoor CSU	TA-54-38, Pad	7,920 gallons (144 55-gallon drum equivalents)	8,580 gallons	37,248	37,864
	TA-54-38, Loading Dock	660 gallons (12 55-gallon drum equivalents)		616	

Supplement 2-1

Secondary Containment Capacities

Area L

CSU	Structure	Length (Feet)	Width (Feet)	Depth (Feet)	Secondary Containment Surface Area (Square Feet)	Secondary Containment Capacity (Gallons)	Structure Maximum Storage Capacity (Gallons)
Aboveground CSU Within the Fence	TA-54-58	30. 5	25	0.5	762	2,852	15,840
	TA-54-36	30 -8	30 -20	0.83 0.83	900 -160 740	4,595	13,200
	TA-54-35	29.5	24.5	0.66	723	3,568	15,840
	TA-54-68	22	8.1	0.56	178	750	1,760
	TA-54-69	22	8.1	0.56	178	750	1,760
	TA-54-70	22	8.1	0.56	178	750	1,760
	TA-54-32: Cells 1 & 6	26.5	13.5	1	358	2,676	17,160
	TA-54-32: Cells 3 & 5	16.83	13.5	1	227	1,700	
	TA-54-32: Cells 2 & 4	13.5	11.17	1	151	1,128	
	TA-54-39: Room 101	39	22.5	0.5	878	3,282	9,900
	TA-54-39: Containment Pad-Western Section	59.5	16	1	952	7,121	15,180
	TA-54-31: Sump 1	4	6	0.42	24	75	1,320
	TA-54-31: Sump 2	4	6	0.42	24	75	
	TA-54-31: Sump 3	6	7	0.42	42	132	
	CSU Total:				**5,415**	**29,454**	

Supplement 2-1 (continued)

Secondary Containment Capacities

Area G

CSU	Structure	Length (Feet)	Width (Feet)	Depth (Feet)	Secondary Containment Surface Area (Square Feet)	Secondary Containment Capacity (Gallons)	Structure Maximum Storage Capacity (Gallons)
Storage Domes 229, 230, 231, and 232 and pad	TA-54-230 (Sump)	See Note 1 for Calculation Details		1.75	1,388	18,170	330,000
	TA-54-230 (Curbed Area)	See Note 2 for Calculation Details		0.25	16,088	30,088	
	CSU Total:				**17,476**	**48,258**	
Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, & 7	TA-54-224	See Note 3 for Calculation Details		0.46	5,566	19,153	95,040
	TA-54-144	6	5	0.535	30	120	330
	TA-54-145	6	5	0.535	30	120	330
	TA-54-146	6	5	0.535	30	120	330
	TA-54-177	6	5	0.535	30	120	330
	TA-54-1027	22	8.1	0.56	178	750	1,760
	TA-54-1028	22	8.1	0.56	178	750	1,760
	TA-54-1030	22	8.1	0.56	178	750	1,760
	TA-54-1041	22	8.1	0.56	178	750	1,760
	CSU Total:				**6,398**	**22,633**	

Notes:

1. Surface area for sump estimated by enlarging sump semicircle to 36 feet for the radius in all directions, which puts the center of the circle 9 feet west of the sump. The area of the circle was divided by two (for the semicircle) and then the additional 9 foot by 72 foot area (previously added to make the semicircle) was subtracted. Sump surface area: $\pi (r)^2$ with radius of 36 feet. Calculation is $\pi(36)^2/2 – (9 \times 72) = 1{,}388$ square feet.

2. Surface area for curbed area estimated with following calculation: $\pi (r)^2$ with radius of 41 feet divided by two (for the semicircle) and then adding the 82-foot by 164-foot area. Calculation is $\pi(41)^2/2 + (82 \times 164) = 16{,}088$ square feet.

3. Surface area estimated with the following calculation: $\pi (r)^2$ with radius of 28.58 feet and then adding the 50-foot by 60-foot area. Calculation is $\pi (28.58)^2 + (50 \times 60) = 5{,}566$ square feet.

3.0 OTHER FEDERAL LAWS

A discussion of federal laws, as required by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, §§ 270.3 and 270.14(b)(20), revised June 14, 2000, is provided in Section 3.0 in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

4.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

The information provided in this section is submitted to address the applicable solid waste management unit (SWMU) requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 270.14(d), revised June 14, 2000. This section addresses the SWMUs that are located at Technical Area (TA) 54 at Los Alamos National Laboratory (LANL).

LANL uses the definition of a SWMU presented in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (U.S. Environmental Protection Agency, 1994), referred to as Module VIII. This definition states that SWMUs are "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

Table 4-1 lists the SWMUs at TA-54. Supplement 4-1, which has been extracted from “The 2003 Solid Waste Management Unit Report” (LANL, 2003), provides descriptions of the SWMUs listed in Table 4-1. These descriptions include, to the extent available, the unit type, general dimensions and structural descriptions, the dates of operation, and the wastes managed at the unit. Supplement 4-1 also includes the most current information available pertaining to releases of hazardous wastes or hazardous constituents from the units and results of sampling and analyses conducted to date. In addition, the location of each SWMU is presented on topographic maps included within Supplement 4-1.

Table 4-1

Technical Area (TA) 54
Solid Waste Management Units (SWMU)

SWMU No./Former SWMU No.	Consolidated SWMU No.	Location	SWMU Description	Unit Status
54-001(a)		TA- 54-215, Area L	Container Storage (Storage Area)	Active; operating under the New Mexico Hazardous Waste Act (NMHWA); to be permitted
54-004		TA- 54, Area H	Material Disposal Area (Material Disposal Area [MDA H])	Inactive; to undergo corrective action
54-005		TA- 54, Area J	Material Disposal Area (MDA J, [Pits 1-5, Shafts 1-4])	Inactive; operated under New Mexico Solid Waste regulations; closure approval pending
54-006		TA- 54, Area L	Material Disposal Area (MDA L, [all subsurface units such as Pit A; Impoundments B, C, D; Shafts 1-28 and 29-34])	Inactive; Shafts 1, 13-17, and 19-34 and Impoundments B and D have been proposed to undergo closure/post-closure in accordance with alternative requirements, as allowed by 20.4.1 NMAC §264.110(c) [6-14-00], to meet post-closure care requirements

Table 4-1 (Continued)

Technical Area (TA) 54
Solid Waste Management Units (SWMU)

SWMU No./Former SWMU No.	Consolidated SWMU No.	Location	SWMU Description	Unit Status
54-007(a)		TA- 54-16, Area G	Subsurface Liquid Disposal (Septic System)	Inactive; voluntary corrective action [VCA] completed; no further action (NFA) recommended
54-007(c)	54-007(c)-99	TA- 54 West	Subsurface Liquid Disposal (Former Septic Systems)	Inactive; VCA completed; NFA recommended
54-012(b)		TA- 54-82, Area L	Physical/Chemical Treatment Unit (Drum Compactor, Reduction Site)	Inactive; to undergo corrective action
See below	54-013(b)-99	TA- 54, Area G	Material Disposal Area (MDA G subsurface waste management units]:	See below
54-013(b)	54-013(b)-99		MDA G, Vehicle Monitoring/Decontamination Area	Inactive; to undergo corrective action
54-014(b)	54-013(b)-99		MDA G, Pit 9	Inactive; to undergo corrective action
54-014(c)	54-013(b)-99		MDA G, Shafts 200-233	Inactive; to undergo corrective action
54-014(d)	54-013(b)-99		MDA G, Trenches A-D	Inactive; to undergo corrective action
54-015(k)	54-013(b)-99		MDA G, Retrievable Storage	Inactive; to undergo corrective action

Table 4-1 (Continued)

Technical Area (TA) 54
Solid Waste Management Units (SWMU)

SWMU No./Former SWMU No.	Consolidated SWMU No.	Location	SWMU Description	Unit Status
54-017	54-013(b)-99		MDA G, Pits 1-8, 10, 12, 13, 16-22, and 24	Inactive; to undergo corrective action
54-018	54-013(b)-99		MDA G, Pits, 25-33 and 35-37	Inactive; Pit 29 has been proposed to undergo closure/post-closure in accordance with alternative requirements, as allowed by 20.4.1 NMAC §264.110(c) [6-14-00], to meet post-closure care requirements
54-019	54-013(b)-99		MDA G, Shafts 1-20, 24-34, 38-92, 96, 109-112, and 150	Inactive; to undergo corrective action
54-020	54-013(b)-99		MDA G, shafts C1-C10, C12, C13, 22, 35-37, 93-95, 99-108, 114, 115, 118-136, 138-140, 151-160, 189-192, and 196	Inactive; Shaft 124 has been proposed to undergo closure/post-closure in accordance with alternative requirements, as allowed by 20.4.1 NMAC §264.110(c) [6-14-00], to meet post-closure care requirements

Supplement 4-1

Solid Waste Management Units at Technical Area 54

Information Extracted from
"The 2003 Solid Waste Management Unit Report"
LA-UR-03-6000

TA-54, Waste Management Site

TA-54 is one of the largest (943 acres) technical areas at LANL. Its primary function is management of radioactive solid and hazardous chemical wastes. The site's 3-mi northern border forms the boundary between the LANL facility and San Ildefonso Pueblo, and its southeastern boundary borders the part of Los Alamos County known as White Rock. Nearly 70 archaeological sites have been found in TA-54.

Many of the operations at LANL generate liquid, solid, and gaseous wastes that contain radioactive materials, hazardous materials, or a combination of both. All of these types of wastes are characterized and stored at TA-54. Waste handled at the site is characterized as low-level radioactive waste, low-level mixed waste, TRU waste, mixed TRU waste, hazardous waste, PCB waste, and nonhazardous chemical wastes. Low-level waste and PCB waste may be disposed of at TA-54.

TA-54 has 120 structures, of which 101 house waste management personnel and operations.

TA-54's facilities are grouped in various areas according to the type of waste managed. Area G operations include low-level radioactive waste treatment and disposal, legacy TRU waste container exhumation venting and storage (TWISP), newly generated TRU waste storage, the Green-is-Clean project (identifies wastes that do not contain radionuclides and may be disposed of as solid waste), and mixed-waste certification for offsite shipment. TA-54 also has the RANT Facility, used to determine the characteristics of packaged TRU waste.

Classified wastes, some of which are radioactive and potentially hazardous, were disposed at MDA H until 1986. MDA H is now inactive and undergoing corrective action.

Treated barium solid wastes, classified wastes, and other solid wastes were formerly disposed of at MDA J. This area became inactive in the summer of 2001 and underwent closure under the New Mexico Solid Waste Act. Area L is the chemical waste management area.



TA-54 — Waste Disposal Site

SWMU 54-001(a) — Container storage

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-215	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-001(a) is within an active RCRA-permitted hazardous waste storage area that also operates in accordance with RCRA interim status requirements for the storage of mixed waste. The 150-ft x 40-ft bermed storage area is situated on the paved surface of Area L directly over the location of pit A, and currently is covered by a storage dome (structure 54-215). The storage area capacity is 100,000 gal.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

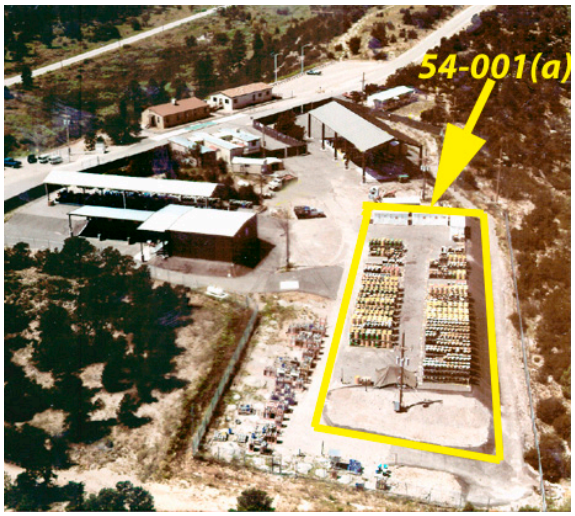
No analytical samples were collected at this site.

References

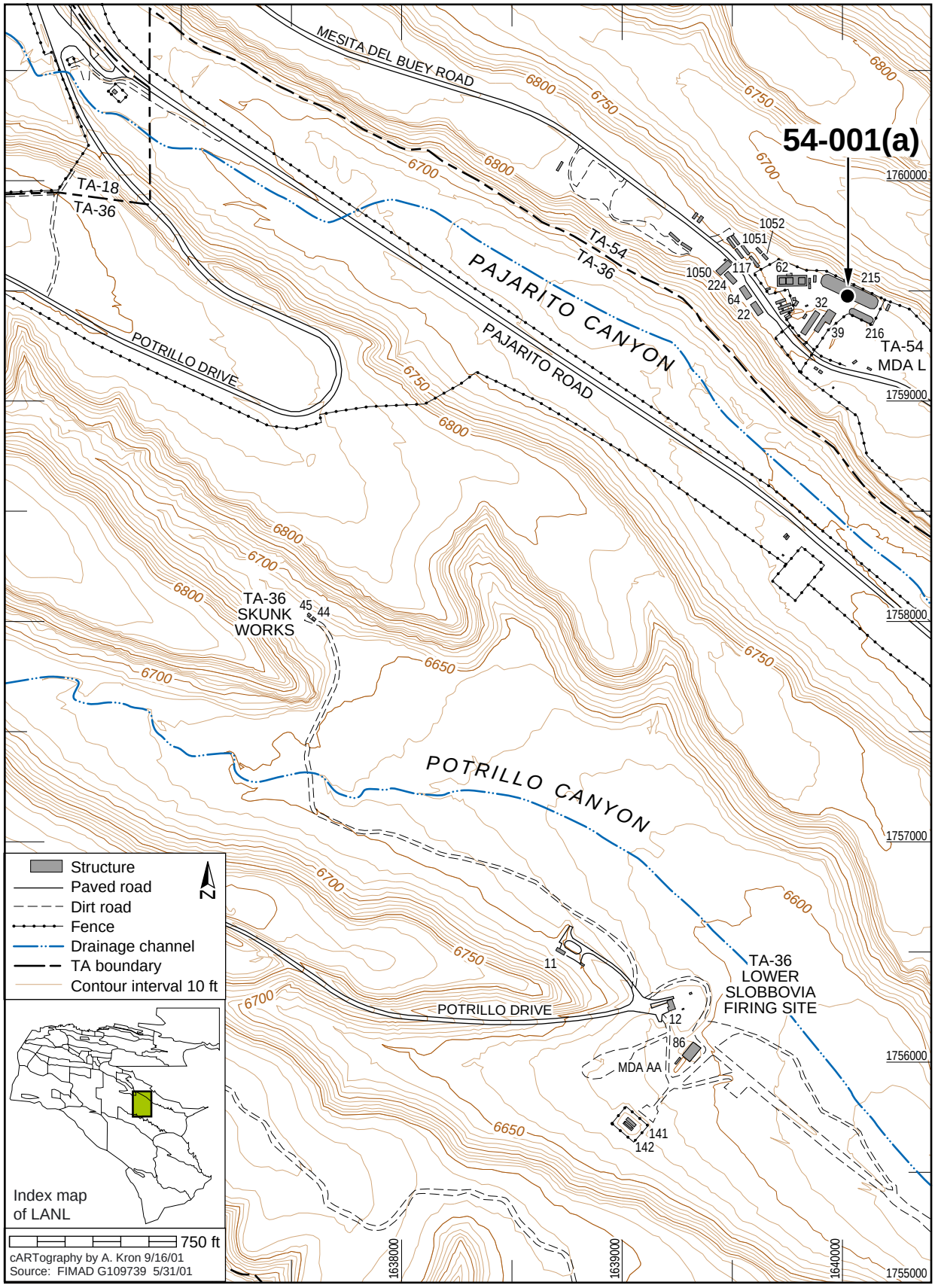
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



View of the south end of storage dome [SWMU 54-001(a)]



Aerial close-up of SWMU 54-001(a), before dome


54-001(a)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1052
1051
1050
117
62
224
64
22
215
32
39
216
45
44
11
12
86
141
142
6800
6750
6700
6650
6600
1760000
1759000
1758000
1757000
1756000
1755000
1638000
1639000
1640000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

AOC 54-001(b) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-31	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-001(b) is part of the active RCRA-permitted hazardous waste storage area that also operates in accordance with RCRA interim status requirements for the storage of mixed waste. The area is located inside structure 54-31 at Area L. The structure is 13.5 ft x 14.5 ft; the floor is paved, sealed, and bermed. The structure's storage capacity is 440 gal. Secondary containment mechanisms consist of three 6-in.-deep sumps, one measuring 7 ft x 6 ft and the other two measuring 6 ft x 4 ft. A paved drainage diversion ditch surrounds the outside of the building to prevent stormwater run-on. No releases have been identified at AOC 54-001(b). This operational waste management unit is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

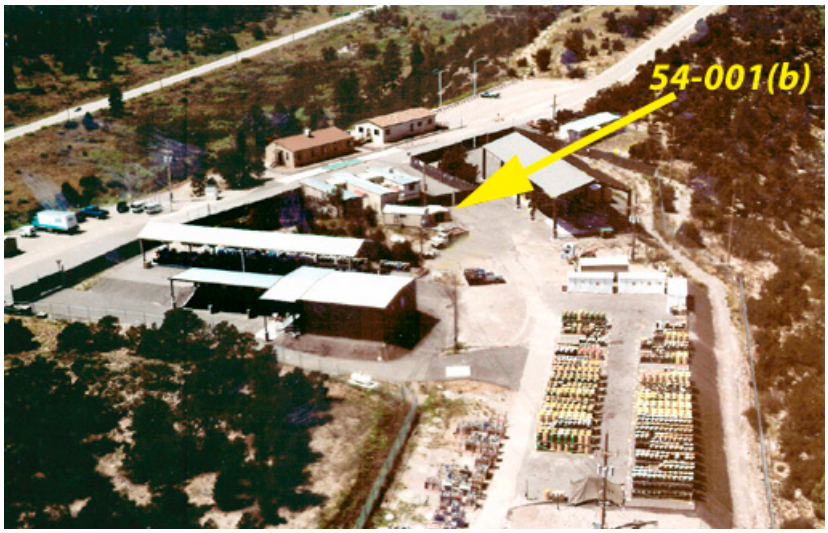
No analytical samples were collected at this site.

References

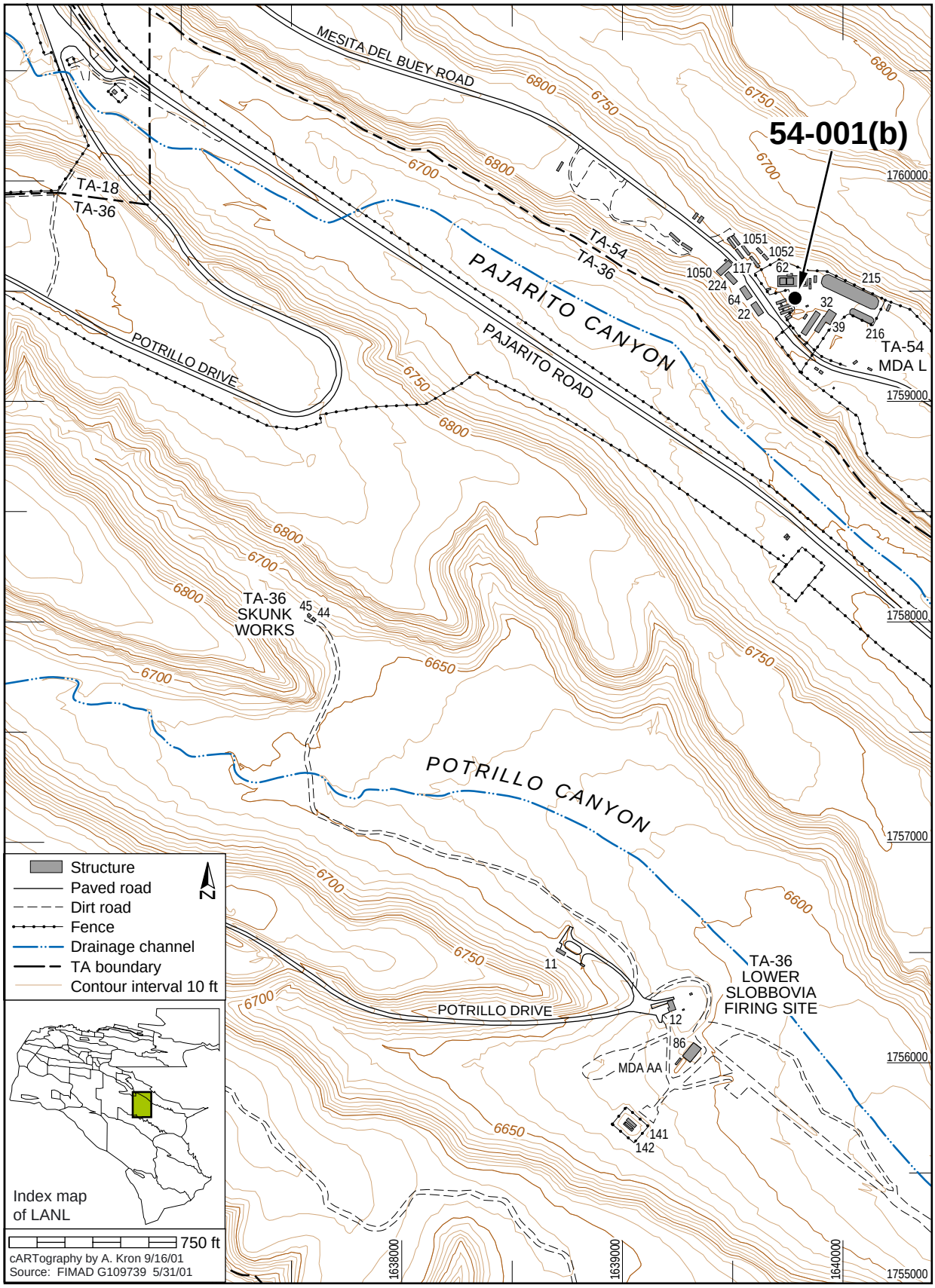
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



View of AOC 54-001(b) - building on right



Aerial view of AOC 54-001(b)


54-001(b)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1760000
1759000
1758000
1757000
1756000
1755000
1638000
1639000
1640000
6800
6750
6700
6650
6600
1051
1052
1050
117
62
224
64
22
215
32
39
216
45
44
11
12
86
141
142
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-001(d) — Storage areas

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-39, 54-81	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-001(d) is part of the operational waste storage area situated on the paved surface of Area L. Radioactive and PCB waste is managed here in accordance with a TSCA approval letter issued by EPA and interim status requirements. EPA issued the initial approval letter in June 1980; renewal authorization is pending. The area consists of an enclosed PCB storage building (Building 54-39), and a PCB storage pad (structure 54-81). The building is equipped with a bermed concrete floor that forms a sump with ramps at all entrances and a foam fire-suppression system with temperature sensors. The storage pad consists of bermed and sealed concrete measuring 59 ft x 17 ft; it has a roof, sheet-metal back wall, and secondary containment system. Typical materials handled at the facilities include PCB-contaminated transformer and capacitor oil, carcasses from transformers and capacitors, debris, protective clothing, PCB-contaminated soil, and stormwater from secondary containment systems around aboveground tanks. Wastes are stored in accordance with TSCA requirements. No known releases are associated with AOC 54-001(d).

ER Project Activities

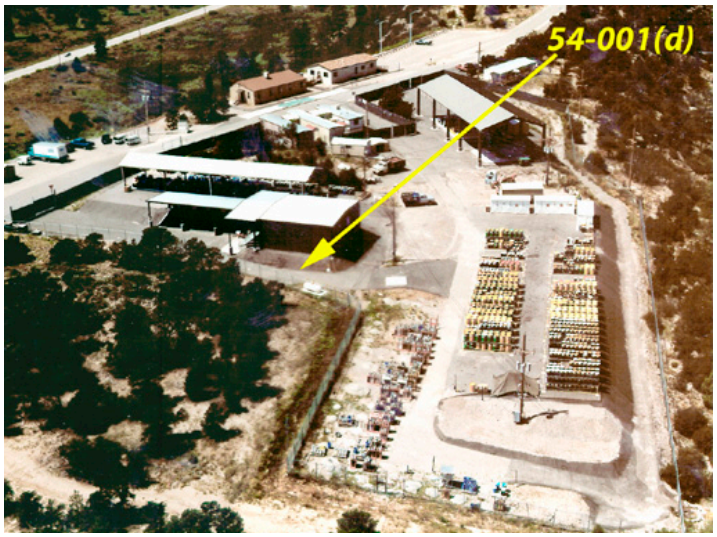
RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

No analytical samples were collected at this site.

References

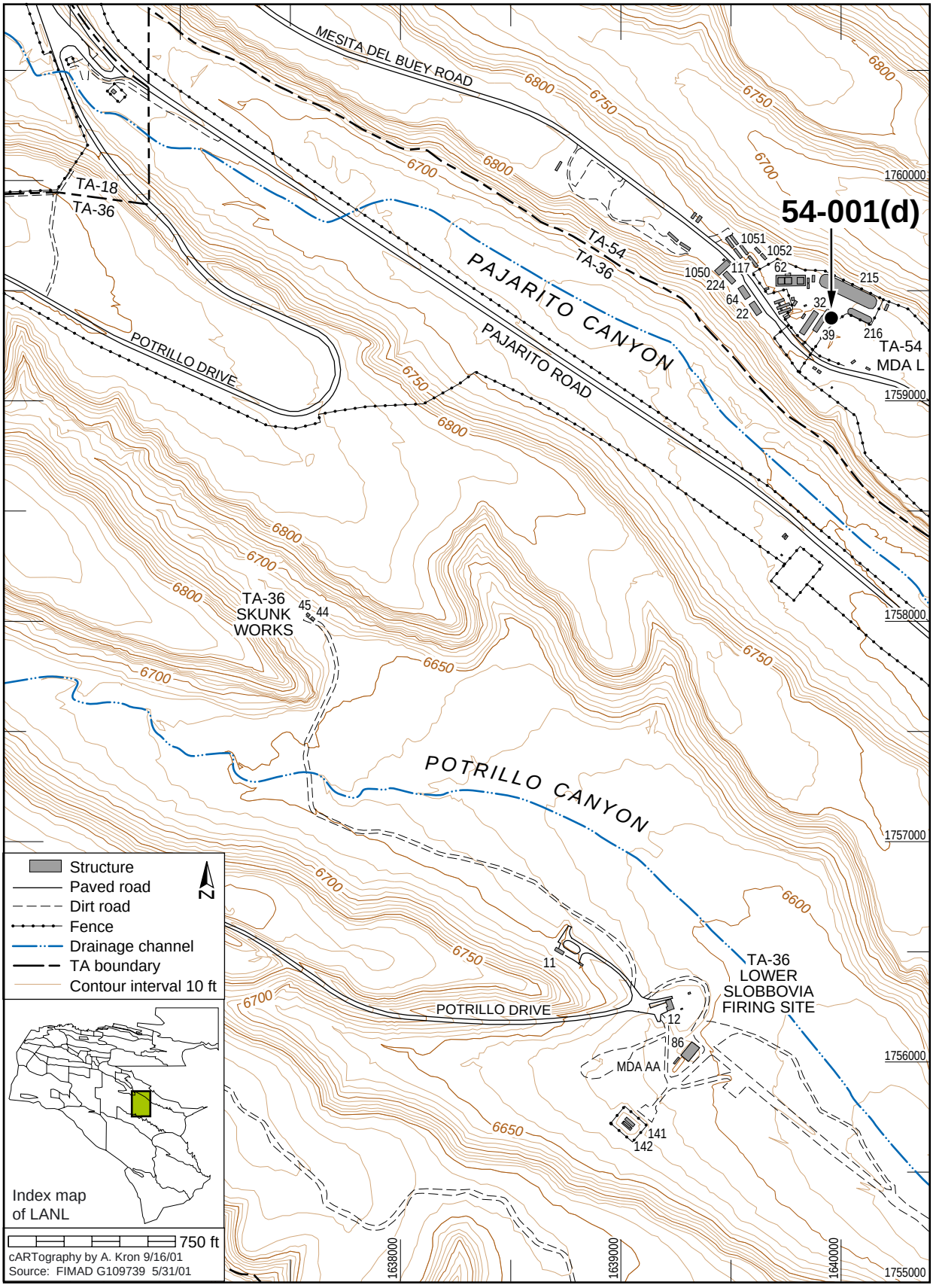
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



Aerial view of AOC 54-001(d)



View of AOC 54-001(d)


54-001(d)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1760000
1759000
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86
141
142
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-001(e) — Storage areas

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1987-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-32	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-001(e) is part of the operational RCRA-permitted hazardous waste storage unit (structure 54-32) which also contains solid waste, situated on the paved surface of Area L. The storage area consists of a bermed and sealed concrete pad that is divided into six cells, each equipped with a secondary containment collection sump. Containers are elevated several inches above the floor by fiberglass or metal grating. The 15.5 ft x 116.5 ft storage area was built in 1987 and has a storage capacity of 16,720 gal. A 117.75-ft x 25.75-ft canopy covers the storage area. Containers are inspected weekly and no releases have been identified. This active waste management unit is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

No analytical samples were collected at this site.

References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 — LA-UR Number: N/A

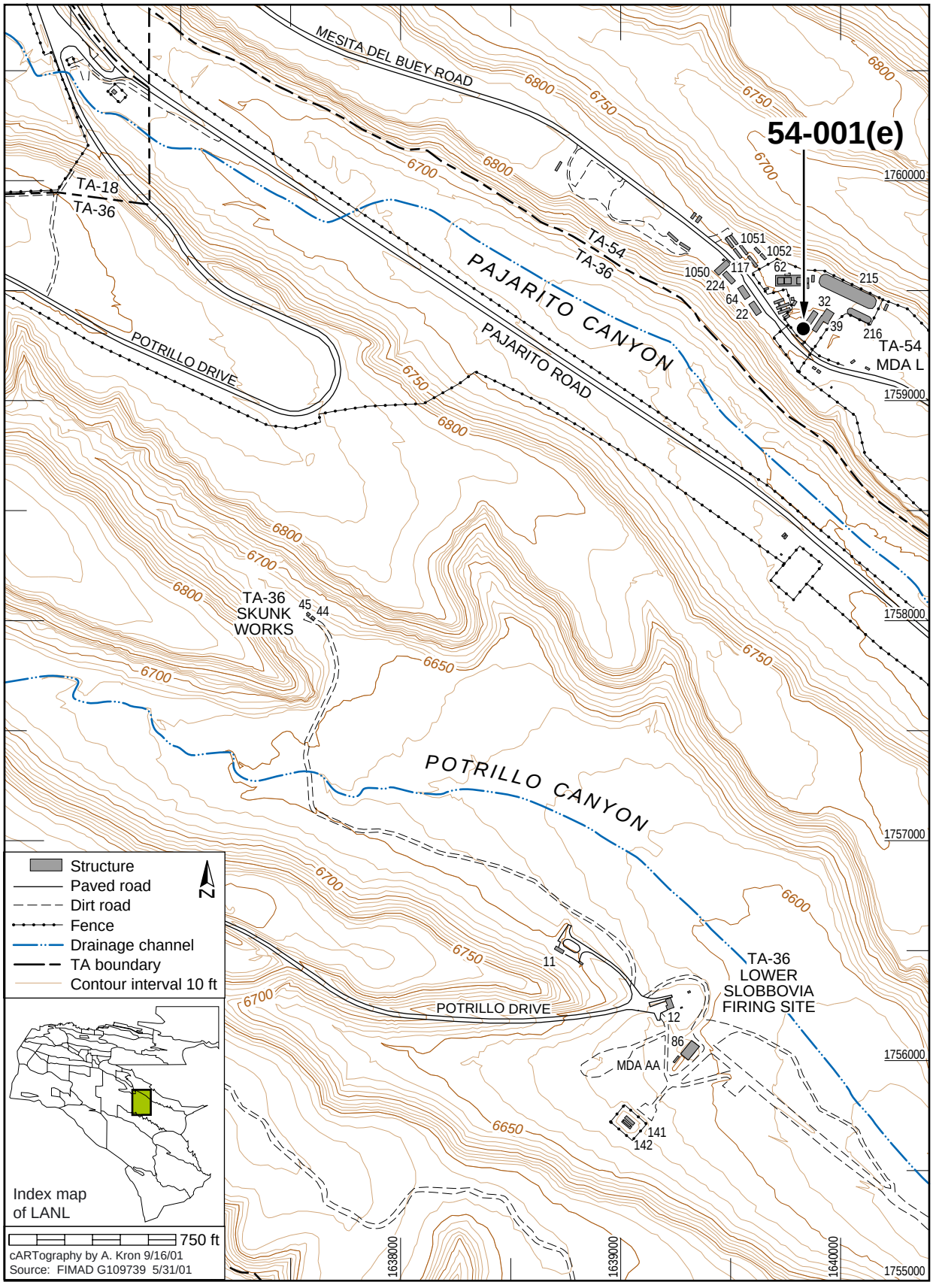
RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



View of AOC 54-001(e)



Aerial close-up of AOC 54-001(e)


54-001(e)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-002 — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-216	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-002 is part of the operational active RCRA-permitted hazardous waste storage unit where gas cylinders are stored. The unit also operates in accordance with interim status requirements for the storage of mixed waste. The storage area (structure 54-216) is situated on the paved surface of Area L and has a capacity of 1950 gal. Cylinders are stored beneath a canopy in racks or baskets along the southern and eastern fence lines in the eastern part of Area L. The cylinders are staged here before they are transported to an off-site location for final disposition. The gases are classified as mixed, hazardous, and solid wastes and are managed in accordance with RCRA and LANL safety requirements. This active waste management unit is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

No analytical samples were collected at this site.

References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 — LA-UR Number: N/A

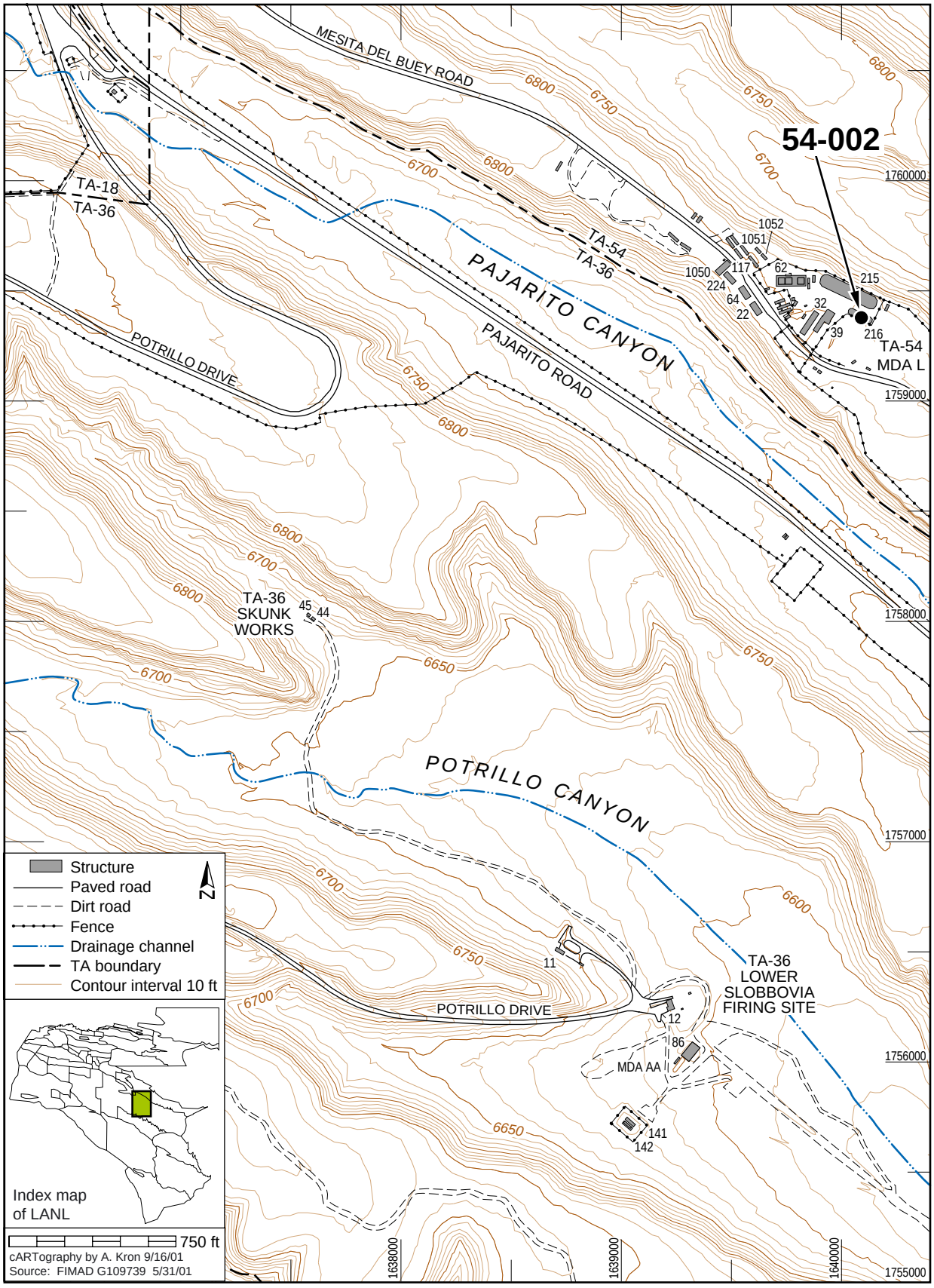
RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



View of AOC 54-002



Aerial close-up of AOC 54-002


54-002
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
POTRILLO DRIVE
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01
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SWMU 54-004 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1960-1986
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-004 is MDA H, a 0.3-acre site on Mesita del Buey that contains nine inactive shafts that were used for disposal of LANL classified waste such as weapon-component mock-up shapes, detonators, papers, and tritium-contaminated items. Much of the classified waste was nonhazardous; however, scraps and shapes were contaminated with depleted uranium, fuel elements, residual plutonium, and HE. One shaft, shaft 9, received hazardous waste after July 26, 1982 and is therefore considered a RCRA-regulated unit. Each shaft is 6 ft in diameter and 60 ft deep. The shafts were capped when waste came to within 6 ft of the surface. Shafts 1 through 8 are capped with 3 ft of crushed tuff followed by 3-ft-thick concrete caps; shaft 9 is capped solely by a 6-ft-thick layer of concrete. The surface area of MDA H has been reseeded. The nine shafts at MDA H were used from 1960 to 1986.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

Tritiated water was encountered at a depth of 40 ft in shaft 8 in 1969 during a LANL-wide effort to determine the background value for tritium in tuff. To determine the extent of tritium at MDA H, the investigation was expanded to include sampling and analysis of air and soil in and around the disposal shafts. The highest tritium concentrations were measured around shaft 8. Additional soil and flora samples were collected in 1973 and analyzed for tritium. Plants growing in the area were found to have concentrations of tritium 3 orders of magnitude higher than species in uncontaminated areas. Surface soils near the shafts had measured concentrations of tritium two to three times the concentration measured in background samples outside the area. Data from the historic tritium investigation were used to support the conceptual model for fate and transport of tritium at MDA H.

The RFI report for sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than on individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport, and if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling, based on their potential for having collected sediment run-off from the four MDAs. Fourteen drainage channels originate near MDA G; the other three MDAs each have only one significant drainage channel. Sample locations were selected within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for radioactivity. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL inorganic chemicals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that have no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape condition for potential receptor access. The drainage channels associated with each MDA were determined not to be of ecological concern because there was little receptor access. The sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

In January 2000, NMED, DOE, and LANL formed the MDA HPT to work on the TA-54 RFI report. In September 2000, the HPT were directed to expedite implementation of a corrective measure alternative at one MDA. The HPT selected MDA H and narrowed the scope of its effort to accommodate the change. The RFI for MDA H subsequently was separated from the RFI reports for MDAs G and L to expedite the evaluation and implementation of a corrective measure at MDA H. The ER Project reissued the RFI report for just MDA H in May 2001.

The RFI fieldwork included the collection of 4 storm drainage sediment samples and 33 core samples from 4 boreholes. Channel sediment samples were analyzed for inorganic chemicals, cyanides, PCBs, pesticides, tritium, and radionuclides. Core samples were analyzed for TAL metals, cyanide, VOCs, SVOCs, PCBs, pesticides, tritium, and radionuclides. Background comparisons (inorganic chemicals and radionuclides) and data evaluations (organic chemicals) identified cadmium, selenium, methoxychlor and tritium in channel sediments and copper, cyanide, selenium, several organic chemicals, and tritium in subsurface tuff as COPCs. None of the VOCs or inorganic chemicals was detected above its SALs. The maximum reported tritium concentration of 777,000 pCi/mL at a

depth of 52.5 ft bgs is equivalent to approximately 1543 pCi/g based on the sample soil moisture of 0.2%. This concentration is an order of magnitude greater than the SAL of 880 pCi/g. The maxiumum concentration of tritium at 10 ft bgs was 5890 pCi/mL, which is equivalent to 182 pCi/g based on the sample soil moisture of 3%. Methoxychlor was not disposed of at MDA H and its presence most likely is due to routine application. Copper, cyanide, and selenium do not appear to be related to a release from the PRS. Tritium and VOCs are related to a release from MDA H. Tritium is in the form of water vapor. Data gathered during the RFI identified the nature and partial extent of contamination in the surface and subsurface media. Analytical results from the RFI were used to assess the present-day impacts to ecological and human health receptors. The present-day risk assessment concluded that existing contamination does not exceed applicable EPA risk thresholds.

To address the remaining data gaps regarding the extent of tritium and VOC contamination and at the request of NMED, the ER Project prepared and implemented a supplemental RFI SAP in 2001. Supplemental RFI activities completed during 2001 included collecting additional subsurface samples to further define the lateral extent of tritium and organic chemical contamination from borehole 54-1023 and from two newly drilled boreholes, installing an air-monitoring station adjacent to the southeastern boundary of MDA H to monitor for tritium in air at the MDA H fence line, and collecting a sediment sample near sample location 54-5132 at the interface of the alluvial sediments and bedrock to collect data where all the sediment accumulated over time. An RFI addendum will be issued in April 2002. The report will summarize the 2001 data and assess whether there are changes to the present-day risk assessment presented in the MDA H RFI report.

In a letter dated December 27, 2000, NMED directed the Laboratory to prepare a CMS plan for MDA H because NMED believes that contaminants at MDA H may present a future threat to human health and the environment over the life of the buried wastes. In this letter, NMED stated that the requirements for closure of Shaft 9 could be met by the corrective measures evaluated in the CMS. Therefore, the unit would be subject to corrective action along with the other eight shafts. Pursuant to DOE orders, LANL also planned to complete a CMS to address the potential for adverse impacts from future releases of radionuclides (tritium). The CMS plan identified corrective action objectives, preliminary corrective measure alternatives that address potential unacceptable future risks, and the methodology to be followed in evaluating the alternatives during the CMS. The CMS plan was approved by NMED in December 2001. The CMS is being conducted in accordance with RCRA requirements and will also meet the intent of DOE Order 5400.5, “Radiation Protection of the Public and the Environment.”

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	23	7	1
Pesticide/PCBs	2	N/A	1
Radionuclides	12	3	1
SVOCs	5	N/A	0
VOCs	12	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	2.1 mg/kg	0.39 mg/kg
Pesticide/PCBs	Endosulfan Sulfate	0.000674 mg/kg	N/A
Radionuclides	Tritium	1543 pCi/g	880 pCi/g

References

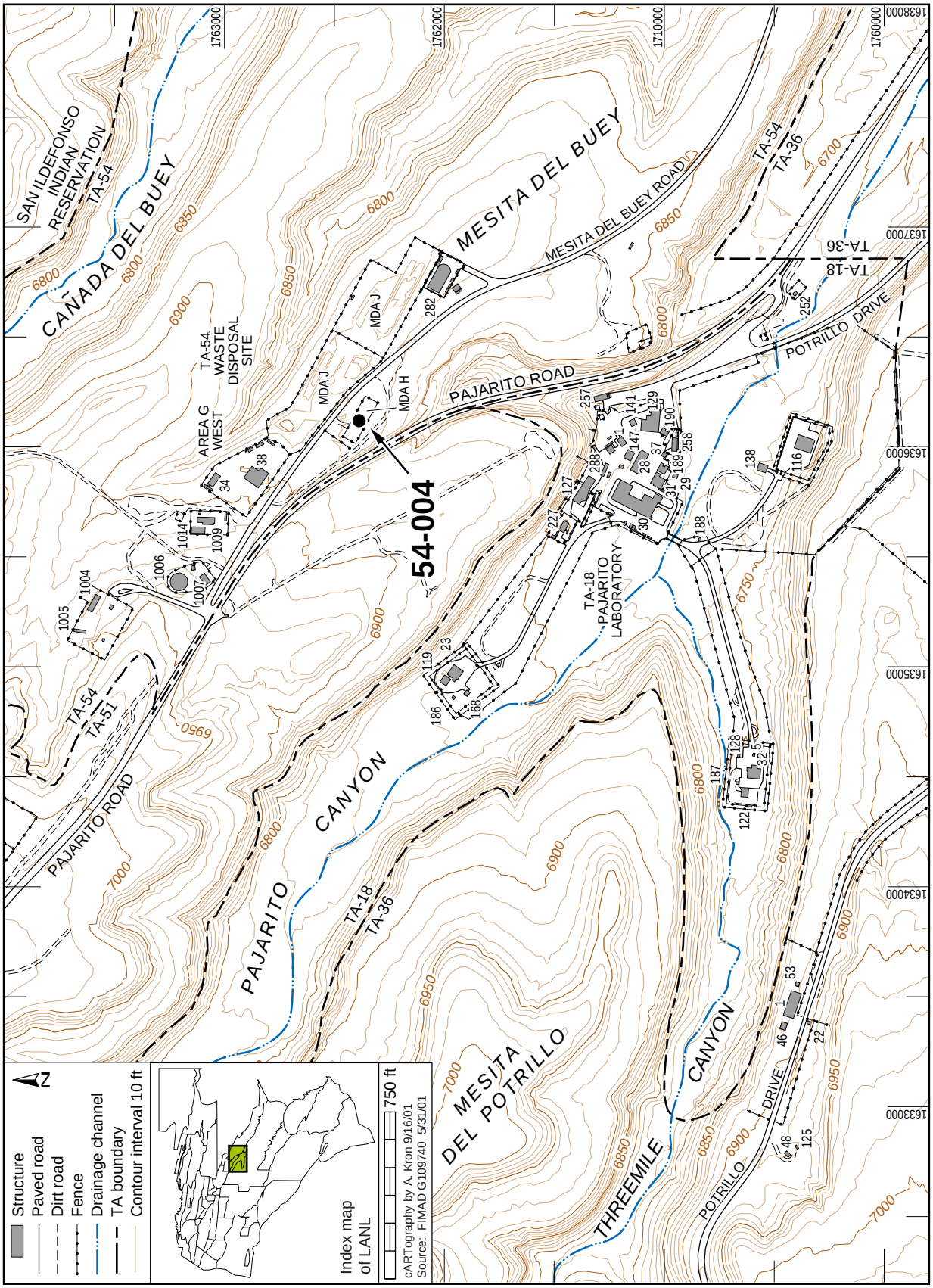
Plan for Supplemental Sampling for the RCRA Facility Investigation at Material Disposal Area H	LA-UR Number: 01-2516
RFI Report for Material Disposal Area H at Technical Area -54	LA-UR Number: 01-1208
Corrective Measures Study (CMS) Plan for Material Disposal Area (MDA) H at Technical Area 54	LA-UR Number: 01-1629



Aerial view of SWMU 54-004



View of SWMU 54-004, looking east



SAN ILDEFONSO INDIAN RESERVATION
TA-54
CAÑADA DEL BUEY
MESITA DEL BUEY
MESITA DEL BUEY ROAD
TA-54 WASTE DISPOSAL SITE
AREA G WEST
MDA J
MDA H
PAJARITO ROAD
POTRILLO DRIVE
TA-36
TA-18
54-004
TA-18 PAJARITO LABORATORY
TA-54
TA-51
PAJARITO ROAD
PAJARITO CANYON
TA-18
TA-36
MESITA DEL POTRILLO
THREEMILE CANYON
POTRILLO DRIVE
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
Index map of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109740 5/31/01

SWMU 54-005 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1961-2001
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 54-005, MDA J, is an inactive 5.5-acre facility consisting of six pits and four shafts. The site was opened in 1961. Waste disposed of in the pits at MDA J consisted of treated barium sand and administratively controlled waste. Surface sites at MDA J previously included a small land-farming project for aeration of soil contaminated with petroleum products, a transfer facility for containers of asbestos awaiting transport to a licensed off-site facility, and two container storage areas. All pits and shafts at MDA J are closed and covered with crushed tuff.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than on individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport, and if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment runoff from the four MDAs. Fourteen drainage channels originate near MDA G, and the other three MDAs each have only one significant drainage channel. Sample locations were selected within dispositional areas determined by on-site geomorphic analysis of each channel. Samples were screened for alpha, beta, and gamma radiation. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that had no history of receiving contaminated runoff. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. In total, 4 sediment channel samples were collected from MDA J during this sampling event. The pesticide, methoxychlor, was detected in one of the channel sediment samples. Am-241, Cs-137, and Po-210 concentrations were reported below SALs.

In May 1995, soil samples were collected from four boreholes at MDA J. A total of 16 soil samples were collected at 5-ft intervals from angled Borehole 54-1019, located on the east side of Pit 1, and were analyzed in the mobile laboratory for gravimetric moisture, tritium, and gross alpha, beta, and gamma radiation. Eight additional soil samples were collected at 10-ft intervals in this borehole and were submitted for analysis for inorganic chemicals, pesticides and PCBs, and organic chemicals at a fixed laboratory. The other three vertical boreholes were sampled at 5-ft intervals for analysis by the rad van, and at 20-ft intervals for analysis by a fixed analytical laboratory for inorganic compounds, pesticides and PCBs, and organic compounds. Eight screening samples were collected from Borehole 54-1020, located on the east side of Pit 2 for analysis by the mobile laboratory and another 2 samples were submitted for analysis by a fixed laboratory. Eight soil samples were collected from the other two boreholes. In total, 18 samples were collected from core in the four boreholes and submitted to a fixed analytical laboratory for analysis. Twenty inorganic chemicals were detected and, of these, six were detected above background values (BVs). Of the six inorganic chemicals detected above BVs, only arsenic exceeded SALs. Four organic chemicals were detected, but none exceeded SALs.

MDA J currently is undergoing closure in accordance with New Mexico Solid Waste Regulations, 20 NMAC 9.1, Subpart V.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	20	6	1
Pesticides/PCBs	1	N/A	0
Radionuclides	13	2	0
SVOCs	1	N/A	0
VOCs	3	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	1.9 mg/kg	0.39 pCi/g

References

RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 11 — LA-UR Number: 96-0110

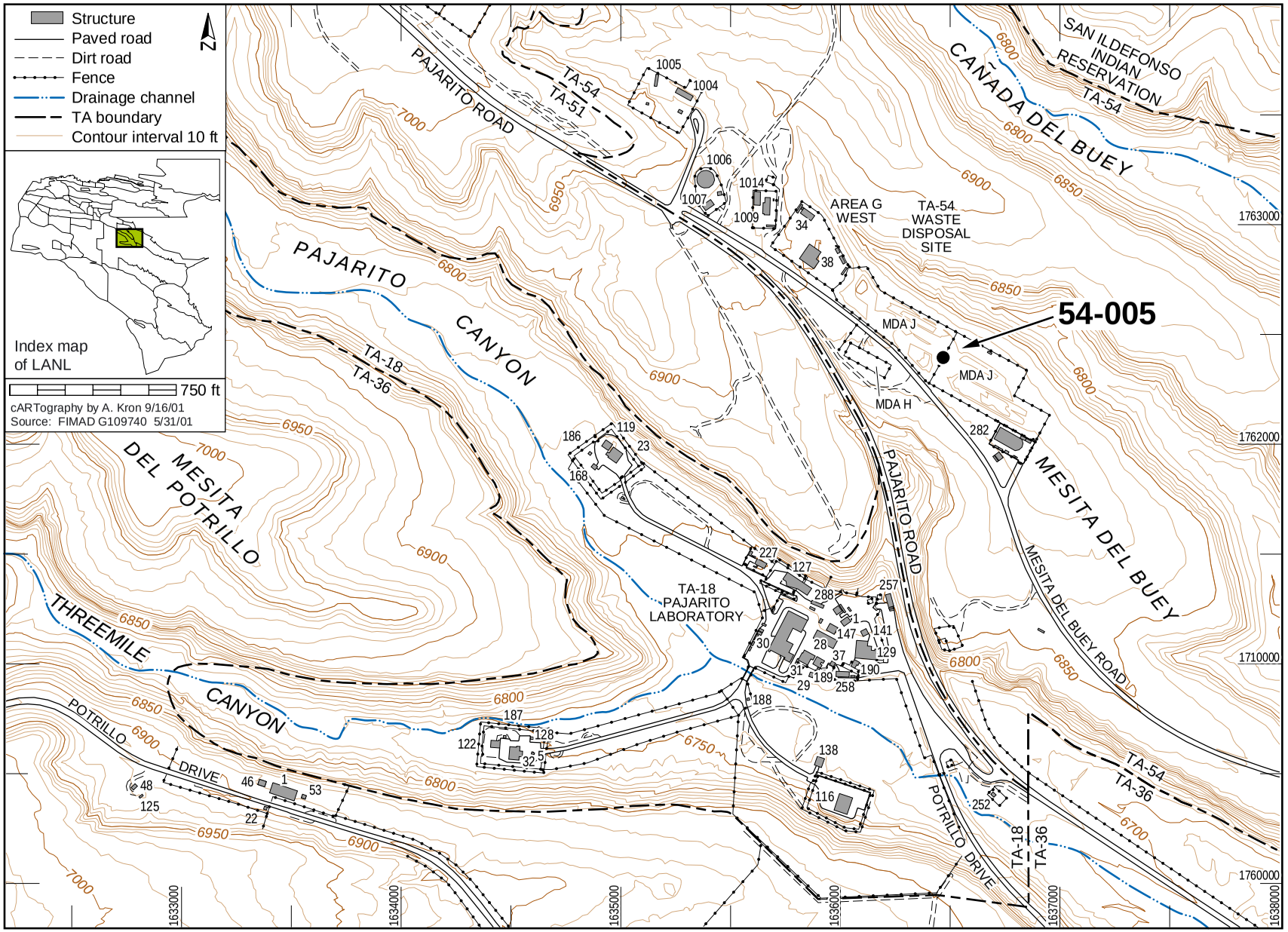
RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



Aerial view of SWMU 54-005



View of SWMU 54-005, looking northeast


Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109740 5/31/01
54-005
PAJARITO ROAD
TA-54
TA-51
CANADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
AREA G WEST
TA-54 WASTE DISPOSAL SITE
MDA J
MDA H
PAJARITO CANYON
TA-18
TA-36
MESITA DEL POTRILLO
MESITA DEL BUEY
MESITA DEL BUEY ROAD
TA-18 PAJARITO LABORATORY
THREEMILE CANYON
POTRILLO DRIVE
1005
1004
1006
1007
1014
1009
34
38
282
119
23
186
168
227
127
288
257
1
147
141
129
30
28
37
31
189
190
258
29
188
187
128
122
32
5
138
116
252
48
125
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53
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6950
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6750
6700
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1762000
1710000
1760000
1633000
1634000
1635000
1636000
1637000
1638000

SWMU 54-006 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1959-1985
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-006 (also called MDA L) is included in Module VIII of LANL's Hazardous Waste Facility Permit. Area L is a 2.5-acre fenced area that includes MDA L, which consists of 1 inactive subsurface disposal pit (pit A); 3 inactive subsurface treatment and disposal impoundments (impoundments B, C, and D); and 34 inactive disposal shafts (shafts 1 through 34). Although no longer in use, impoundments B, D, and shafts 1, 13-17, and 19-34 are considered regulated units until RCRA closure is certified and approved by NMED. The entire fenced surface area of Area L is an active RCRA-permitted hazardous waste unit. Disposal pit A is located in the eastern portion of MDA L beneath a Dome 54-215. The pit is 200 ft long x 12 ft wide x 12 ft deep. It received chemical waste from the late 1950s until December 1978. Initial waste disposal practices included disposal of uncontainerized chemical wastes and liquids in drums without added sorbents. The pit also was used as an evaporative pit. Pit A was filled with waste to within approximately three feet of the surface between 1964 and 1978, and then was covered with crushed, consolidated tuff.

The three impoundments (impoundments B, C, and D) are located northwest of pit A. Impoundment B was excavated in 1978 and is 60 ft long x 18 ft wide x 10 ft deep. It had a capacity of 7,560 cubic feet (asssuming it was filled to within 3 ft of the surface) and operated from January 1979 to June 1985 to evaporate treated salt solutions and electroplating wastes. Impoundment C was closed in the early 1978. This impoundment, which is 35 ft long x 12 ft wide x 10 ft deep, was used for the same disposal purposes as impoundment B. Impoundment C had a capacity of 2940 cubic feet (asssuming it was filled to within 3 ft of the surface). Impoundment D is approximately 75 ft long x 18 ft wide x 10 ft deep and had a capacity of 9450 cubic feet (asssuming it was filled to within 3 ft of the surface). It was used to treat small quantities of lithium hydride by reaction with water. This practice began in 1972 and was discontinued in 1984. Impoundment D later was used as secondary containment for used oil storage tanks (see AOC 54-021). All three impoundments are covered with crushed tuff.

The 34 disposal shafts at MDA L were drilled directly into the subsurface tuff. Shafts 1 through 28 are located south of pit A. Shafts 29 through 34 are located northwest of impoundments B, C and D. Three feet of crushed tuff were placed in the bottom of each shaft to fill cracks and joints. The shafts range from 15 ft to 65 ft deep and vary in diameter from 3 ft to 8 ft. Groups of shafts were constructed as needed. When in use, the shafts were covered with a steel cap that could be opened or removed, depending on design, to allow placement of waste. The operational dates of the shafts vary, but collectively the shafts were operated from February 1975 to August 1985. The shafts were used to dispose of containerized and bulk liquid chemical wastes. Before 1982, containerized liquids were disposed of without adding absorbents to the containers. Space around the drums was filled with crushed tuff and a 6-in. layer of crushed tuff was placed between each layer of drums. After 1981, uncontainerized waste was no longer disposed of in the shafts. From 1982 to 1985, wastes were accumulated on the site and packaged in drums until sufficient quantity had accumulated to put the drum in a shaft. When filled, the shafts were covered with a concrete plug approximately 3 ft thick.

Early disposal practices at MDA L resulted in a subsurface volatile organic vapor plume that extends beneath the facility and beyond its boundary. Several previous investigations have taken place at MDA L. Since 1982, channel sediments have been collected from permanent stations in the main drainages surrounding TA-54 to monitor the potential transport of radionuclides by stormwater run-off. In 1985 NMED issued a compliance order to LANL that required quarterly pore-gas monitoring at MDAs G and L. Nine boreholes were drilled between 1985 and 1988 to monitor the subsurface VOC plume. Analytical data from the pore-gas monitoring shows that 1,1,1-trichloroethane is the primary plume constituent; it is present to at least 200 ft below the mesa surface, and concentrations vary across the plume. In 1986, additional boreholes were drilled to measure air permeability in the tuff. The data were used to evaluate the nature and extent and fate and transport of subsurface contamination at MDA L.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted RFI fieldwork at MDA L from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases.

The 1996 RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigations focused on the MDAs collectively rather than individual disposal cells, shafts or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport, and if so, to determine if concentrations likely

would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment run-off from the four MDAs. Four sample locations were selected for sampling at MDA L, within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for alpha, beta, and gamma radiation. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that had no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape condition for potential receptor access. Each MDA-related drainage was determined not to be an ecological concern because there was little receptor access. The channel sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

An RFI report for MDAs G, H, and L was issued in 2000. The report was a collaborative effort (high performing team) between the NMED and LANL. In September 2000, the high performing team received direction from senior management to expedite the implementation of a preferred remedy at one MDA. The team selected MDA H and narrowed the scope of its effort to accomodate the change. The high performing team agreed that HWB would not review the 2000 combined RFI Report and that LANL would submit individual RFI reports on each of the MDAs. The first of the three RFI reports was submitted in May, 2001. The next scheduled submittal is for MDA L, (SWMU 54-006) in August, 2003. RFI fieldwork at MDA L included the collection and analysis of 4 drainage sediment samples, over 180 core samples from 16 boreholes, VOC and tritium surface flux samples, and ambient air sampling. The sediment samples were analyzed for inorganic chemicals, cyanide, PCBs/pesticides, herbicides, radionuclides, and tritium. The ambient air samples were analyzed for VOCs. The core samples were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs/pesticides, herbicides, cyanide, and radionuclides. The RFI data were supplemented by environmental surveillance surface water data, VOC emissions data from passive extraction tests, and quarterly VOC pore-gas monitoring samples. Analytical results showed the presence of tritium at elevated levels in the surface flux samples and the subsurface tuff samples and organic chemicals in the subsurface and ambient air samples, which indicated a subsurface release. The primary VOCs identified are 1,1,1-trichloroethane and trichloroethene. Barium, cobalt, copper, chromium, mercury, nickel, uranium, and zinc were detected at concentrations greater than BVs in subsurface tuff samples. The pesticide methoxychlor and plutonium-238 are present at concentrations below SALs in site channel sediments.

Quarterly pore-gas sampling of the vapor phase VOC plume at MDA L is ongoing; sampling results are reported in the ER quarterly reports.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Herbicides	0	N/A	0
Inorganic chemicals	26	20	2
Pesticide/PCBs	3	N/A	1
Radionuclides	14	4	0
SVOCs	3	N/A	1
VOCs	18	N/A	2

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

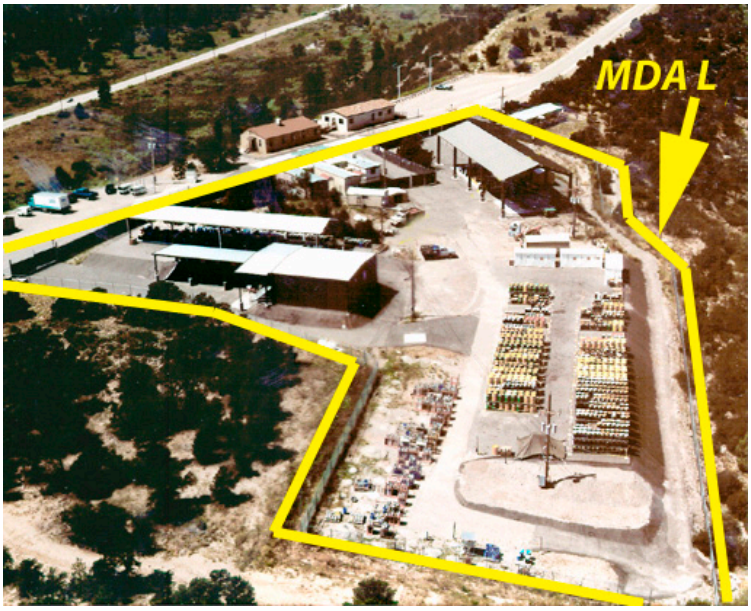
Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	1.7 mg/kg	0.39 mg/kg
	Cyanide (total)	0.96 mg/kg	N/A
Pesticide/PCBs	Aroclor-1260	0.313 mg/kg	0.22 mg/kg
SVOCs	Pentachlorophenol	13 mg/kg	3 mg/kg
VOCs	Dichloropropane[1,3-]	0.0068 mg/kg	N/A
	Trichloropropane[1,2,3-]	0.014 mg/kg	0.0014 mg/kg

References

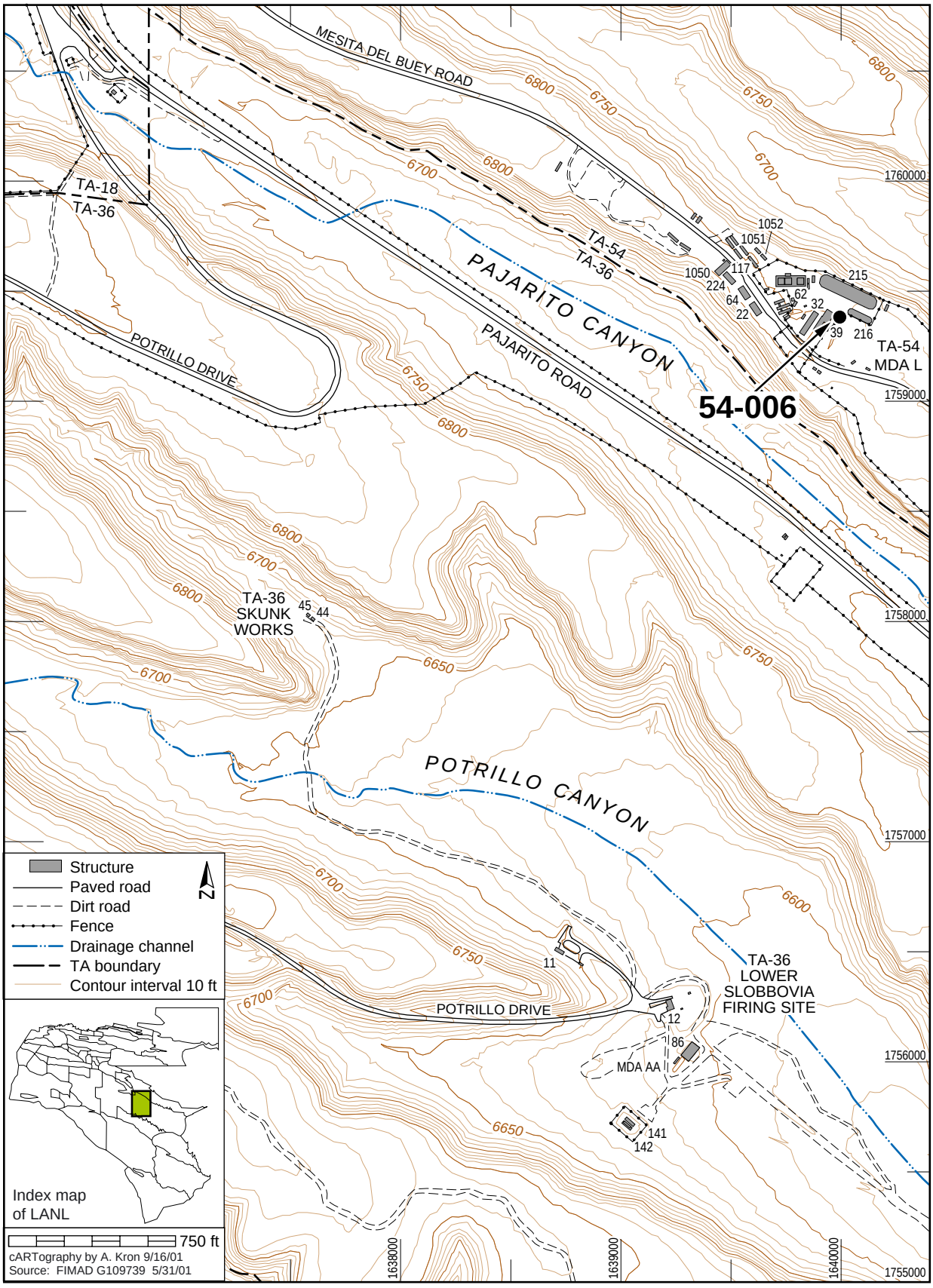
RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) — LA-UR Number: 96-0110

Proposed Action Plan Drilling Near Area [MDA] L, TA-54, OU 1148 — LA-UR Number: N/A

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



Aerial close-up of SWMU 54-006, before domes


MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
54-006
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

SWMU 54-007(a) — Subsurface liquid disposal

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-1998
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-16	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-007(a) is an inactive septic system located within Area G at TA-54. The system was constructed in 1976 and consists of a 1000-gal. concrete septic tank (54-16), concrete distribution box, and VCP drainlines. The outlet line from the distribution box discharged to a drainfield. The system served the former compactor building [Building 54-2, SWMU 54-012(a)] and the waste management control facility for Area G (Building 54-11). The septic system received sanitary wastes, but historically may have received radioactive constituents, based on previous activities conducted in the buildings it served. The septic system was left in place in 1998 when the buildings it served were tied into the Laboratory's SWCS.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

In accordance with ER Project BMPs, a VCA/VCM is scheduled for this SWMU during fiscal year 2002 to characterize and remove the septic tank and its contents and the distribution box. Samples were collected from the tank and distribution box excavations to determine if there has been a release and the nature and extent of any release. Characterization/confirmation samples will be collected within and around the drainfield to determine the nature and extent of any release. Human health and ecological screening risk assessments will be conducted on analytical data from the confirmation samples to determine if additional excavation of soil is required and results will be reported in a VCA/VCM completion report.

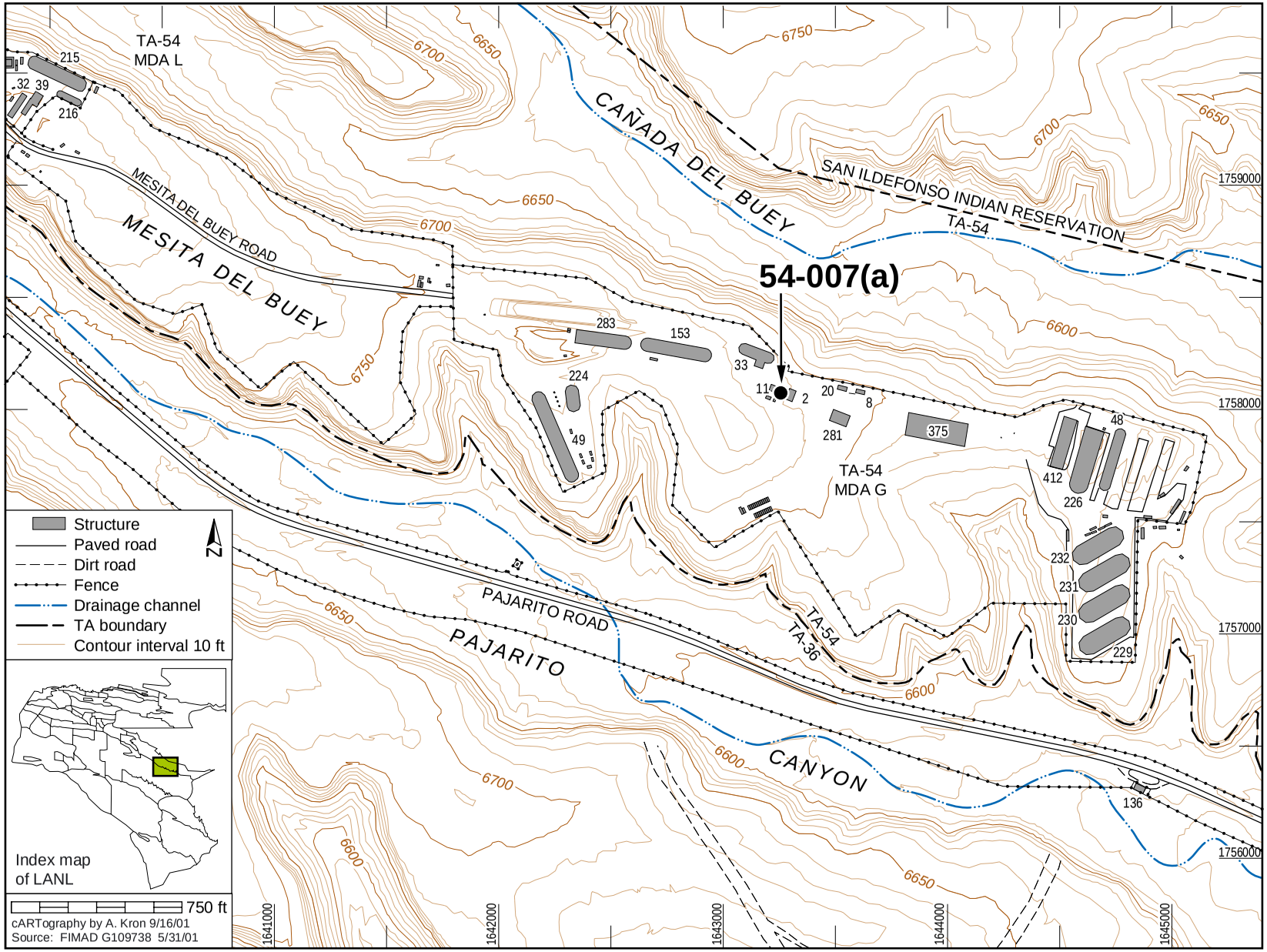
ER Project Sampling Summary

No analytical samples were collected at this site.

References

VCA Completion Report for SWMU 54-007(a)	LA-UR Number: 02-5114
Voluntary Corrective Action Plan for SWMU 54-007(a), Inactive Septic System at Technical Area -54	LA-UR Number: 02-1866
RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

No photo; subsurface unit


54-007(a)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
MESITA DEL BUEY ROAD
MESITA DEL BUEY
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
215
32
39
216
283
153
33
224
49
110
2
20
8
281
375
48
412
226
232
231
230
229
136
6750
6700
6650
6600
1759000
1758000
1757000
1756000
1641000
1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

SWMU 54-007(c)-99 — Subsurface liquid disposal

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1960s-1992
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	Yes
Structure Number	54-9	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-007(c)-99 consists of former SWMU 54-007(c) and former AOC 54-007(e). Former SWMU 54-007(c) was an inactive septic system that served an office building (Building 54-34) and the Radioassay and Nondestructive Testing (RANT) Facility (Building 54-38). The septic system consisted of a fiberglass tank 4 ft in diameter and 12 ft long, a drainline, and a drainfield formed by three parallel-buried lines of slotted PVC pipe, approximately 4 ft below ground surface. The septic system was constructed in the late 1980s and decommissioned in 1992. Former AOC 54-007(e) was an inactive septic system that served an animal holding facility (Building 54-1015) from the time of construction in the mid-1960s until the late 1980s. In 1992, the facility was remodeled as an analytical laboratory for environmental samples. The septic system consisted of a 1500-gal. concrete septic tank (structure 54-9) and a 4-in. PVC drainline connected to a drainfield formed by two parallel lines of 4-in. slotted PVC pipe. The two septic system drainfields were interconnected. Both septic systems were left in place in 1992 when the buildings they served were tied to a new sewer line installed as part of LANL's SWCS. Because the two septic system drainfields were connected, received similar waste streams (sanitary wastewater), and were located adjacent to each other, they were consolidated during the 1999 AUA with NMED HWB.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

During the 1995 Phase I RFI, 4 subsurface soil samples (3 RFI samples and 1 duplicate) were collected adjacent to drainlines (5 ft bgs) in each of the two septic system drainfields; the contents of each septic tank were sampled and analyzed. All samples were screened for radioactivity and analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganic chemicals. Results showed elevated gross beta levels in soils around the drainfield of former SWMU 54-007(c) and extremely low concentrations of several VOCs and SVOCs in the contents of both septic tanks and soils adjacent to the connected drainfields. No inorganic chemicals were detected above LANL BVs; however, DLs for antimony and cyanide were greater than SAL and 0.1 SAL, respectively. Because the nature and extent of potential contamination were not determined, a Phase I RFI report was not prepared.

VCA activities were implemented at SWMU 54-007(c)-99 in 2000/2001 that involved resampling both septic tank contents for waste characterization purposes. The sludge samples from both tanks were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs, pesticides, isotopic plutonium and uranium, gamma spec, and tritium. Both septic tanks and their contents were removed. The contents of both septic tanks were disposed of at SWCS (after waste characterization data were determined to meet the SWSC WAC) and the septic tanks were excavated and removed. Inlet and outlet drainlines were plugged and left in place. Six confirmation samples were collected from two depths at three locations within each septic tank footprint and two samples were collected from two depths at a single location beneath each tank inlet line connection. Twelve confirmation samples were collected from two depths at six locations within each drainfield. The drainfield sample locations were selected to supplement the 1995 Phase I RFI data. The confirmation sample analytical suite was based on the 2000 waste characterization results for the contents of both septic tanks and included screening for radioactivity, and fixed laboratory analysis for VOCs and SVOCs. Results showed consistently low concentrations of organic COPCs, most at concentrations below their EQLs; the EQLs decreased with depth. Acetone was the only organic chemical detected in both the septic tank sludge samples and confirmatory soil samples. A VCA completion report was submitted to NMED in September 2001. In the human health screening assessment, maximum concentrations of COPCs were less than 0.1 SAL for noncarcinogens and less than SAL for carcinogens. The detected COPECs did not result in an HQ greater than 0.3 for ecological receptors at this PRS. SWMU 54-007(c)-99 was recommended for NFA.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	16	1	1
Pesticides/PCBs	0	N/A	0
Radionuclides	3	0	0
SVOCs	9	N/A	0
VOCs	8	N/A	0

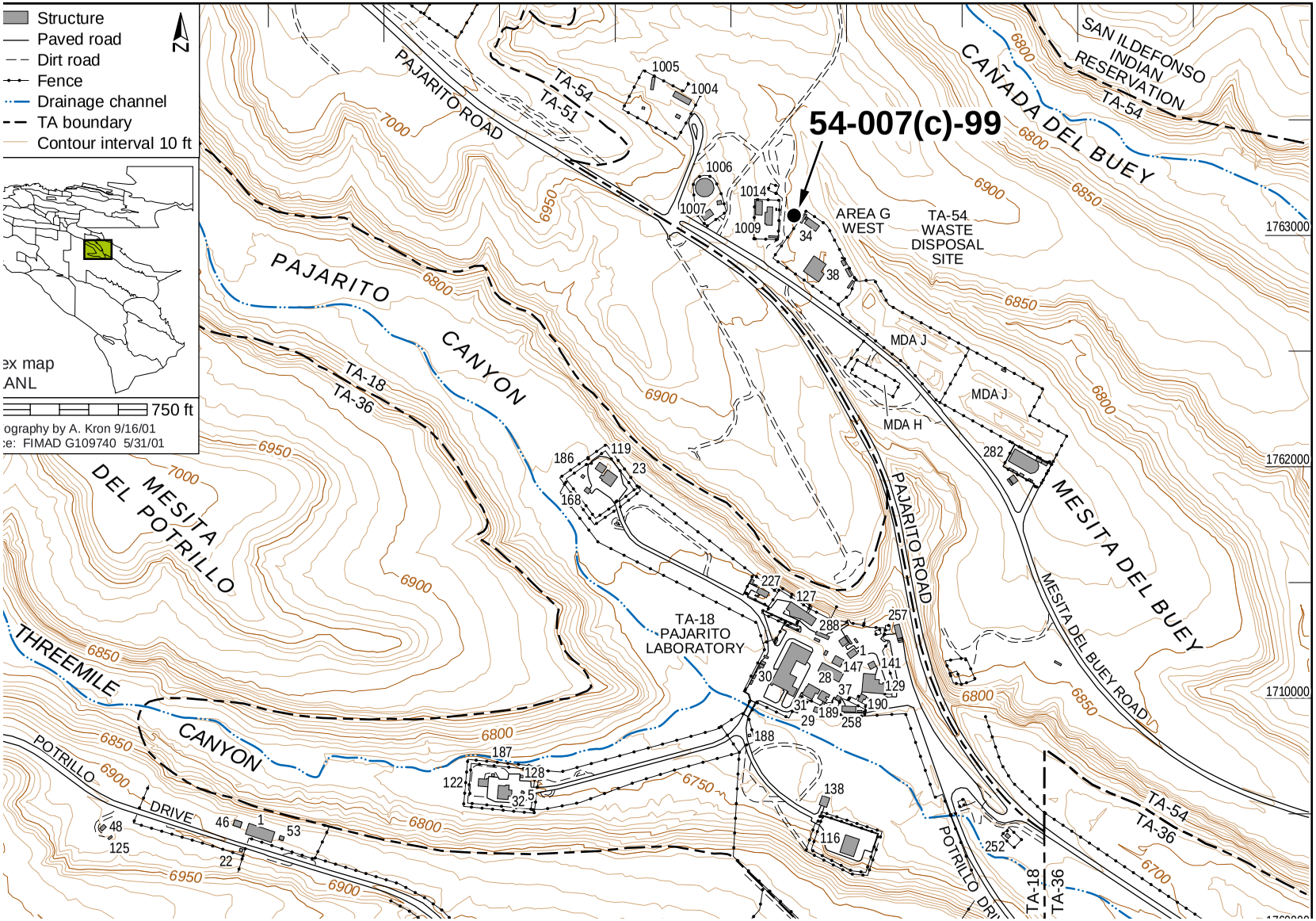
The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	0.73 mg/kg	0.39 mg/kg

References

Los Alamos National Laboratory Permit Modification Request, September 2002	LA-UR Number: N/A
Voluntary Corrective Action Completion Report for PRS 54-007(c)-99, Revision 1	LA-UR Number: 02-0635
Voluntary Corrective Action (VCA) Completion Report for Consolidated for PRS 54-007(c)-99	LA-UR Number: 01-5311
Voluntary Corrective Action (VCA) Plan for Consolidated Potential Release Site (PRS) 54-007(c)-99	LA-UR Number: 00-3905
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

No photo; subsurface unit


Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
750 ft
54-007(c)-99
PAJARITO ROAD
TA-54
TA-51
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
AREA G WEST
TA-54 WASTE DISPOSAL SITE
PAJARITO CANYON
TA-18
TA-36
MDA J
MDA H
MESITA DEL POTRILLO
MESITA DEL BUEY
PAJARITO ROAD
MESITA DEL BUEY ROAD
TA-18 PAJARITO LABORATORY
THREEMILE CANYON
POTRILLO DRIVE
1763000
1762000
1710000

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AOC 54-007(d) — Subsurface liquid disposal

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1962-1993
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	Yes
Structure Number	54-4	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-007(d) is a former septic system that served the Radiation Exposure Facility (Buildings 54-1001, 54-1002, 54-1003, and 54-1004). The septic system consisted of a 972-gal. concrete septic tank (structure 54-4), drainlines, a distribution box, and a split drainfield. A 4-in. drainline from the septic tank connected to a reinforced concrete distribution box that diverted effluent east and west into the drainfield. The drainfield consists of two 60-ft-long, 4-in.-diameter tile drainlines that run east and west from the former location of the distribution box. The Radiation Exposure Facility operated from 1962 to the mid-1970s and was used for biomedical research on the exposure of animals to gamma radiation from sealed cobalt-60 sources. The sources were removed from the facility when the research was terminated and the facility was used for research on the exposure of animals to nitrogen oxides. The septic system was left in place in 1993 when the buildings it served were tied to a new sewer line installed as part of LANL's SWCS. Effluent now flows to a new manhole (structure number 54-151), which is located south of the former septic tank location.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

During the 1995 Phase I RFI, 4 subsurface soil samples (3 RFI samples and 1 duplicate) were collected adjacent to drainlines (5 ft bgs) in the two septic system drainfields and the contents of the septic tank were sampled and analyzed. All samples were screened for radioactivity and analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganic chemicals. Results showed extremely low concentrations of several VOCs in the septic tank contents soils adjacent to the drain field. Because the nature and extent of potential contamination were not determined, a Phase I RFI report was not prepared.

The ER Project characterized the contents and removed the septic tank in a VCA that was conducted in 2000 and 2001. During 2000, the liquid and sludge in the septic tank were sampled and analyzed for pesticides/PCBs, inorganic chemicals, organic chemicals, gamma-emitting radionuclides, tritium, isotopic plutonium, and isotopic uranium. Waste characterization results meet the SWSC WAC. The contents of the septic tank were disposed of at the SWCS and the septic tank was excavated and removed. Inlet and outlet drainlines were plugged and left in place. Seven confirmation samples were collected from two depths at three locations within the septic tank footprint and two samples were collected from two depths at a single location beneath the tank inlet line connection. Drainfield sample locations were selected to supplement the 1995 RFI data and to ensure determination of the nature and extent of contamination. A total of 24 subsurface soil samples were collected from 12 locations in the in the drainfield. The confirmation sample analytical suite was based on the 2000 waste characterization results for the septic tank contents and included screening for gross alpha, beta, and gamma radiation and fixed laboratory analysis for VOCs and SVOCs. Results showed no elevated gross radiation screening levels, and no VOCs or SVOCs above their respective SALs. AOC 54-007(d) was recommended for NFA.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	16	0	1
Pesticides/PCBs	3	N/A	1
SVOCs	1	N/A	0
VOCs	11	N/A	0

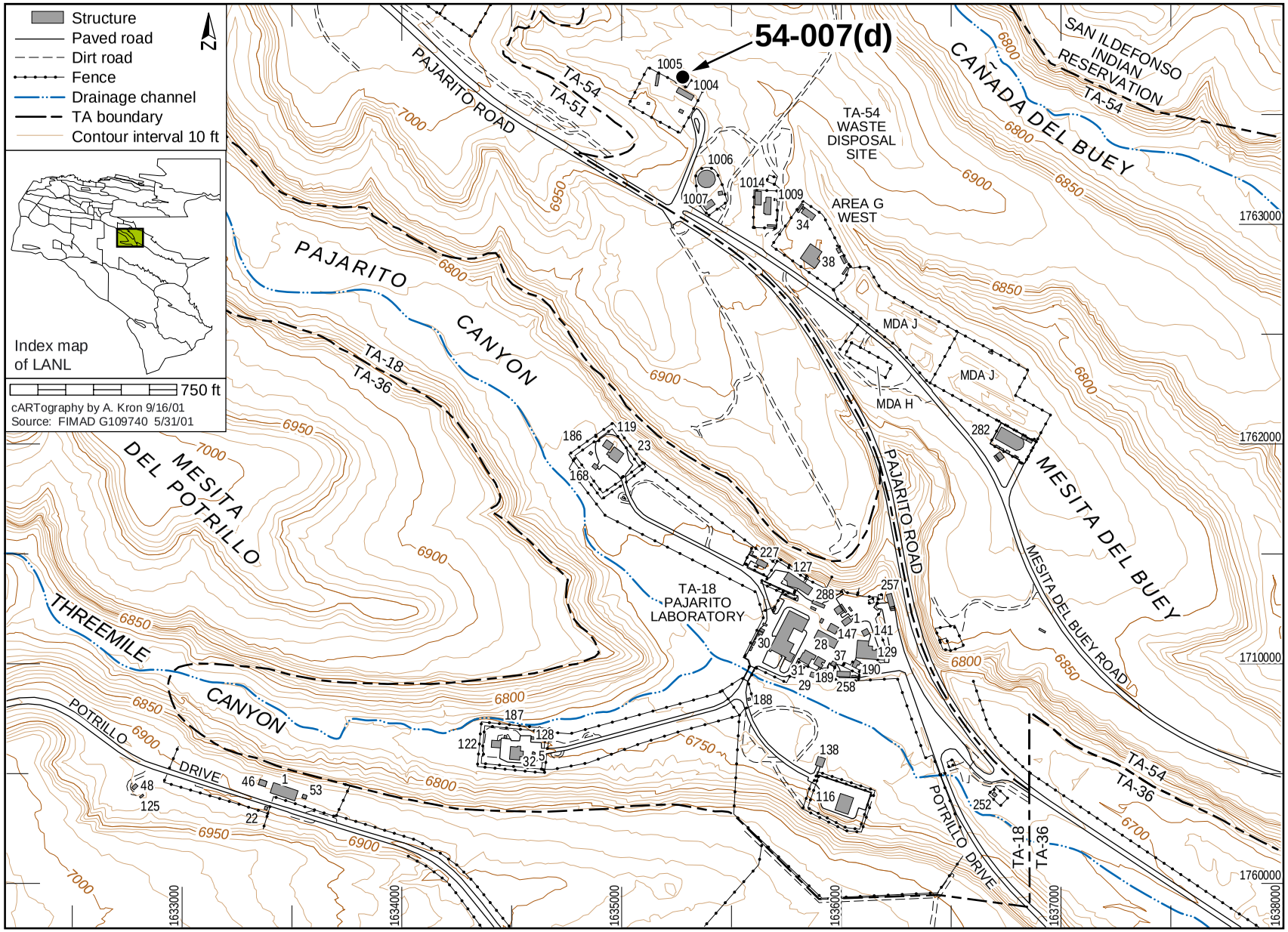
The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Pesticides	Aroclor-1254	0.25 mg/kg	0.22 mg/kg

References

Voluntary Corrective Action (VCA) Completion Report for Potential Release Sites (PRSs) 51-001 and 54-007(d)	LA-UR Number: 01-5223
Voluntary Corrective Action Plan for Potential Release Sites 51-001 and 54-007(d)	LA-UR Number: 00-3617
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

No photo; subsurface unit


54-007(d)
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
Index map of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109740 5/31/01
PAJARITO ROAD
TA-54
TA-51
TA-54 WASTE DISPOSAL SITE
AREA G WEST
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
PAJARITO CANYON
TA-18
TA-36
MDA J
MDA H
MESITA DEL POTRILLO
MESITA DEL BUEY
MESITA DEL BUEY ROAD
TA-18 PAJARITO LABORATORY
THREEMILE CANYON
POTRILLO DRIVE
1005
1004
1006
1007
1014
1009
34
38
282
186
119
23
168
227
127
257
288
1
147
141
28
30
37
129
31
189
190
29
258
188
187
128
122
32
5
138
116
252
48
125
46
1
53
22
6700
6750
6800
6850
6900
6950
7000
1763000
1762000
1710000
1760000
1633000
1634000
1635000
1636000
1637000
1638000

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AOC 54-009 — Physical/chemical treatment units

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1988-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-35	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-009 consists of two aboveground, open-top RCRA-permitted treatment tanks situated on the paved surface of Area L. The tanks are not included in Module VIII of LANL's Hazardous Waste Facility Permit. The carbon steel tanks each have a capacity of 1660 gal. and are 9 ft in diameter and 3.5 ft high. The tanks are located on a bermed concrete pad with a containment capacity of 3554 gal. Installed in 1988, the tanks were last used to treat barium-contaminated sand from burn pads at other LANL areas; they are not in use currently. Barium was precipitated in the tanks as barium sulfate, a nonhazardous salt, and was drummed and shipped to MDA J. The treatment sand also was disposed of at MDA J. Two additional open-top treatment tanks and a 210-gal. mixing tank previously were included as part of this AOC, but were removed in the 1990s. Historically, the tanks were used to treat ammonium bifluoride, neutralize acids and bases, and oxidize reactive wastes. The tanks have been removed by the operating group and closure certification is being provided to the NMED. No releases have been identified from AOC 54-009.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

No analytical samples were collected at this site.

References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 — LA-UR Number: N/A

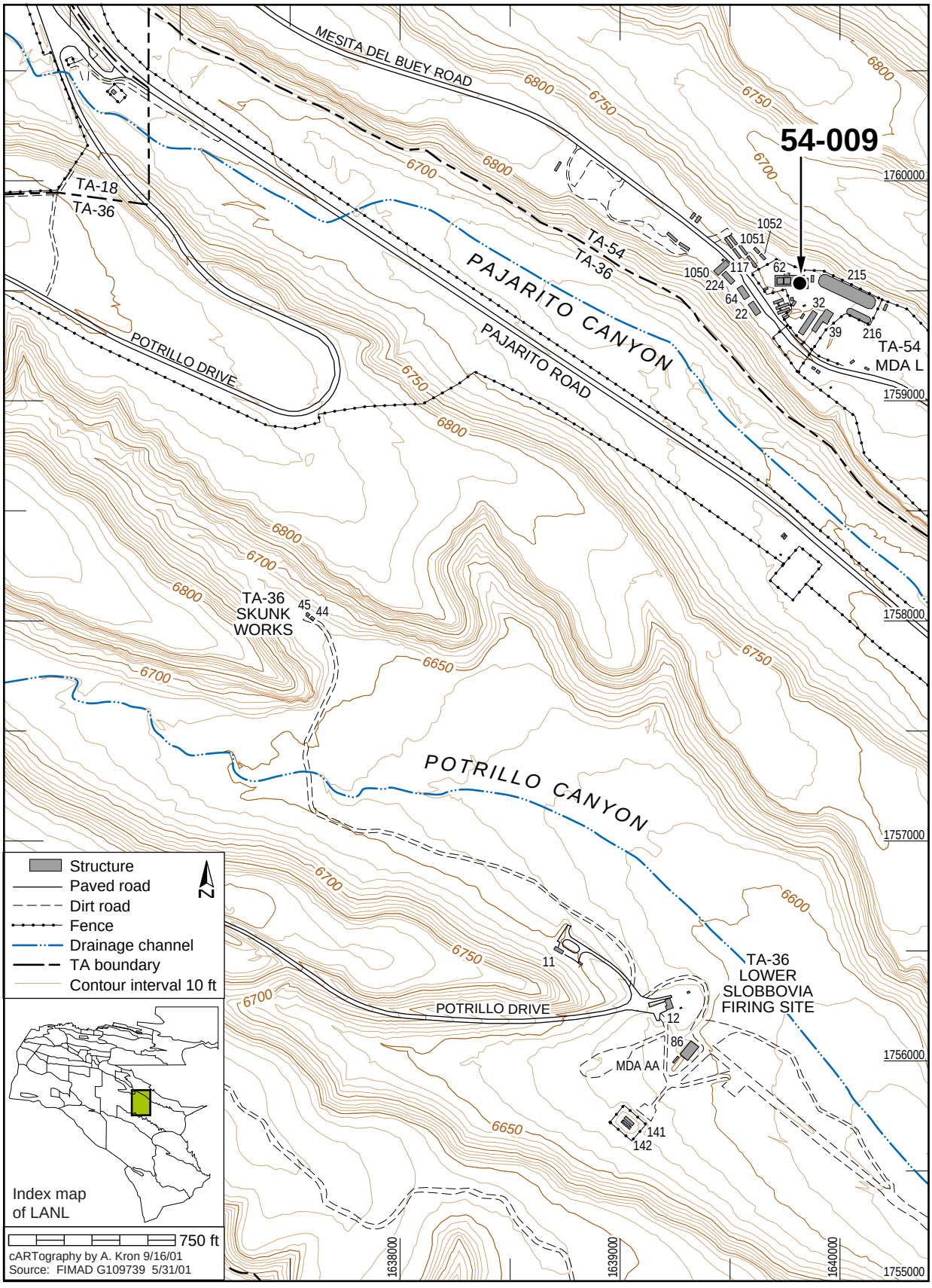
RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



Aerial close-up of AOC 54-009



View of AOC 54-009


54-009
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
POTRILLO DRIVE
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-012(a) — Physical/chemical treatment units

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

AOC 54-012(a) was a drum compactor formerly located inside Building 54-2. The compactor was used to compact radioactive solid waste. The compactor was removed in the mid-1990s and replaced with a new compactor located in Building 54-281. Building 54-2 was decontaminated and currently is used to store, assemble, and repair tools in support of Area G operations.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

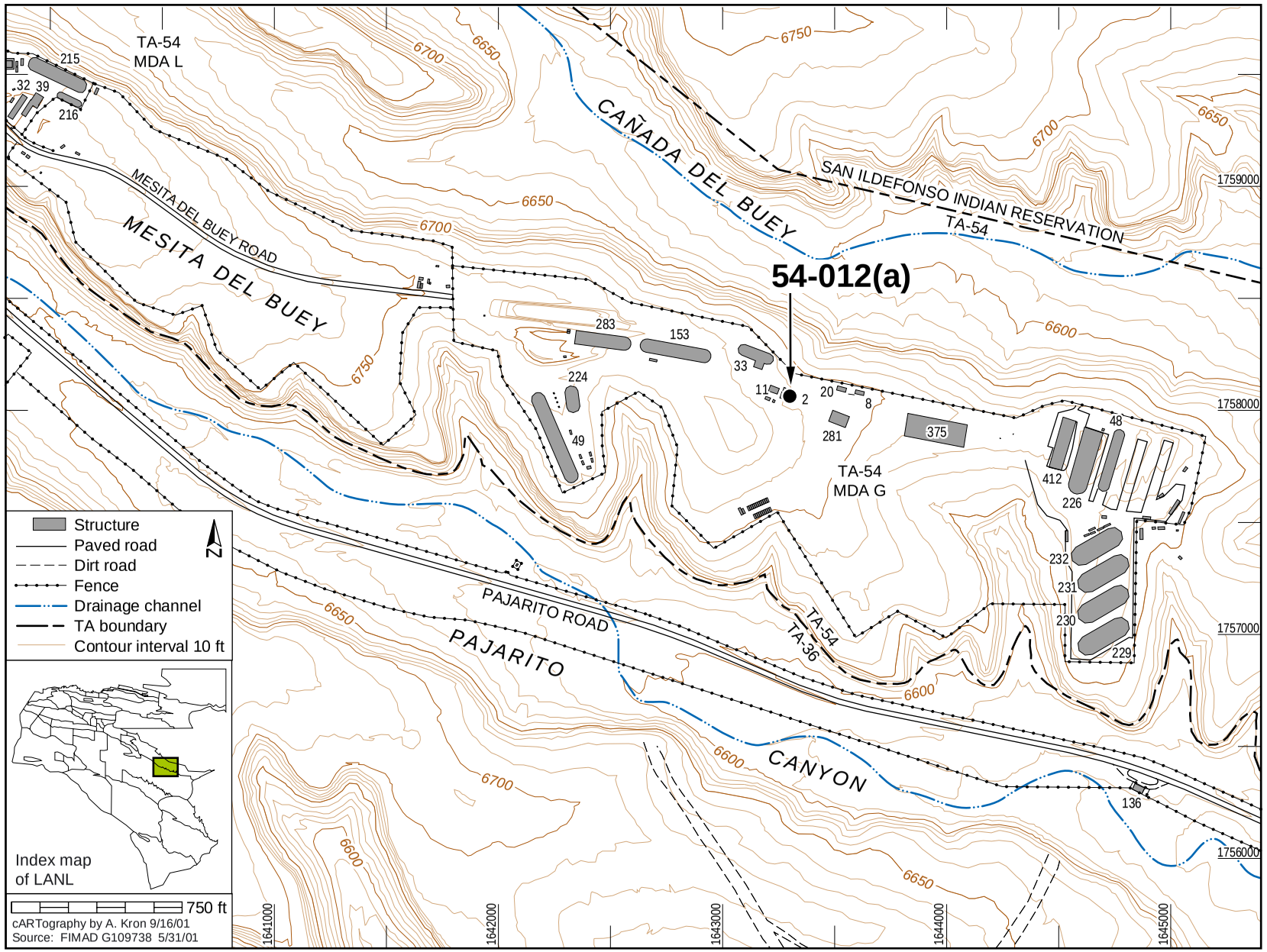
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



View of AOC 54-012(a)


54-012(a)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
MESITA DEL BUEY ROAD
MESITA DEL BUEY
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
215
32
39
216
283
153
33
11
2
20
8
224
49
281
375
48
412
226
232
231
230
229
136
6750
6700
6650
6600
1759000
1758000
1757000
1756000
1641000
1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

SWMU 54-012(b) — Physical/chemical treatment units

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-82	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 54-012(b) is the former and current location of a drum compactor in the central portion of Area L. The compactor is used to crush empty, discarded 30- and 55-gal. drums. The compactor uses hydraulic pressure to move, ram and crush the drums. Prior to crushing, all containers are inspected to ensure they met the RCRA definition of “empty.” The drum compactor, which was included in Module VIII of LANL's Hazardous Waste Facility Permit, was situated on bare soil prior to relocation to the current SWMU 54-012(b)location. The compactor was relocated to a concrete containment pad (structure 54-82) at Area L in late 1989 or early 1990, and the stained soil from the previous location was removed. The compactor currently is inactive.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

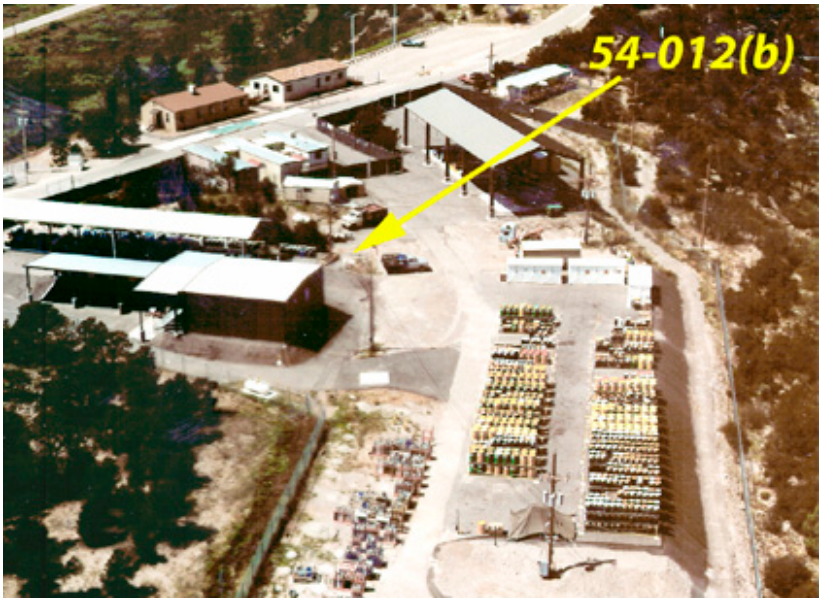
ER Project Sampling Summary

No analytical samples were collected at this site.

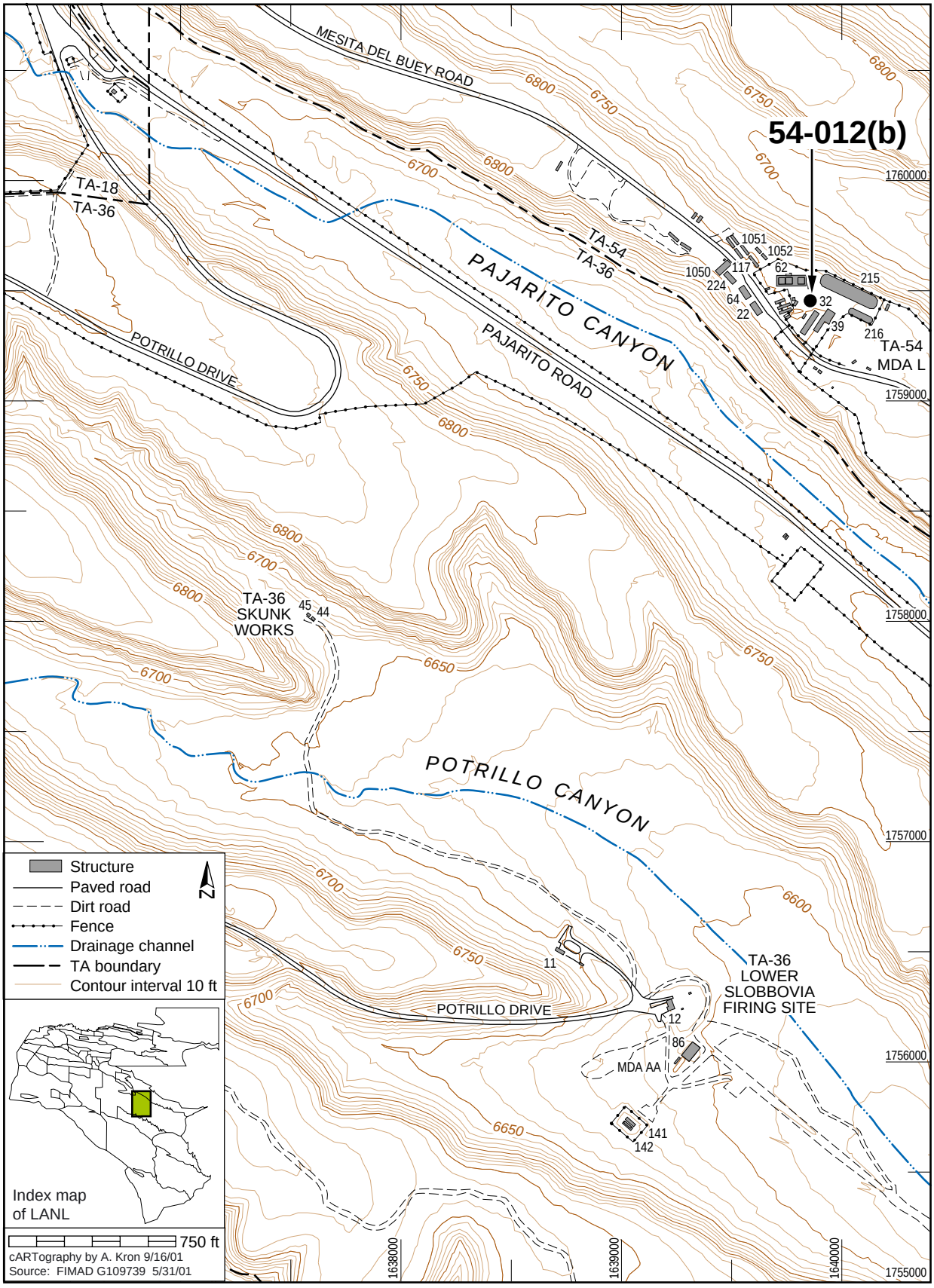
References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 — LA-UR Number: N/A

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



Aerial close-up of SWMU 54-012(b)


54-012(b)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1760000
1759000
1758000
1757000
1756000
1755000
1638000
1639000
1640000
6800
6750
6700
6650
6600
1051
1052
1050
117
62
224
64
22
215
32
39
216
45
44
11
12
86
141
142
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

SWMU 54-013(b)-99 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1957-1997
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 54-013(b)-99, MDA G, consists of former SWMUs 54-013(b), 54-014(b), 54-014(c), 54-014(d), 54-015(k), 54-017, 54-018, 54-019, and 54-020. The MDA G former SWMUs are inactive subsurface disposal units within MDA G; they no longer receive waste. Portions of MDA G began operation in 1957. DOE initially authorized Area G for the disposal of low-level radioactive waste and certain radioactively contaminated infectious waste, asbestos-contaminated material, and PCBs, and for the temporary placement of TRU waste. Area G is located on Mesita del Buey between Pajarito Canyon to the south and Cañada del Buey to the north. Current disposal activities at Area G include only DOE-authorized disposal of LLW and EPA-authorized disposal of PCB waste. RCRA interim status mixed waste and DOE-authorized, RCRA interim status mixed TRU waste are stored in surface structures erected over many of the subsurface SWMUs.

Former SWMU 54-013(b) was a vehicle monitoring/decontamination area located in the central portion of Area G on the surface of pit 19. The area was used to decontaminate trucks and TRU waste drums but is no longer in use and is included in Module VIII of LANL's Hazardous Waste Facility Permit.

Former SWMU 54-014(b) is pit 9, which is included in Module VIII of LANL's Hazardous Waste Facility Permit. It is 30 ft wide x 400 ft long by 20 ft deep. Pit 9 received retrievable TRU and mixed TRU waste from 1974 to 1978, and remains inactive. Once filled, the pit was covered with 3.3 ft of consolidated crushed tuff and 4 in. of topsoil, and reseeded with native grasses.

Former SWMU 54-014(c) consists of TRU waste disposal shafts 200 through 233 and is located in the northeastern quadrant of Area G. Former SWMU 54-014(c) is included in Module VIII of LANL's Hazardous Waste Facility Permit. The shafts each measure 1 ft in diameter, 18 ft deep; they are lined with concrete and contain TRU waste. Some of the shafts began receiving TRU waste in 1978 and were closed between 1979 and 1987, and remain inactive. Shafts were used for wastes that required special packaging (primarily tritium), special handling (e.g., highly active metals), or segregation. Once filled, disposal shafts typically were filled with waste to within 3 ft of the ground surface, backfilled with crushed tuff, and covered with a concrete dome.

Former SWMU 54-014(d), which consists of TRU disposal trenches A, B, C, and D, is located in the south-central portion Area G and is included in Module VIII of LANL's Hazardous Waste Facility Permit. These trenches began receiving TRU and mixed LLW in 1974. Trenches A, B, and C vary in size from 219 ft to 262.5 ft long by 13 ft wide by 6 ft to 8 ft deep. Trench D is 60 ft long x 13 ft wide x 6 ft deep. TRU waste placed in trenches was packaged in 30-gal. containers inside concrete casks. Once filled, the trenches were backfilled with 3.3 ft of crushed tuff followed by 4 in. of topsoil. The surface was reseeded with native grasses.

Former SWMU 54-015(k) consists of a layer of retrievable TRU waste in cement-filled sections of corrugated pipe located inside a mound of fill material within the top of pit 29 in the northeast quadrant of Area G; the site is included in Module VIII of LANL's Hazardous Waste Facility Permit.

Former SWMU 54-017 consists of inactive disposal pits 1 through 8, 10, 12, 13, 16 through 22, and 24. Former SWMU 54-018 consists of disposal pits 25 through 33 and 35 through 37. Only pit 29 (although no longer in use) is considered a regulated unit until RCRA closure is certified and approved by NMED. Pits 11, 14, 23, and 24 were never excavated. Both sites are included in Module VIII of LANL's Hazardous Waste Facility Permit. Pits 1 through 24 were operational between 1959 and 1980 and received radioactive, mixed, and TRU wastes in the form of wing tanks, dry boxes, building debris, sludge drums, lab waste, contaminated soil, D&D waste, filter plenums, and uranium. Pits 1 through 24 are located in the eastern portion of Area G with volumes ranging from 1371 to 56,759 cubic yards. Pits 25 through 28 and 30 through 36 were operational between 1979 and 1980 and received radioactive, mixed, and TRU waste in the form of reactor control rods, D&D waste, contaminated soil, transformers, gloveboxes, asbestos, and lab waste and range in volume from 20,957 to 59,930 cubic yards. Pit 29 operated until 1986. Pit 37 operated from 1990 to 1997 and primarily received circuit boards and contaminated soil. Once filled, the pits were covered with 3.3 ft of consolidated crushed tuff and 4 in. of topsoil, and reseeded with native grasses.

Former SWMU 54-019 consists of disposal shafts 1 through 20, 24 through 34, 38 through 92, 96, 109 through 112, and 150. These 92 shafts are included in Module VIII of LANL's Hazardous Waste Facility Permit and were operational between 1966 and 1980. The shafts received LLW and hazardous and mixed waste. They range in size from 1 ft to 6 ft in diameter and 25 ft to 60 ft deep and are located primarily in the northeast quadrant of Area G. Disposal shafts typically were filled with waste to within 3 ft of the ground surface, backfilled with crushed tuff, and covered with a concrete dome.

Former SWMU 54-020 consists of disposal shafts C1 through C10, C12, C13, 22, 35 through 37, 93 through 95, 99 through 108, 114, 115, 118 through 136, 138 through 140, 151 through 160, 189 through 192, and 196. These shafts are included in the Module VIII of LANL's Hazardous Waste Facility Permit and were operational between 1970 and the early 1990s. Only shaft 124 (although no longer in use) is considered active until RCRA closure is certified and approved by NMED. The shafts contain one or a combination of the following waste types: PCB residues, LLW, hazardous and mixed waste. The shafts range in size from 1 ft to 8 ft in diameter and 25 to 65 ft deep, and are located throughout the eastern portion of Area G. Disposal shafts were typically filled with waste to within 3 ft of the ground surface, backfilled with crushed tuff, and covered with a concrete dome.

Sampling of sediment and surface water runoff downgradient from MDA G has been part of LANL environmental surveillance activities since 1982. From 1982-1992, analyses of sediment at nine sampling stations indicated plutonium concentrations above background in most of the drainages. Additional sediment sampling along the perimeter of MDA G is part of the ongoing LANL environmental surveillance program. Data indicated low levels of tritium, plutonium, and cesium at concentrations above background levels but below SALs.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted RFI fieldwork at MDA G from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases.

The RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water, sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than on individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface-sediment transport, and if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment runoff from the four MDAs. Fourteen drainage channels originate near MDA G. Sample locations were selected within depositional areas determined by an on-site geomorphic analysis of each channel. Samples were screened for radioactivity. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results from the sediment samples showed the presence of americium-241, plutonium-238, plutonium-239, and cobalt-60 at elevated concentrations. Also detected at elevated concentrations were beryllium, cobalt, mercury, selenium, and silver. Methoxychlor was also detected in sediment samples.

In 1997, the ER Project submitted an RFI status report that addressed the tritium distribution in surface soils at MDA G. The report presented the results of environmental surveillance data available from 57 samples that ESH-19 collected from 53 locations. These data showed the tritium distribution in mesa-top surface soils. Tritium concentrations were compared with a SAL of 260 pCi/g for tritium in soil. Comparisons with baseline data collected from the expansion area at MDA G (the west end of the site) indicated that tritium concentrations throughout MDA G are greater than background concentrations but only one location exceeded SAL (2191 pCi/g). Because the physical site model has unique characteristics not captured in the SAL calculation, the SAL was determined to be inadequate as a screening tool for the human health risk assessment. The RFI status report stated that further assessment of tritium must incorporate surface-soil data and consider the possibility that tritium flux from buried waste is the likely source of the observed surface-soil concentrations. The RFI status report recommended integrating information from each MDA G status report into a multipathway assessment that will be incorporated into a final report. Recommendations about any additional site investigations or other RFI-related activities were deferred until the final RFI report for MDA G.

An RFI report for MDAs G, H, and L was issued in 2000. The report was a collaborative effort (high performing team) between the NMED and LANL. In September 2000, the high performing team received direction from senior management to expedite the implementation of a preferred remedy at one MDA. The team selected MDA H and narrowed the scope of its effort to accommodate the change. The high performing team agreed that HWB would not review the 2000 combined RFI Report and that LANL would submit individual RFI reports on each of the MDAs. The first of the three RFI reports was submitted in May, 2001. The MDA G RFI Report is scheduled for submittal in 2003. RFI fieldwork at MDA G included the collection and analysis of over 50 drainage sediment samples, core samples from 20 boreholes, VOC and tritium surface flux samples, and ambient air sampling. The sediment samples were analyzed for inorganic chemicals, cyanide, PCBs/pesticides, herbicides, radionuclides, and tritium. The ambient air samples were analyzed for VOCs. The core samples were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs/pesticides, herbicides, cyanide, and radionuclides. Analytical results from subsurface tuff samples showed the presence of americium-241, cesium-137, europium-152, lead-210, plutonium-238, plutonium-239, strontium-90, uranium-235, and tritium at elevated concentrations. Cadmium, cyanide, molybdenum, selenium, silver, thallium, and vanadium were also detected at concentrations higher than their respective BVs. Numerous organic chemicals were detected in subsurface tuff samples. Analytical results from subsurface pore-gas samples showed the presence of multiple VOCs and tritium. The RFI data were supplemented by environmental surveillance surface water data, VOC emissions data from passive extraction tests, and quarterly VOC pore-gas monitoring samples. Americium-241, plutonium-238, plutonium-239,uranium-234, uranium-235, uranium-238, and tritium were detected at elevated concentrations in ambient air samples. VOCs were also detected. The dominant VOC detected in ambient air was TCA.

The present-day risks posed by MDA G to human and ecological receptors were characterized using a human health risk assessment and an ecological screening assessment. The site is assumed to be operational until 2044. The present-day human health risk assessment concluded that residual contamination in surface soil, sediments, and air does not pose an unacceptable risk. Chemical hazards from the COPCs and radiation doses from tritium diffusing upward from the site were orders of magnitude less than pertinent health effects criteria of 15 mrem/yr (radionuclides) and a hazard quotient of 1.0 for chemical hazard.

Quarterly pore-gas sampling of the vapor phase VOC plume at MDA G is ongoing. Sampling results are reported in the ER Project quarterly reports. At the request of NMED, the RFI report for MDA G is being rewritten to be consistent with the RFI report for MDA H, to incorporate additional recent information on the nature and extent of contamination, and to clearly identify remaining data gaps.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	24	18	3
Pesticides/PCBs	5	N/A	0
Radionuclides	18	16	5
SVOCs	9	N/A	1
VOCs	10	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	3.5 mg/kg	0.39 mg/kg
	Cyanide (total)	0.71 mg/kg	N/A
	Iron	39,000 mg/kg	23,000 mg/kg
Radionuclides	Lead-210	0.81 pCi/g	N/A
	Polonium-210	3.51 pCi/g	N/A
	Thorium-228	3.25 pCi/g	2.0 pCi/g
	Tritium	13,958 pCi/g	880 pCi/g
	Yttrium-90	0.38 pCi/g	N/A
SVOCs	Benzo(a)pyrene	0.23 mg/kg	0.062 mg/kg

References

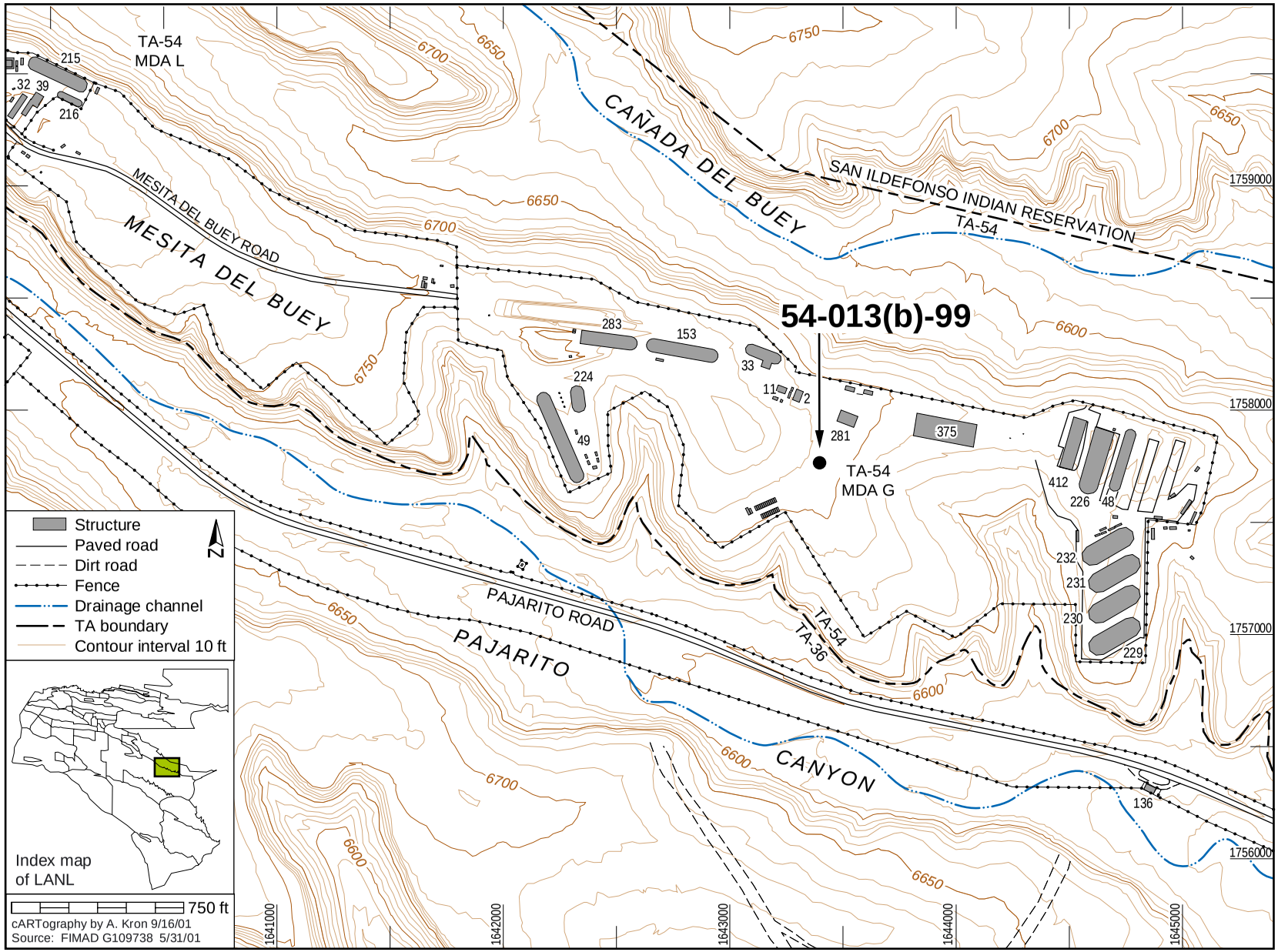
RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54 — LA-UR Number: 97-1308

RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) — LA-UR Number: 96-0110

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



View of SWMU 54-013(b)-99


54-013(b)-99
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
MESITA DEL BUEY
MESITA DEL BUEY ROAD
SAN ILDEFONSO INDIAN RESERVATION
TA-54
PAJARITO ROAD
TA-54
TA-36
PAJARITO
CANYON
215
32
39
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283
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281
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1641000
1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

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AOC 54-014(a) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Unknown	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-014(a) refers to the lead stringer storage shafts (shafts 36 and 37) located adjacent to the northwest corner of Area L that are currently operated under RCRA interim status requirements for storage of mixed waste. The lead stringers were placed in storage in the mid-1980s. Lead stringers are steel rods filled with irradiated lead and concrete. Shaft 36 is 30 in. in diameter and 27.5 ft deep, and shaft 37 is 48 in. in diameter and 35.75 ft deep, each with a storage capacity of 300 gal. Both of the shafts are constructed of corrugated metal pipe and equipped with a 1-ft-thick concrete plug at the bottom of the shaft. Each shaft is capped with a steel cap and concrete shielding block. AOC 54-014(a) is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

No analytical samples were collected at this site.

References

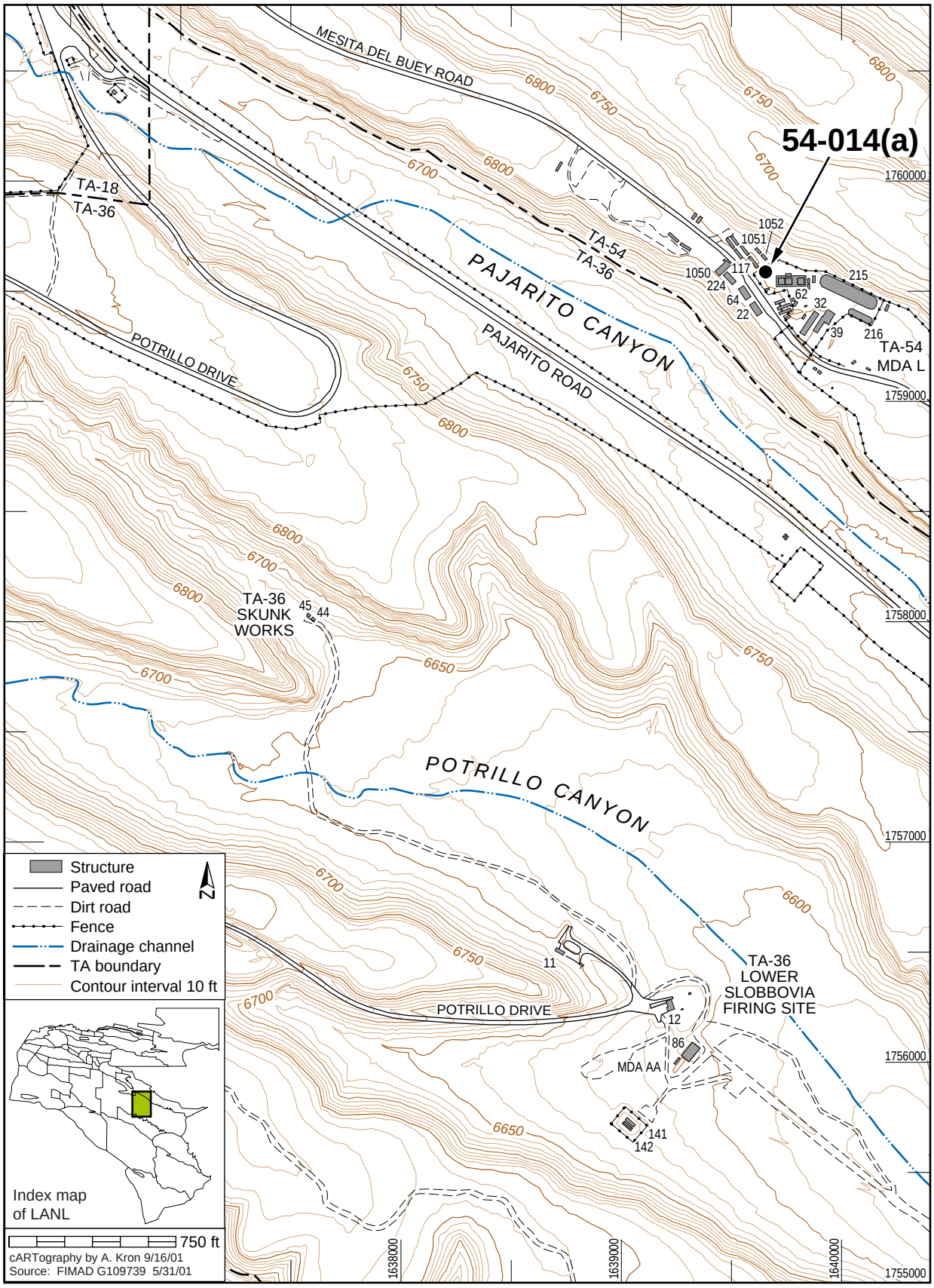
RFI Report for Material Disposal Areas G, H, and L at Technical Area -54	LA-UR Number: 00-1140
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
Proposed Action Plan Drilling Near Area [MDA] L, TA-54, OU 1148	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



Aerial close-up of AOC 54-014(a)



View of the surface AOC 54-014(a)


54-014(a)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1052
1051
1050
117
224
64
22
62
32
39
216
215
11
12
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141
142
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6750
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1755000
1638000
1639000
1640000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-015(a) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-8	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(a) is a mixed-waste container storage area operated under RCRA interim status requirements. The storage area is located in structure 54-8, a 15-ft x 40-ft x 12-ft-high metal shed. The structure was previously used for the storage of mixed TRU waste containers before being sprayed with a corrosion inhibitor for placement in retrievable storage on the TRU pads. The structure is currently used to store TRU drums retrieved during TWISP activities, before the corrosion inhibitor is removed from them in Building 54-33, and before they are placed in a storage dome pending disposal at WIPP. This AOC is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

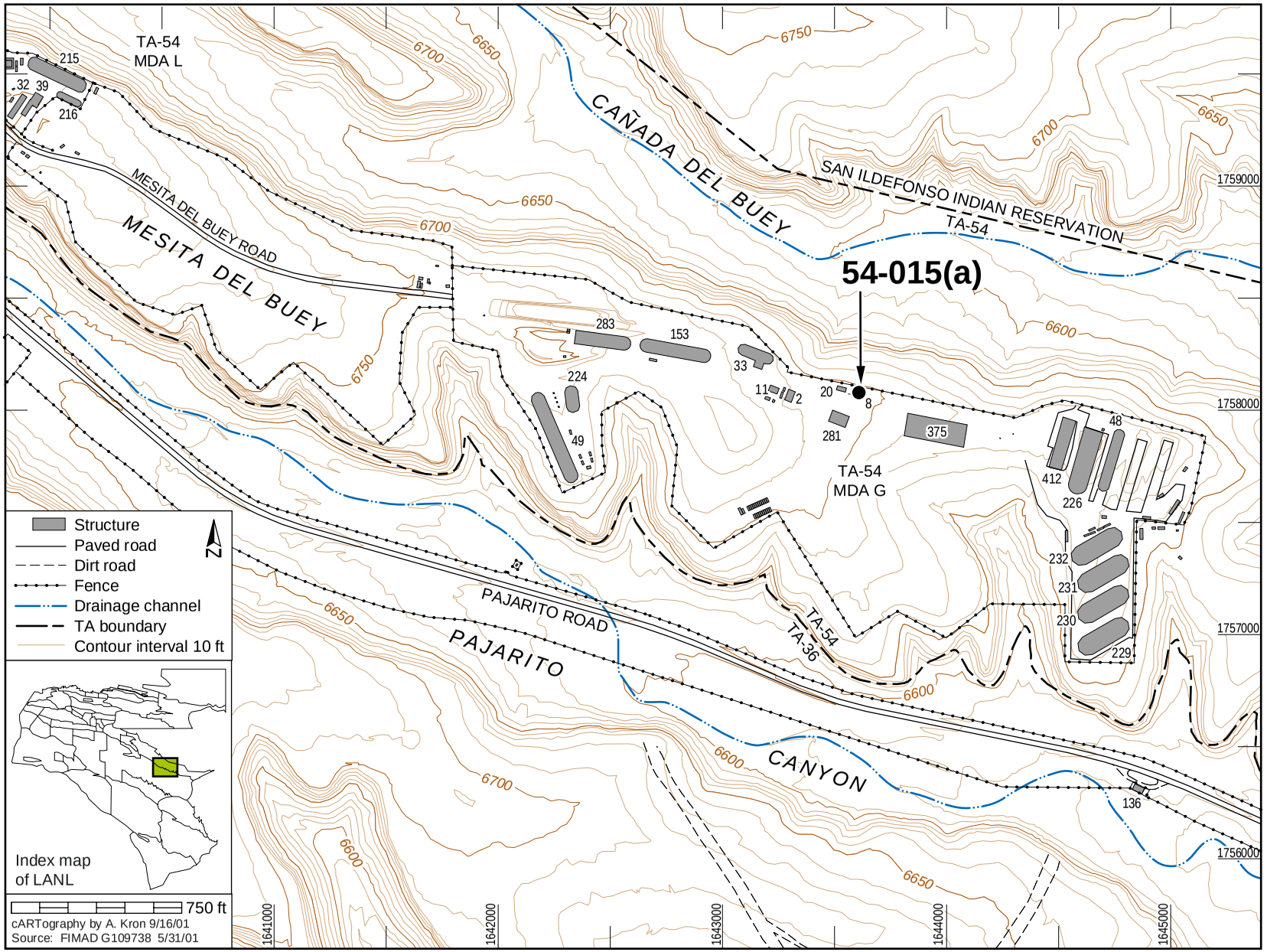
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A



View of AOC 54-015(a)


54-015(a)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
MESITA DEL BUEY ROAD
MESITA DEL BUEY
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
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283
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1641000
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1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

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AOC 54-015(b) — Storage areas/waste piles/magazines

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Pit 39	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(b) is pit 39, an active low-level radioactive waste disposal area at Area G. At the time the RFI work plan was written, the surface of AOC 54-015(b) was the location of an aboveground TRU waste container storage area; however, the TRU waste was subsequently moved and placed in a storage dome. Pit 39 is located approximately 100 ft southwest of the Area G waste management control facility (Building 54-11).

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

The OU 1148 work plan proposed sampling groupings of related SWMUs to focus on contaminant identification and the nature and extent of migration. The ER Project, in collaboration with other LANL divisions, is investigating Area G.

ER Project Sampling Summary

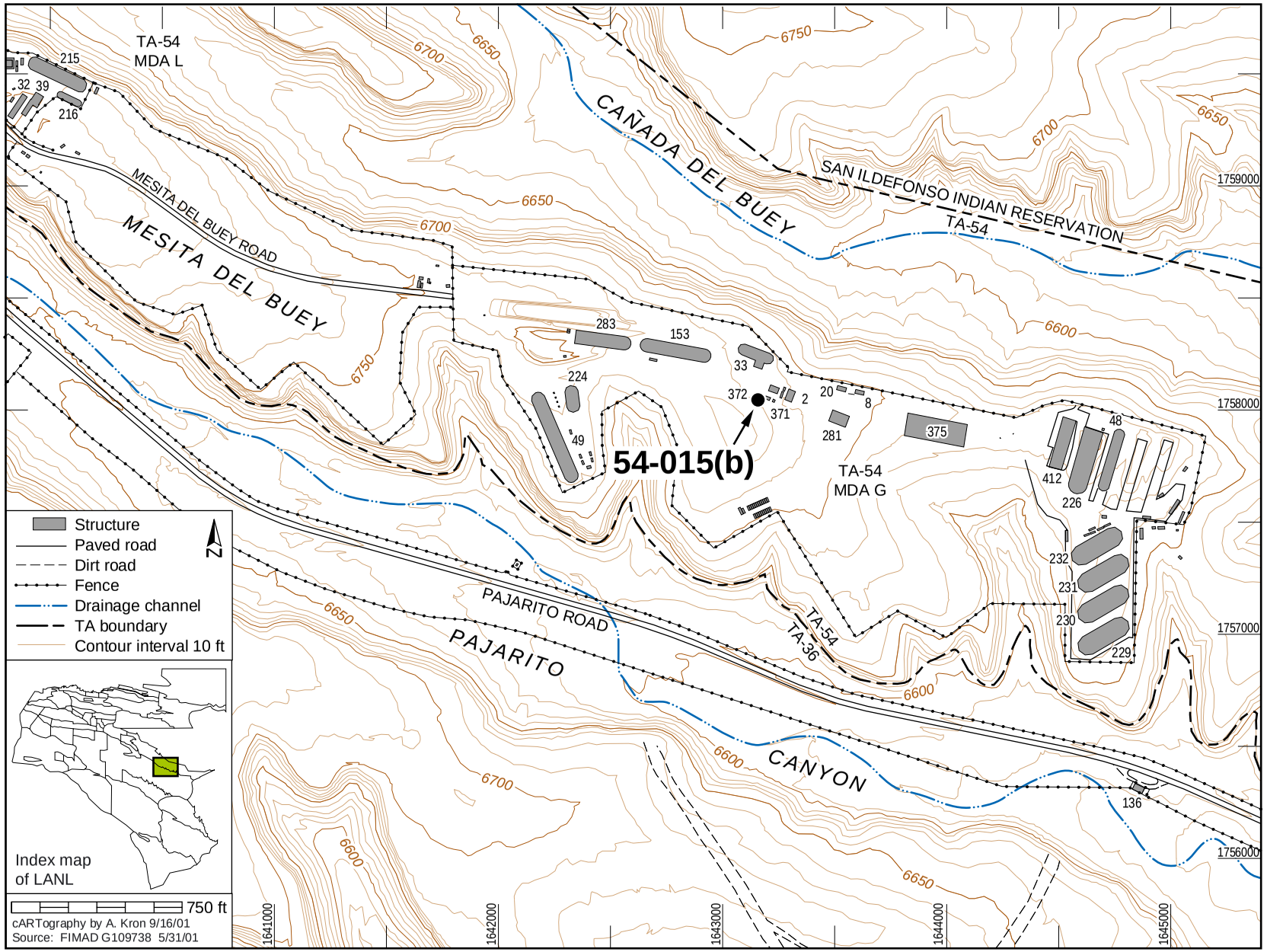
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



View of AOC 54-015(b)


54-015(b)
TA-54
MDA L
TA-54
MDA G
MESITA DEL BUEY
MESITA DEL BUEY ROAD
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
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1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-015(c) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	TRU Pad 1	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(c) is TRU pad 1, one of four TRU waste storage areas located in the northwest corner of Area G. The pad overlies the western ends of inactive disposal pits 2, 4, and 5 [SWMU 54-013(b)-99]. The pad stores three levels of retrievable contact-handled TRU waste in 55-gal. containers inside a dome (structure 54-226) with a total storage capacity of 960,000 gal. The pad was partially filled with drums and partly covered with tuff when the RFI work plan was written. The dome was constructed directly over pad 1 for use in the retrieval of TWISP drums being moved from pads to storage domes. The TRU waste containers are destined for disposal at WIPP. This is an active waste management unit that operates under interim status requirements for storage and is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

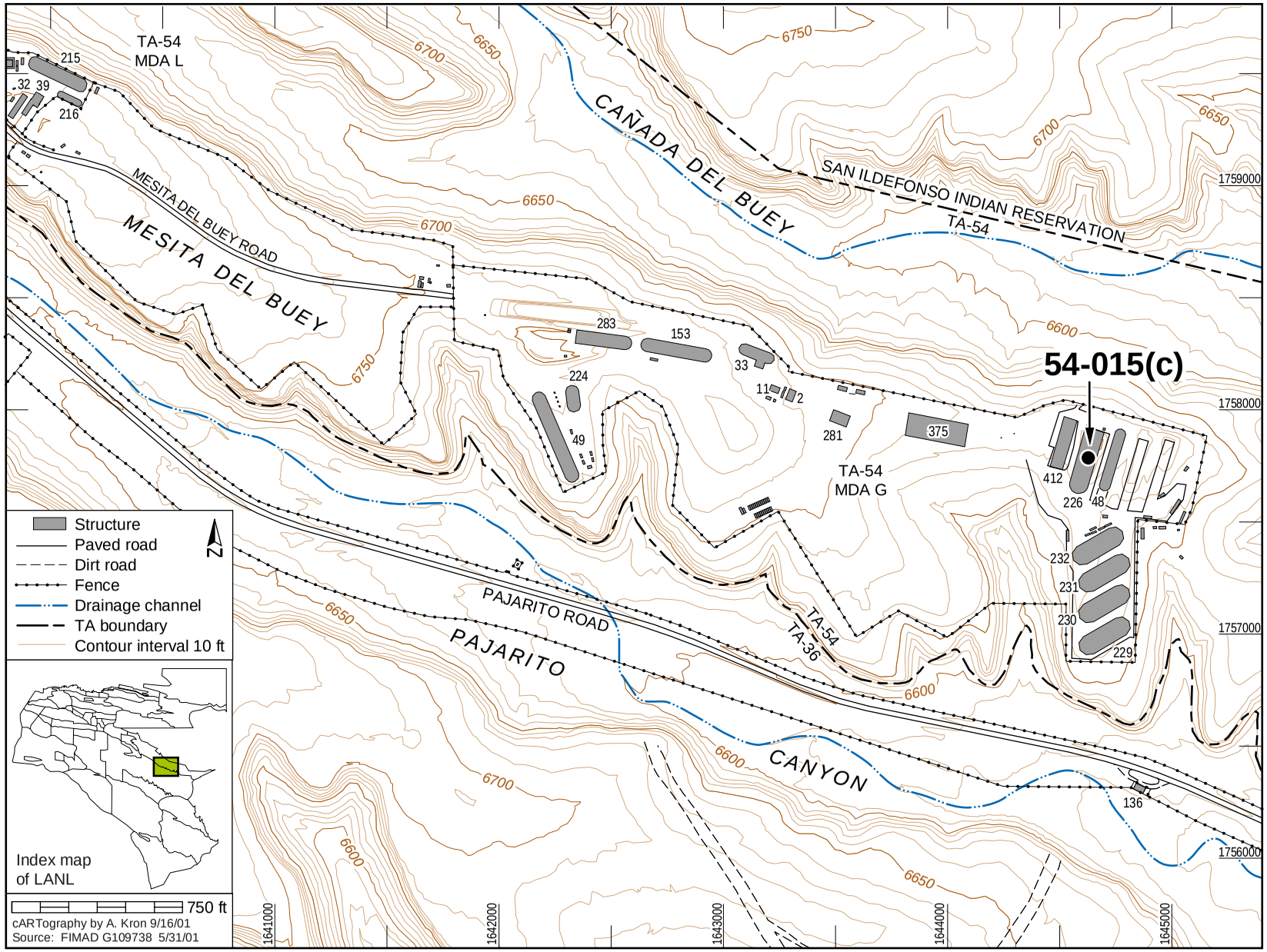
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



View of AOC 54-015(c)


TA-54
MDA L
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39
216
MESITA DEL BUEY ROAD
MESITA DEL BUEY
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
6750
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6650
6600
283
153
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281
375
TA-54
MDA G
54-015(c)
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232
231
230
229
PAJARITO ROAD
PAJARITO
TA-54
TA-36
CANYON
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1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-015(d) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1974-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	TRU Pad 2	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(d) is the former location of TRU pad 2, one of four TRU waste storage areas in the northwest corner of Area G. The pad previously stored six levels of retrievable contact-handled TRU waste in 55-gal. containers with a total storage capacity of 430,000 gal. The pad was completely filled and covered with tuff when the RFI work plan was written. All of the TRU containers previously stored at pad 2 were retrieved and moved to a TRU storage dome during the TWISP activities and are destined for disposal at WIPP. The former pad location is currently unoccupied and overlies inactive disposal pits 2, 4, and 5 [SWMU 54-013(b)-99]. This is an active waste management unit that operates under interim status requirements for storage and is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

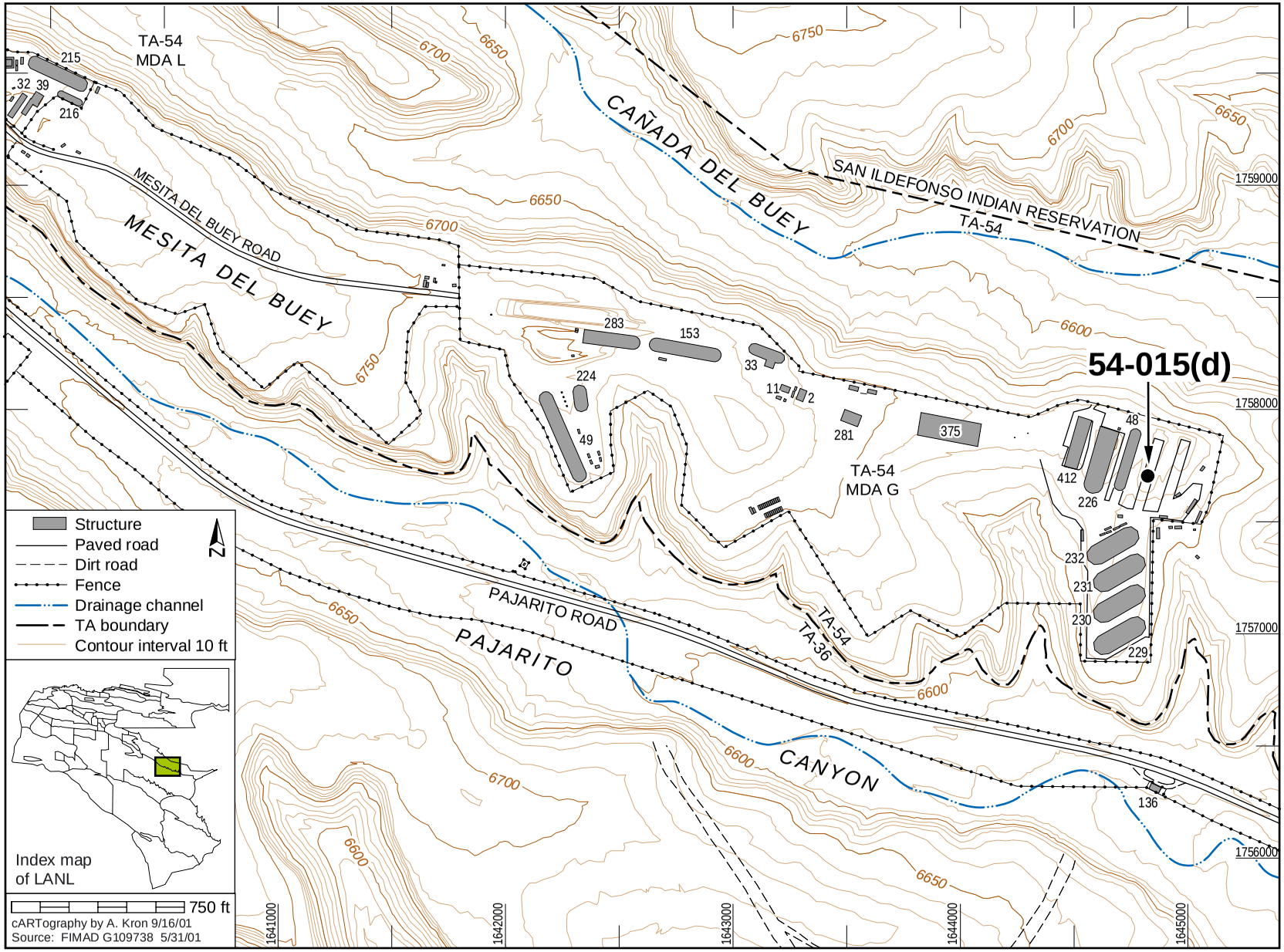
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



Aerial view of AOC 54-015(d)


54-015(d)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
MESITA DEL BUEY
MESITA DEL BUEY ROAD
SAN ILDEFONSO INDIAN RESERVATION
TA-54
PAJARITO ROAD
PAJARITO
CANYON
TA-36
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1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

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AOC 54-015(e) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1974-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	TRU Pad 3	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(e) is TRU pad 3, one of four TRU waste storage areas located in the northwest corner of Area G. The pad overlies inactive disposal Pits 2, 4, and 5 [SWMU 54-013(b)-99]. The pad stores three levels of retrievable contact-handled TRU waste in 55-gal. containers inside a dome (structure 54-48) with a total storage capacity of 300,000 gal. The dome was constructed directly over pad 3 for use in the retrieval of TWISP drums being moved from pads to storage domes. The TRU waste containers are destined for disposal at WIPP. This is an active waste management unit that operates under interim status requirements for storage and is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

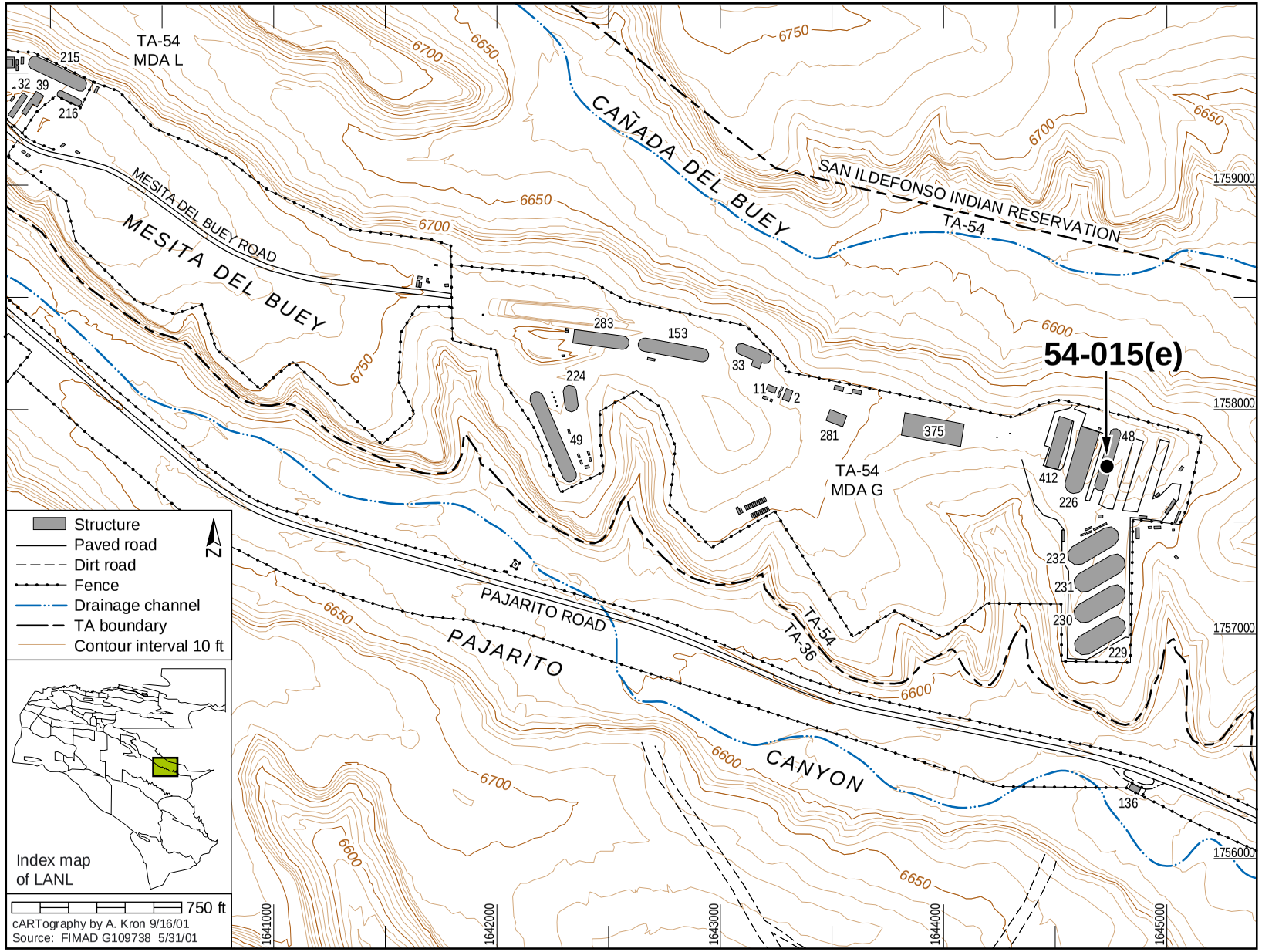
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



View of AOC 54-015(e)


TA-54
MDA L
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216
MESITA DEL BUEY ROAD
MESITA DEL BUEY
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
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1756000
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153
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224
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281
375
54-015(e)
48
412
226
TA-54
MDA G
232
231
230
229
PAJARITO ROAD
PAJARITO
TA-54
TA-36
CANYON
136
1641000
1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-015(f) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1974-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	TRU Pad 4	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(f) is the former location of TRU pad 4, one of four TRU waste storage areas in the northwest corner of Area G. The pad previously stored six levels of retrievable contact-handled TRU waste in 55-gal. containers with a total storage capacity of 970,000 gal. The pad was partially filled and covered with tuff when the RFI work plan was written. All of the TRU containers previously stored at pad 4 were retrieved and moved to a TRU storage dome during the TWISP activities and are destined for disposal at WIPP. The former pad location is currently unoccupied and overlies inactive disposal pits 2, 4, and 5 (SWMU 54-013(b)-99). This is an active waste management unit that operates under interim status requirements for storage and is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

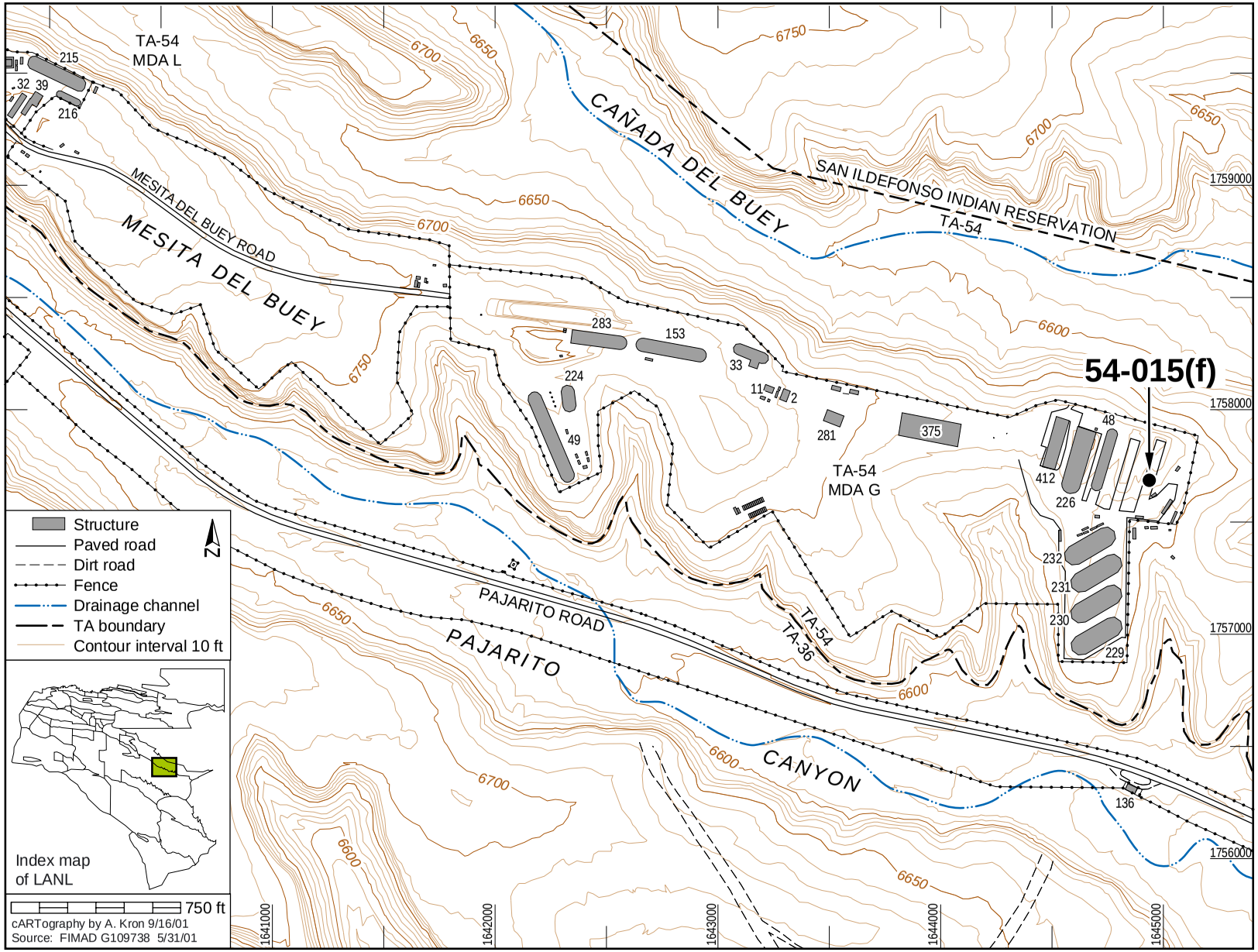
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



Aerial view of AOC 54-015(f)


54-015(f)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
MESITA DEL BUEY ROAD
MESITA DEL BUEY
PAJARITO ROAD
PAJARITO
CANYON
TA-54
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-015(j) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-49	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(j) is an active mixed waste storage area operated under RCRA interim status. The bermed storage area is situated on top of pit 32 [SWMU 54-013(b)-99] and is currently covered by a storage dome (structure 54-49). This AOC is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

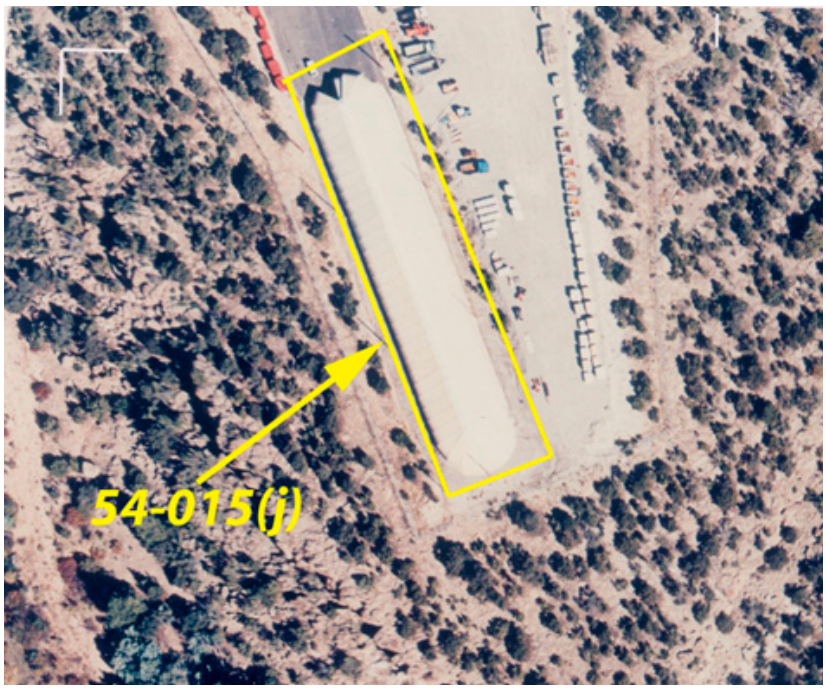
RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

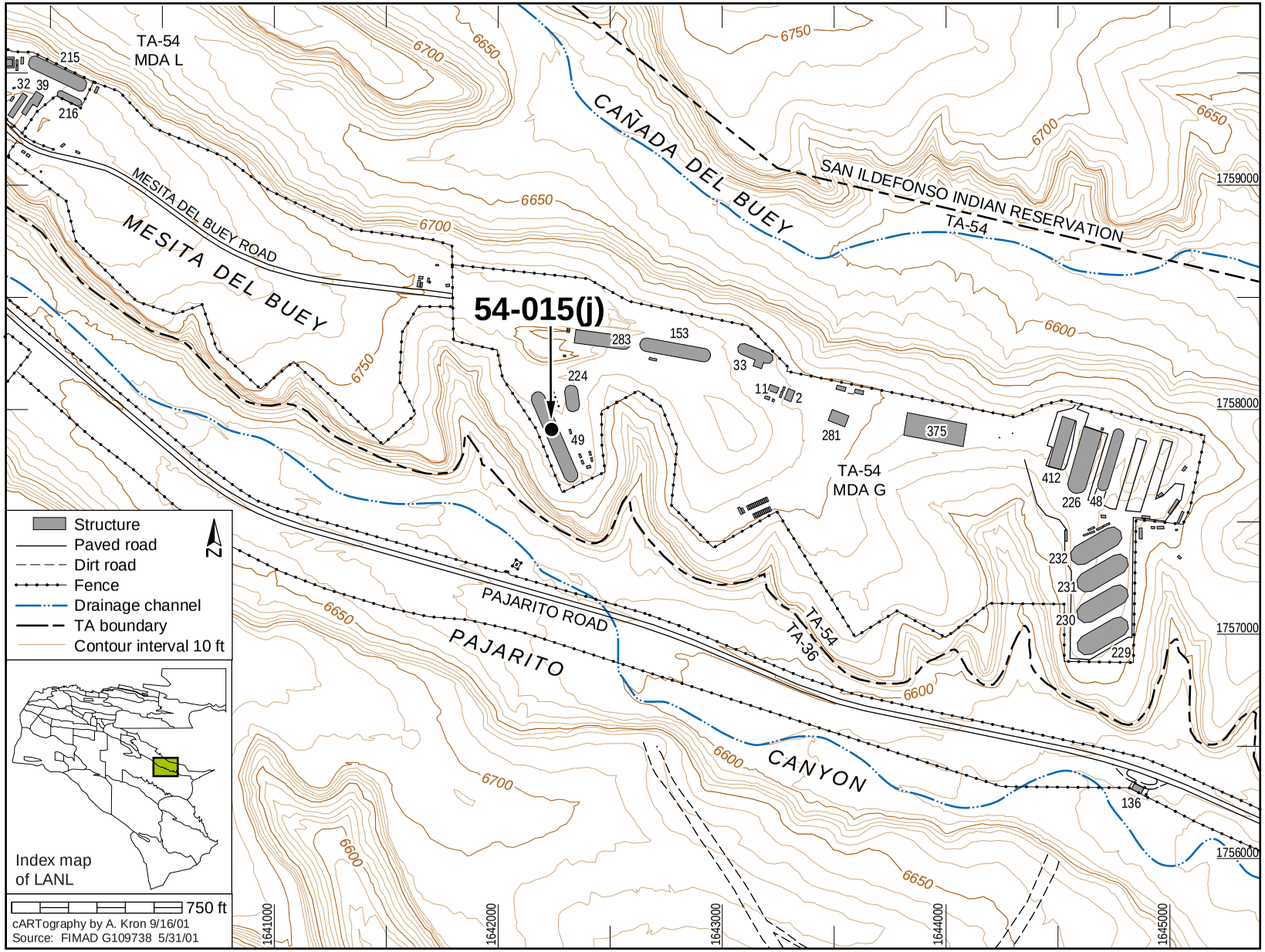
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



Aerial close-up of AOC 54-015(j)


54-015(j)
TA-54
MDA L
TA-54
MDA G
MESITA DEL BUEY ROAD
MESITA DEL BUEY
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
PAJARITO ROAD
PAJARITO
CANYON
TA-54
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1642000
1643000
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1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-016(b) — Sumps

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Unknown	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-016(b) is a sump at Area G located within the TRU waste drum facility (Building 54-33). The sump was designed to collect wash water from the removal of the corrosion inhibitor that is sprayed on TRU waste drums [see AOC 54-015(a)]; however, there has never been any release to the sump. This AOC is not listed in Module VIII of LANL'S Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

No analytical samples were collected at this site.

References

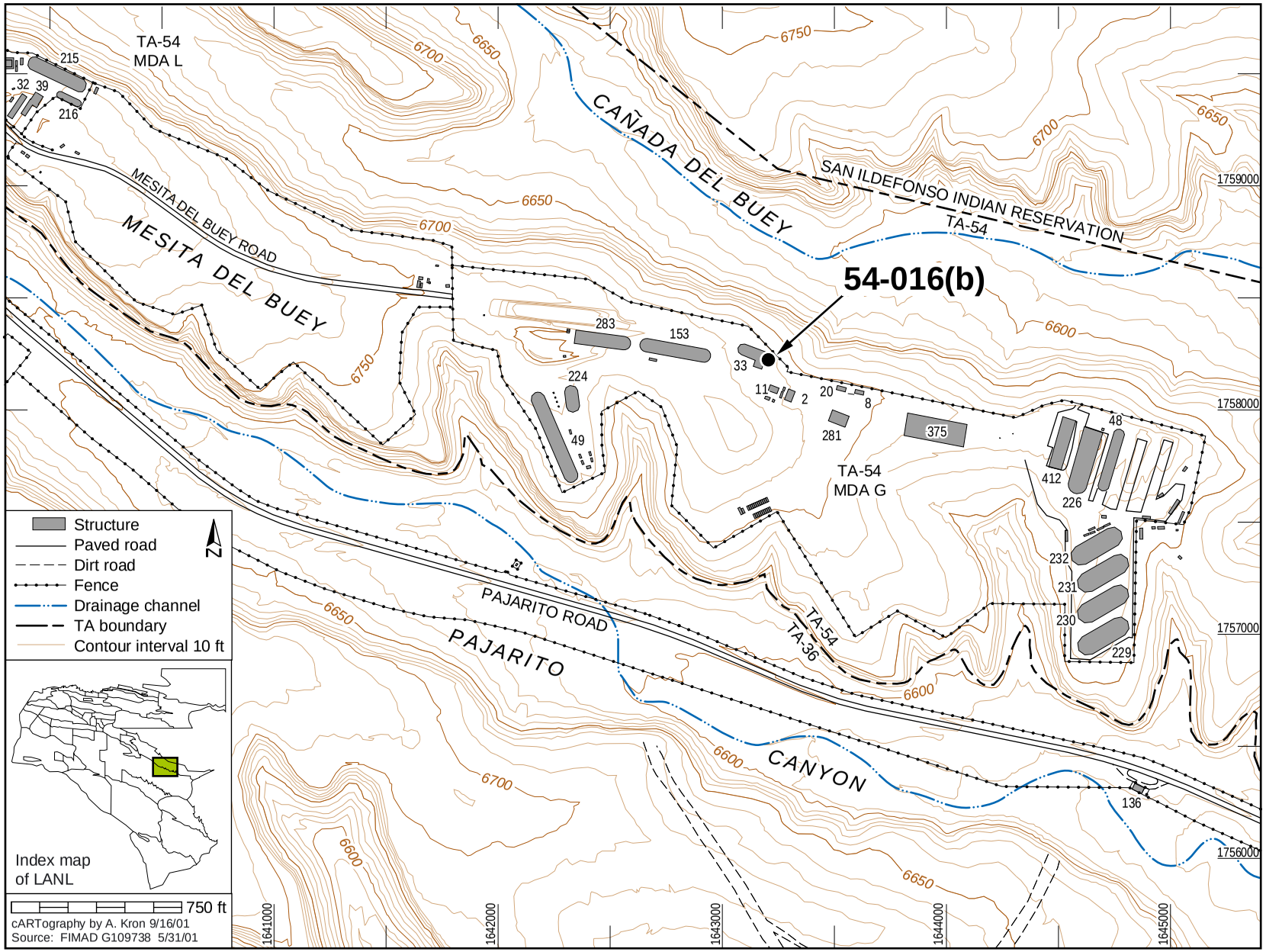
RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



View of AOC 54-016(b)



View of AOC 54-016(b)


54-016(b)
TA-54
MDA L
TA-54
MDA G
MESITA DEL BUEY
MESITA DEL BUEY ROAD
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
215
32
39
216
283
153
33
224
49
11
2
20
8
281
375
48
412
226
232
231
230
229
136
6750
6700
6650
6600
1759000
1758000
1757000
1756000
1641000
1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-021 — Aboveground storage tanks

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Unknown	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-021 is the former location of six aboveground fiberglass oil storage tanks that were located at Area L. Four of the tanks had a capacity of 771 gal. each. The other two tanks had capacities of 5650 gal. and 5086 gal., respectively, and were situated within the dirt berms of former impoundment D at MDA L (for containment purposes). The tanks, which stored waste oil, were pumped out in 1989 and moved from MDA L to MDA G to make room for new facilities. The tanks were closed in 1990 under RCRA regulations, and a closure report was submitted to NMED in 1991. Any associated contaminated soil that may be at Area L will be addressed during closure of the RCRA-permitted surface treatment and storage units currently located on the surface of Area L or during corrective action.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

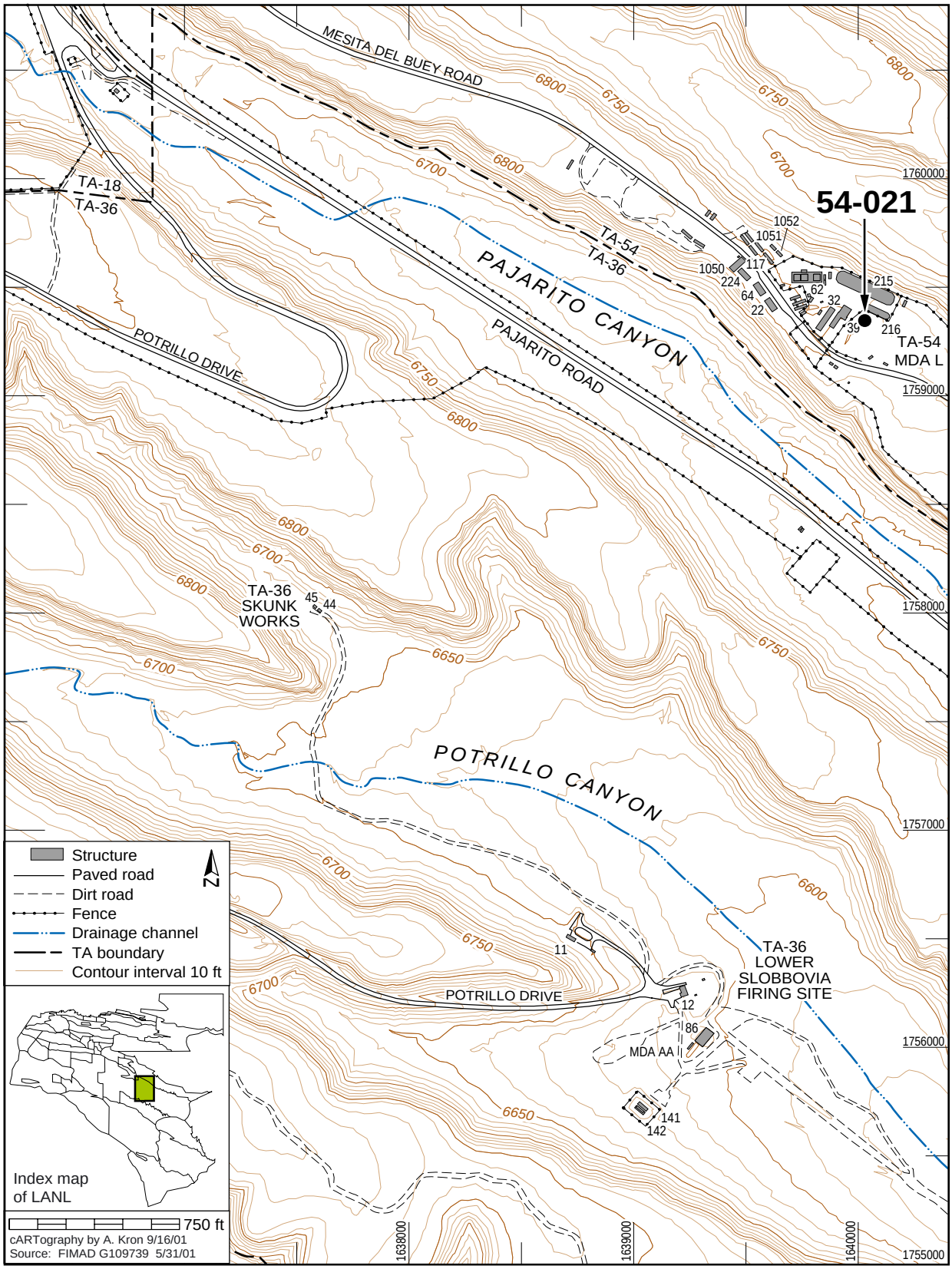
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
Request for Permit Modification, Units Proposed for NFA, March 1995	LA-UR Number: 95-0767
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



View of AOC 54-021


54-021
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1760000
1759000
1758000
1757000
1756000
1755000
1638000
1639000
1640000
6800
6750
6700
6650
6600
1052
1051
1050
117
224
64
22
62
32
39
215
216
45
44
11
12
86
141
142
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

5.0 CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
University of California
Operator

8/22/03
Date Signed

Ralph E. Erickson
Manager, Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy
Owner/Operator

8/22/03
Date Signed

6.0 REFERENCES

EPA, 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515," effective date May 19, 1994, U.S. Environmental Protection Agency, Region 6, Hazardous Waste Management Division, Dallas, Texas.

LANL, 2003, "The Solid Waste Management Unit Report," LA-UR-03-6000, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002a, "Response to Notice of Deficiency: TA-54 Part B RCRA Permit Application; September 1999, Revision 0.1; December 2000, Revision 2.0; Los Alamos National Laboratory EPA ID# NM0890010515," LA-UR-02-4263, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002b, "Los Alamos National Laboratory General Part A Permit Application," Revision 3.0, LA-UR-02-5273, August 2002, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002c, "Closure/Post-Closure Plan for the Technical Area 54 Area L Landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D)," LA-UR-02-2304, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002d, "Closure/Post-Closure Plan for the Technical Area 54 Area G Landfill (Pit 29 and Shaft 124)," LA-UR-02-2303, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002e, "Compliance Demonstration with 40 CFR 264, Subparts G and F under Corrective Action Procedures for Material Disposal Area H at Technical Area 54," LA-UR-02-2174, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2000a, "Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application," Revision 2.0, December 2000, LA-UR-00-5666, Los Alamos National Laboratory, Los Alamos, New Mexico.

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LANL, 1999a, "Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application," Revision 0.0, January 1999, Los Alamos National Laboratory, Los Alamos, New Mexico.

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LANL, 1999c, "Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application," Revision 1.0, December 1999, Los Alamos National Laboratory, Los Alamos, New Mexico.

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Westinghouse, 2000, “TRUPACT-II Authorized Methods for Payload Control,” Revision 19, April 2000, Westinghouse TRU Solutions, LLC, Carlsbad, New Mexico.

ATTACHMENT A

FACILITY DESCRIPTION

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
AASHTO	American Association of State Highway and Transportation Officials
CSU	container storage unit
JCI	Johnson Controls World Services, Inc.
LANL	Los Alamos National Laboratory
MLLW	mixed low-level waste
MTRUW	mixed transuranic waste
TA	technical area

ATTACHMENT A
FACILITY DESCRIPTION

The information provided in this attachment is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00]. The following subject areas are addressed in this attachment:

- A general description of Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) [20.4.1 NMAC § 270.14(b)(1)];
- Site-specific traffic patterns, volume, and control [20.4.1 NMAC § 270.14(b)(10)];
- Site-specific location information for compliance with the seismic and floodplain standard requirements [20.4.1 NMAC § 270.14(b)(11), and 20.4.1 NMAC § 264.18(a) and (b)];
- Site-specific topographic map requirements [20.4.1 NMAC § 270.14(b)(19)];
- Site-specific groundwater monitoring and protection information [20.4.1 NMAC § 270.14(c), and 20.4.1 NMAC § 264.90(a)].

A LANL-wide facility description addressing additional regulatory requirements is provided in Appendix A in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B.

A.1 TA-54 GENERAL DESCRIPTION [20.4.1 NMAC § 270.14(b)(1)]

TA-54 is located in the east-central portion of LANL (Figure A-1) on Mesita del Buey, an east-west-trending finger mesa bounded by Cañada del Buey to the north and by Pajarito Canyon to the south. Mesa-top elevations at TA-54 range from approximately 6,400 to 6,650 feet above mean sea level. TA-54 consists of several waste management areas, including Area L, Area G, and TA-54 West, and supporting offices.

The TA-54 hazardous and mixed waste management units addressed in this permit renewal application are located at Area L, Area G, and TA-54 West (Figure A-2).

At Area L, there are two container storage units (CSU) for storage of hazardous waste and/or mixed low-level waste (MLLW). They include the aboveground CSU within the fence and the Storage Shafts CSU (Shafts 36 and 37).

At Area G, there are nine CSUs for storage of hazardous waste, MLLW, and mixed transuranic waste (MTRUW). They include the following:

- Storage Domes 229, 230, 231, and 232, and Pad 9;
- TA-54-412, Storage Dome 226, and Pad 1;
- Storage Dome 48 and Pad 3;
- Pad 10 (former Pads 2 and 4) and the transuranic waste characterization facilities;
- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7;
- Storage Domes 153 and 283, and Pad 6;
- Storage Shed 8;
- TA-54-33, and;
- Storage Dome 375 and Pad 11.

At TA-54 West, there are two CSUs for storage of MLLW and MTRUW in solid form. They include the Indoor CSU and the Outdoor CSU at TA-54-38.

Descriptions of the Area L, Area G, and TA-54 West CSUs are provided in Section 2.0 and Attachment G of this permit renewal application. The locations of these CSUs are shown on Figures 2-1, 2-3, and 2-14 in Section 2.0.

A.2 TRAFFIC PATTERNS [20.4.1 NMAC § 270.14(b)(10)]

General traffic pattern information, traffic volumes, and traffic control signals for the LANL-wide facility are provided in Appendix A of the LANL General Part B.

A.2.1 Routes of Travel

The primary traffic routes used to transport hazardous and mixed waste to TA-54 include Pajarito Road, Diamond Drive, and West Jemez Road (State Road 501) (see Map 1 in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application" [hereinafter referred to as the LANL General Part A]). Within TA-54, waste is transported along Mesita del Buey Road to TA-54 West, Area L, or Area G (Figure A-2).

A.2.2 Traffic Volumes

Traffic volumes on Mesita del Buey Road are generally light to moderate. A traffic study was conducted in 1993 at the intersection of Pajarito Road and Rex Drive, which immediately joins Mesita del Buey Road. Based on this study, the Pajarito Road and Rex Drive intersection had a volume of 380 vehicles turning off of Pajarito Road between 6:30 and 9:00 in the morning (Johnson

Controls World Services, Inc. [JCI], 1993). Vehicle types are generally cars, light- and medium-duty trucks, and vans. Flatbed trucks or trailers also use Mesita del Buey Road to transport waste containers.

A.2.3 Traffic Control Signals

Traffic control signals within TA-54 include stop signs, posted speed limits, caution lights, and other traffic and pedestrian control signs. The locations of existing signs at TA-54 are shown on Figure A-3.

A.2.4 Road Surfacing and Load-Bearing Capacity

Roads within TA-54 are generally two-lane roads with asphaltic-concrete surfaces. Load-bearing capacity for these roads is 32,000 pounds per axle. These roads are typically constructed with a 6-inch-thick base overlain with a 3-inch-thick asphaltic-concrete surface. These roads were designed and constructed to meet the American Association of State Highway and Transportation Officials (AASHTO) specification HS-20 (AASHTO, 1996). In TA-54, Area G, road surfaces consist of asphaltic-concrete, graded gravel, and/or dirt.

A.3 LOCATION INFORMATION [20.4.1 NMAC § 270.14(b)(11)]

A.3.1 Seismic Standard [20.4.1 NMAC § 270.14(b)(11)(i and ii) and 20.4.1 NMAC § 264.18(a)]

The hazardous and mixed waste management units at TA-54, Areas L and G, are exempt from the seismic standards in 20.4.1 NMAC § 270.14(b)(11), and 20.4.1 NMAC § 264.18(a) [6-14-00], because these units or the interim status storage capacity existed prior to January 25, 1985, and July 25, 1990, when the State of New Mexico received hazardous and mixed waste authorization, respectively. The mixed waste management units at TA-54 West are exempt from the seismic standards in 20.4.1 NMAC § 270.14(b)(11), and 20.4.1 NMAC § 264.18(a) [6-14-00], because this unit existed prior to July 25, 1990 when the State of New Mexico received mixed waste authorization. Consistent with the criteria provided in 20.4.1 NMAC § 270.14(b)(11)(i), and 20.4.1 NMAC § 264.18(a) [6-14-00], the waste management units at TA-54 existed prior to the effective date of regulations or were approved under interim status; thus, the seismic standards are not applicable.

A.3.2 Floodplain Standard [20.4.1 NMAC §§ 270.14(b)(11)(iii through v) and 270.14(b)(19)(ii); 20.4.1 NMAC § 264.18(b)]

The hazardous and mixed waste management units at TA-54 are located on a mesa top, Mesita del Buey. In accordance with 20.4.1 NMAC § 270.14(b)(11)(iii through v) [6-14-00], the hazardous and mixed waste management units at TA-54 are not located within the 100-year floodplain boundary. Additional floodplain information is provided in Appendix A of the LANL General Part B.

A.4 TOPOGRAPHIC MAPS [20.4.1 NMAC § 270.14(b)(19)]

Topographic maps and figures are provided herein or referenced to meet the requirements of 20.4.1 NMAC § 270.14(b)(19) [6-14-00]. The maps clearly show the map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- LANL-wide 100-year floodplain maps were provided as Appendix C of the "Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application; General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM0890010515" (LANL, 2001).
- Maps showing surface waters, including intermittent streams, near TA-54 are included as Figures 2-1, 2-3, and 2-14 in Section 2.0 of this permit renewal application.
- Surrounding land uses are shown on Map 1 in the LANL General Part A.
- Wind roses for TA-54 are shown on Figures A-4 and A-5.
- A map showing the legal boundaries of LANL (including TA-54) is provided as Map A-2 in the LANL General Part B.
- Access control features at TA-54 (e.g., fences, gates) are shown on Figures 2-1, 2-3, and 2-14 in Section 2.0 of this permit renewal application.
- The locations of buildings, hazardous and/or mixed waste management units and structures, and loading and unloading areas at TA-54 are shown on Figures 2-1, 2-3, and 2-14 in Section 2.0 of this permit renewal application.
- A map showing National Pollutant Discharge Elimination System discharge structure locations is included in the LANL General Part A.
- Storm, sanitary, and process sewer systems at LANL are shown on Map A-1 of the LANL General Part B.

- Drainage control features (e.g., run-on/runoff, drainage barriers) are shown on Figures 2-1, 2-3, and 2-14 of this permit renewal application.

- Fire stations serving LANL and the County of Los Alamos are shown on Figure E-2 of Appendix E in the LANL General Part B.

- The equipment cleanup area for LANL is located at TA-50-1. The location of TA-50-1 is shown on Figure 50-1 in the LANL General Part A.

Contour lines on all topographic maps are in intervals sufficient to detail natural drainage at LANL and in the vicinity of the waste management units. As provided in 20.4.1 NMAC § 270.14(b)(19) [6-14-00], LANL has submitted the maps to the New Mexico Environment Department at these scales and contour intervals due to the size of the waste management units, the extent of the LANL facility, and the topographic relief in the area.

A.5 GROUNDWATER MONITORING [20.4.1 NMAC § 270.14(c) and 20.4.1 NMAC § 264.90(a)]

Groundwater monitoring information is provided in Appendix A of the LANL General Part B.

A.6 OTHER PERMIT ACTIVITIES

Other types of Resource Conservation and Recovery Act permits include, but are not limited to, the following;

- Permits by Rule
- Emergency Permits
- Hazardous Waste Incinerator Permits
- Permits for Land Treatment Demonstrations Using Field Test or Laboratory Analyses
- Interim Permits for Underground Injection Control Program Wells
- Research, Development, and Demonstration Permits
- Permits for Boilers and Industrial Furnaces Burning Hazardous Waste.

Currently, none of these permit types are relevant for operations at TA-54.

A.7 REFERENCES

AASHTO, 1996, "Standard Specifications for Highway Bridges," 16th Edition, American Association of State Highway and Transportation Officials.

JCI, 1993, "Conceptual Study Report for Entrances to TA-54 at Pajarito Road and Rex Drive, at New Intersection Between TA-51 and TA-54 West, and at TA-54, Area G, Dirt Road Connecting Pajarito Road to Waste Site on Top of Mesa," JCI 93-128, Johnson Controls World Services, Inc., Design Department, Los Alamos, New Mexico.

LANL, 2001, “Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application: General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM0890010515,” LA-UR-01-6054, Los Alamos National Laboratory, Los Alamos, New Mexico.

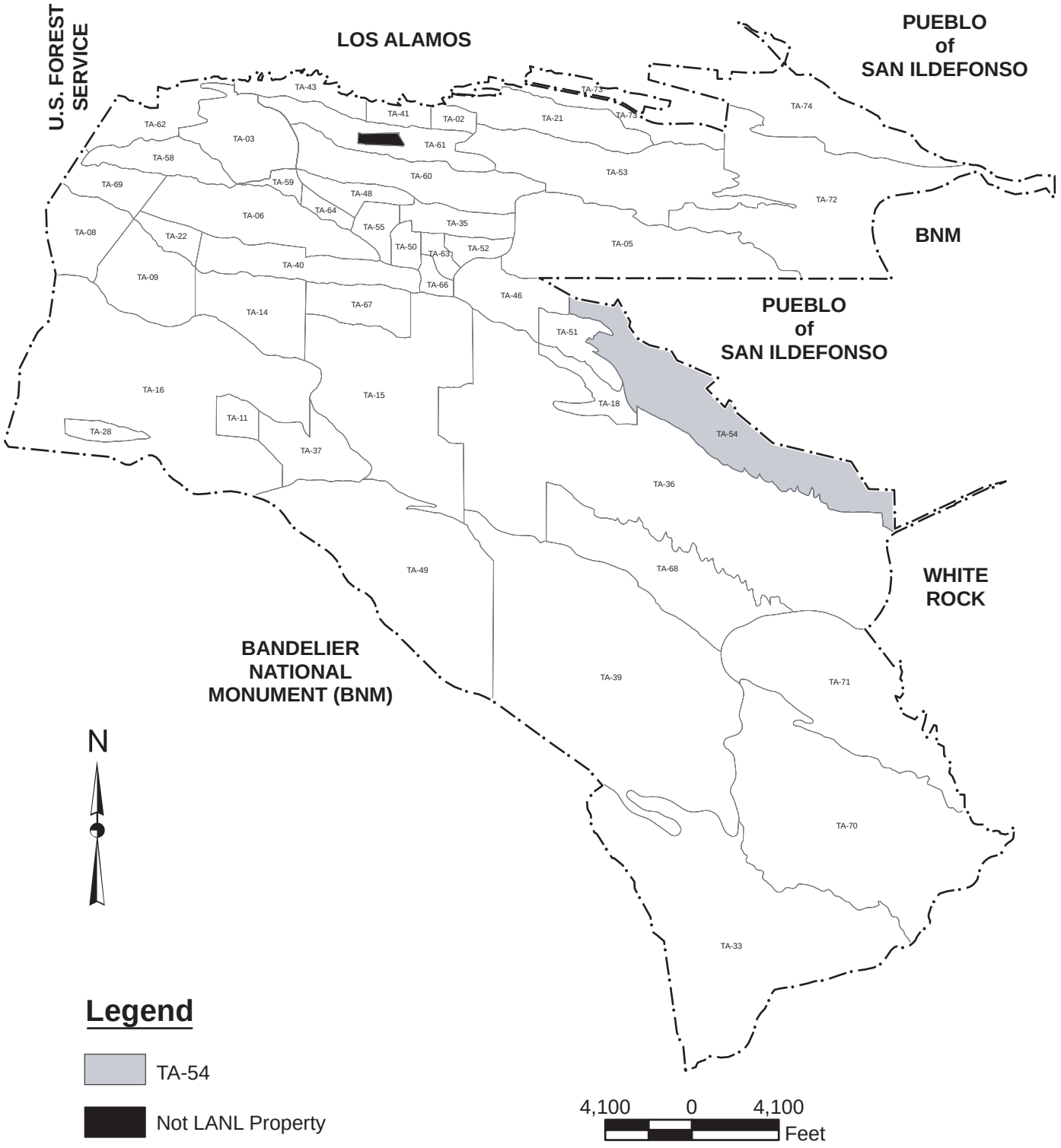

Figure A-1

Location Map of Technical Area (TA) 54 at Los Alamos National Laboratory

State Plane Coordinate System New Mexico Central Zone North American Datum 1983 (ft)

Disclaimer: Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, including the warranties of merchantability and fitness for a particular purpose, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.

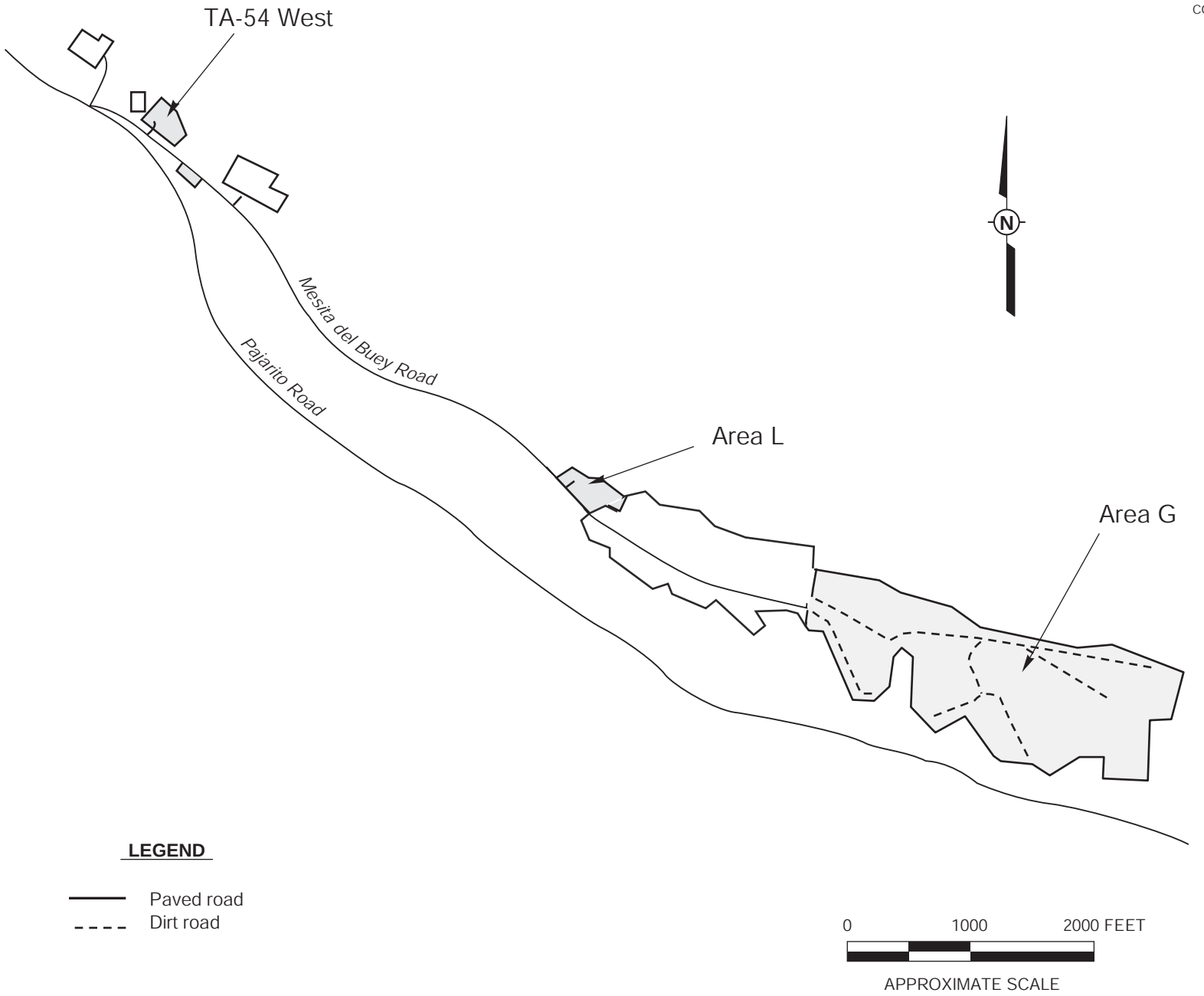

Figure A-2
Technical Area (TA) 54 Location Map of Area L, Area G, and TA-54 West

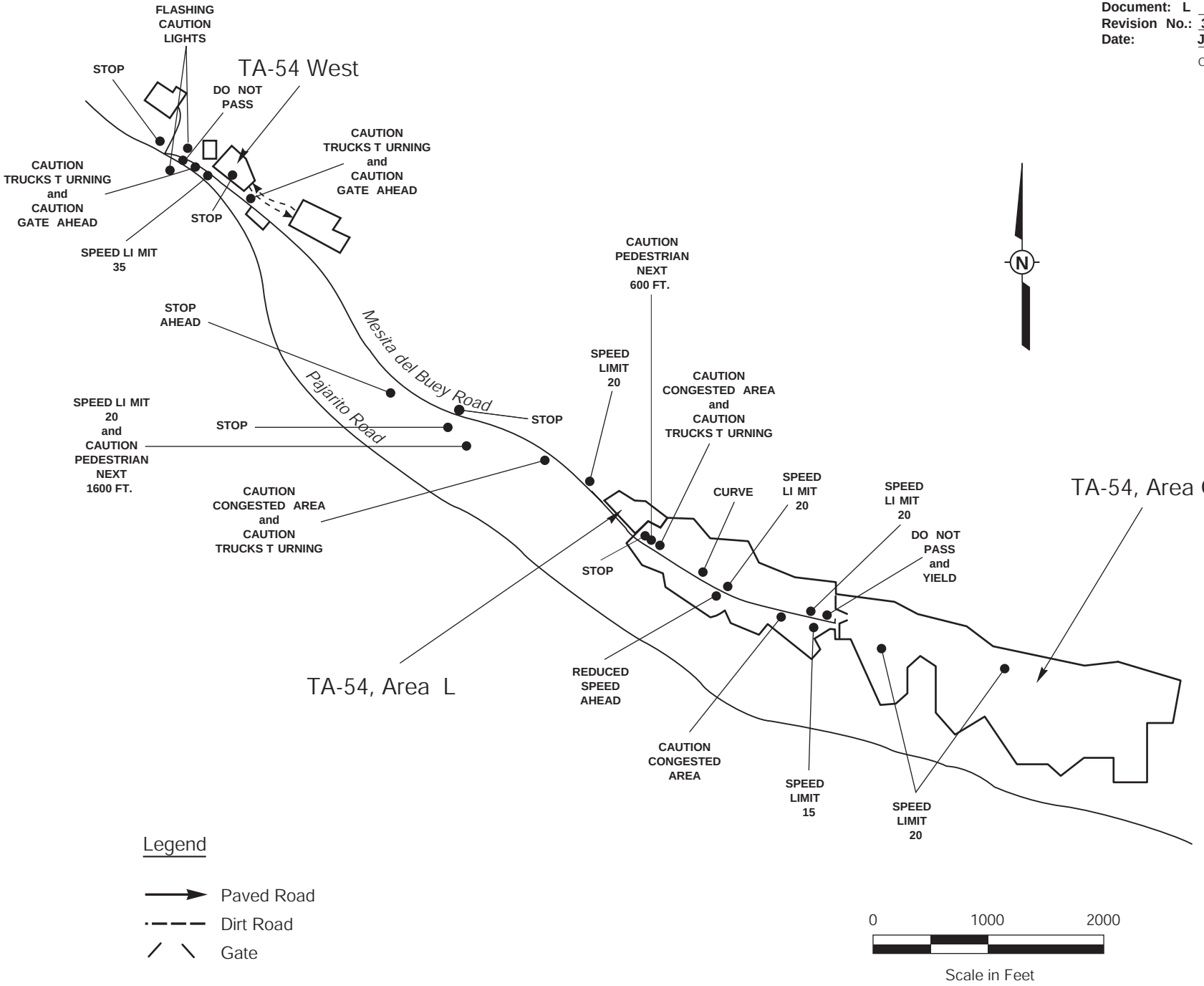

Figure A-3
Location Map of Traffic Control Signs in Technical Area (TA) 54

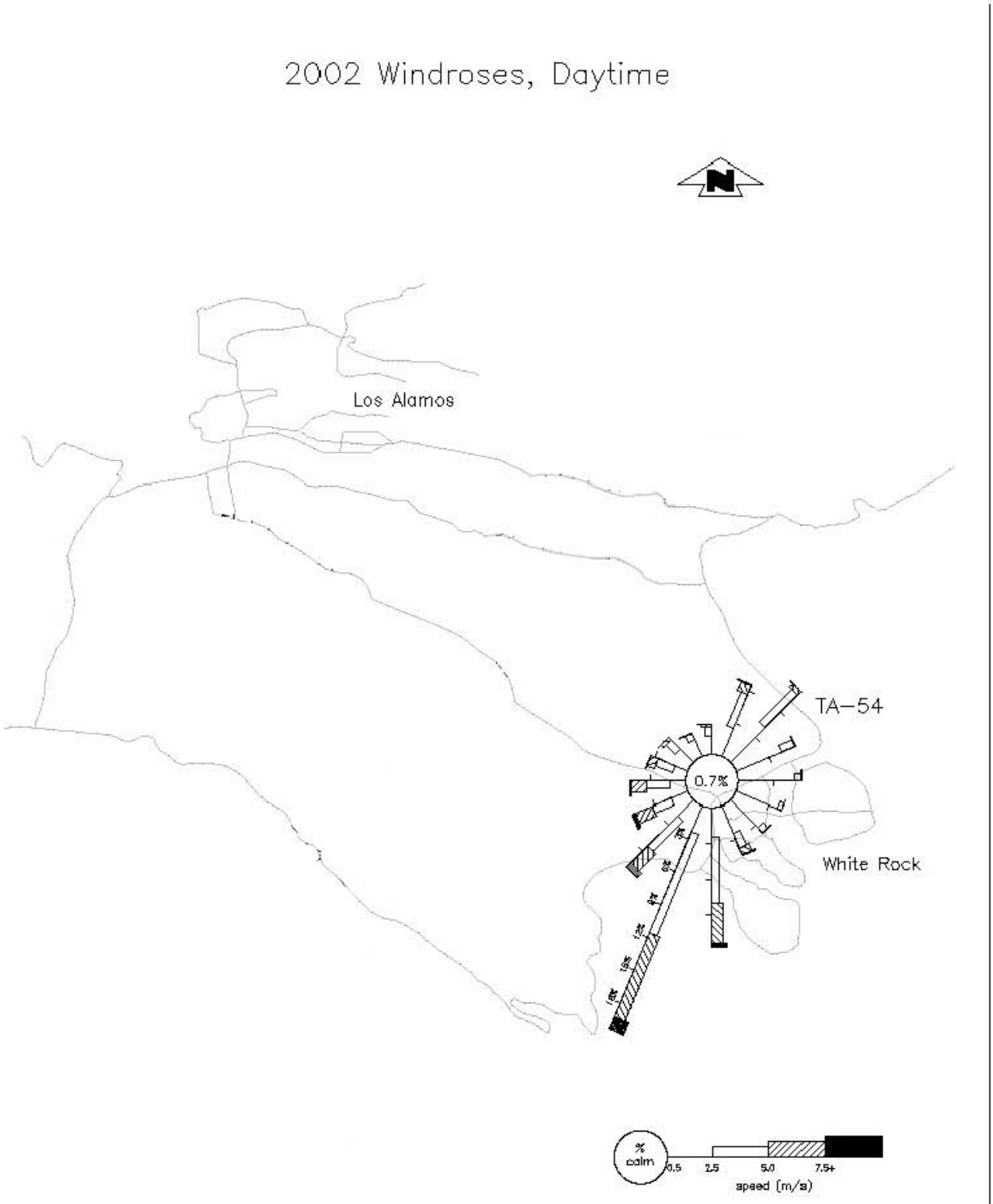

Figure A-4

Annual Wind Roses for Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) – Day

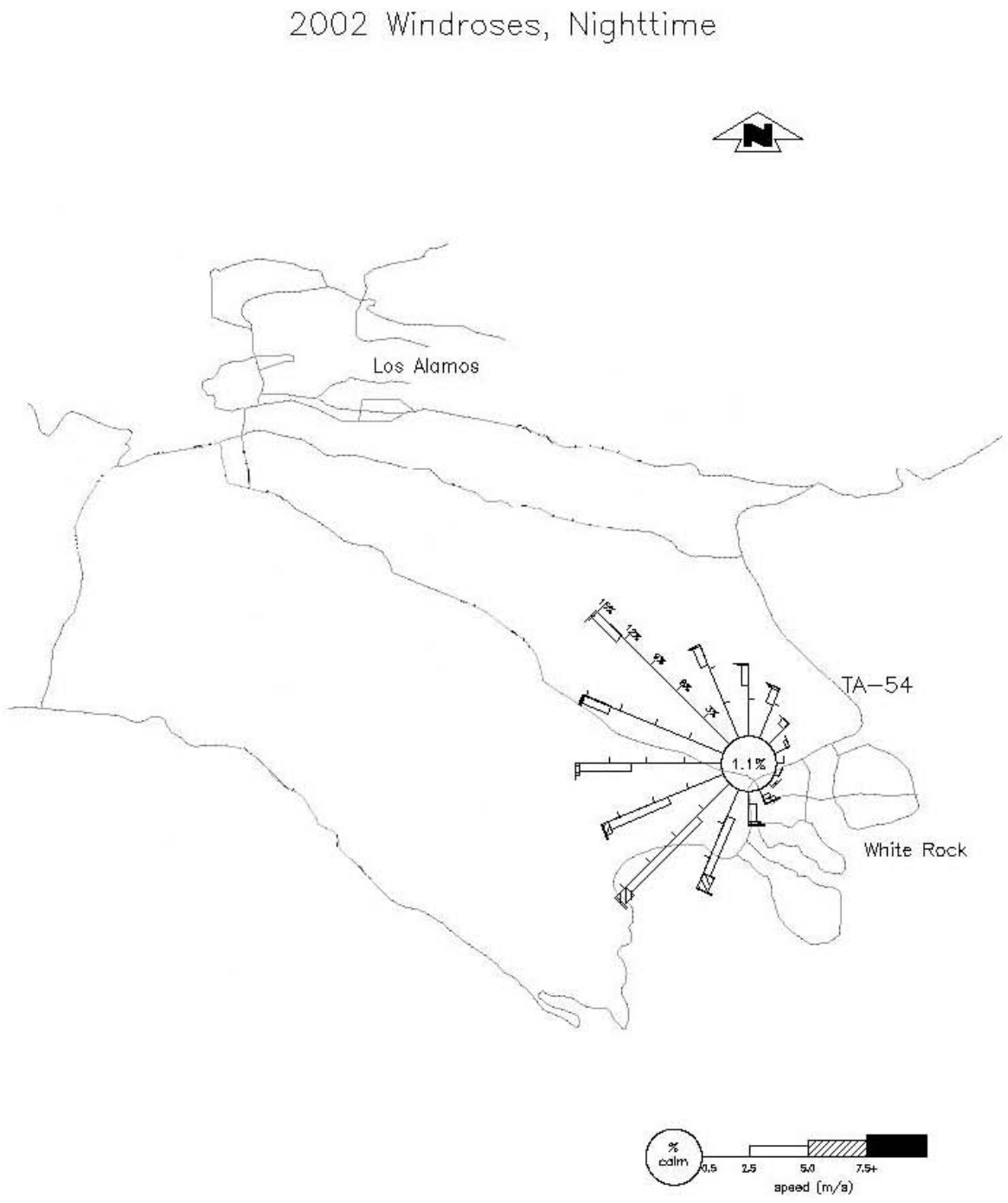

Figure A-5

Annual Wind Roses for Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) – Night

ATTACHMENT B

WASTE ANALYSIS PLAN

ATTACHMENT B
WASTE ANALYSIS PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), § 270.14(b)(2); 20.4.1 NMAC § 264.13; and 20.4.1 NMAC § 268.7, revised June 14, 2000, waste analysis requirements for hazardous and/or mixed wastes managed at Technical Area 54 are addressed in Appendix B in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT C

INSPECTION PLAN

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C.2 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART CC REQUIREMENTS C-1

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CFR	Code of Federal Regulations
LANL	Los Alamos National Laboratory
m^3	cubic meters
ppmw	parts per million by weight
TA	technical area
TRU	transuranic
TRUPACT-II	Transuranic Package Transporter-II

ATTACHMENT C
INSPECTION PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), § 270.14(b)(5), and 20.4.1 NMAC § 264.15, revised June 14, 2000 [6-14-00], inspection requirements for all hazardous and/or mixed waste management units at Los Alamos National Laboratory (LANL) are addressed in Appendix C of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. This attachment presents additional inspection requirements specific to the container storage units at Technical Area (TA) 54. Inspections will be conducted often enough to identify problems in time to correct them before they harm human health or the environment.

C.1 INSPECTION REQUIREMENTS FOR TRUPACT-II CONTAINERS [20.4.1 NMAC §§ 264.15(b) and 264.174]

Transuranic Package Transporter-II (TRUPACT-II) containers will be used to store transuranic (TRU) and mixed TRU waste containers prior to shipment from TA-54 West to the Waste Isolation Pilot Plant. These double containment, stainless-steel shipping containers are designed to contain up to 14 drums, two rounded-end standard waste boxes, or one ten-drum overpack.

TRUPACT-II containers are intended to store only waste containers of structural integrity. Waste containers will be visually inspected prior to their placement in the TRUPACT-II containers to ensure their integrity. The inspection will include a close examination of the cover and closure devices for visible cracks, holes, gaps, or other open spaces into the interior of the waste container when the cover and closure devices are secured in the closed position. The TRUPACT-II will be loaded with waste containers and sealed with a locking-ring closure mechanism. After the TRUPACT-II has been sealed, only the outside of the TRUPACT-II will be inspected to ensure its integrity and that there has been no human intervention.

C.2 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART CC REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart CC]

The hazardous wastes stored in containers at TA-54 may be subject to 20.4.1.500 NMAC (incorporating the Code of Federal Regulations [CFR], Title 40, Part 264, Subpart CC, "Air Emission Standards for Tanks, Surface Impoundments, and Containers") based on the applicability criteria specified in 40 CFR § 264.1080. Subpart CC standards for containers, as currently set forth by the

U.S. Environmental Protection Agency, require that containers of hazardous waste be covered so that there are no detectable emissions of volatile organic compounds to the air. Inspection and monitoring requirements are also specified.

As indicated in 40 CFR § 264.1080(b)(6), these standards are not currently applicable to containers that are used solely for management of radioactive mixed waste in accordance with all regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act. The standards are also not applicable to containers of hazardous waste with less than 500 parts per million by weight (ppmw) volatile organics, containers of less than 0.1 cubic meters (m^3) (approximately 26 gallons) capacity, or that have received waste prior to the effective date of the regulation (December 6, 1996). The following management standards apply for hazardous wastes managed at LANL that do not meet any of the exemptions listed in 40 CFR §264.1080(b).

LANL requires that Subpart CC requirements be evaluated by the generator as part of the waste characterization process. Generator information is used to determine whether the concentration of volatile organics in a waste stream at the point of generation is equal to or greater than 500 ppmw, which is the threshold concentration for Subpart CC requirements. The generator documents this determination for that waste stream. In the event that this information is not available, the waste will be characterized in accordance with Appendix B of the LANL General Part B prior to being received by TA-54. Any hazardous waste that is newly-generated through the treatment or re-characterization of mixed waste at TA-54 will be characterized for the volatile organic content in accordance with Appendix B.

Three levels of air emission controls based on container design capacity are established in 40 CFR § 264.1086(b). TA-54 hazardous waste storage procedures require Level 1 controls based upon container design capacities. Containers of greater than 0.1 m^3 and less than 0.46 m^3 (approximately 119 gallons) capacity and that meet U.S. Department of Transportation specifications under 49 CFR, Part 178, are kept closed during storage pursuant to 40 CFR § 264.1086(c)(3). Containers undergoing waste characterization activities may be opened for access for the purposes described in 40 CFR § 264.1086(c)(3). As required by 40 CFR § 264.1086(c)(4), these containers are subject to a visual inspection and monitoring program. On or before acceptance of the waste container at TA-54, the container is inspected to check for visible cracks, holes, gaps, or other open spaces into the interior of the container when the cover and closure devices are secured in the closed position, in accordance with 40 CFR § 264.1086(c)(1)(ii). This

inspection is documented in uniform hazardous waste manifests. Pursuant to the Inspection Plan in Appendix C of the LANL General Part B, the containers are inspected weekly at TA-54 to ensure that the containers remain closed during storage, thereby exceeding the monthly inspection requirements of 40 CFR § 264.1086(c)(4)(ii).

ATTACHMENT D

PERSONNEL TRAINING PLAN

ATTACHMENT D
PERSONNEL TRAINING PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), § 270.14(b)(12), and 20.4.1 NMAC § 264.16, revised June 14, 2000, training requirements for workers who manage hazardous or mixed waste at Technical Area 54 are addressed in Appendix D of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT E

CONTINGENCY PLAN

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ATTACHMENT E
CONTINGENCY PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart V, Part 264, Subpart D, and 20.4.1 NMAC § 270.14(b)(7), revised June 14, 2000, contingency measures applicable to the hazardous and mixed waste management units at Technical Area (TA) 54 are provided in Appendix E of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

Listings of emergency equipment currently available for use at Area L, Area G, and TA-54 West are presented in Tables E-1 through E-3. Figures E-1 and E-2 show evacuation routes and muster areas that may be used at TA-54 in the event of an emergency. Emergency equipment, evacuation routes, and muster area locations are subject to change.

Table E-1

Emergency Equipment at Technical Area (TA) 54, Area L[a]

FIRE CONTROL EQUIPMENT:

Halon, water, dry chemical, and/or carbon dioxide fire extinguishers are available at TA-54-37, TA-54-60, TA-54-51, TA-54-32, TA-54-39, the southeast end of Area L, TA-54-31, 30 feet from the southeast side of TA-54-32, TA-54-117, TA-54-62, on the forklift and Bobcat operating in Area L, TA-54-68, TA-54-69, TA-54-70, TA-54-185, TA-54-215, and TA-54-221.

A dry-pipe sprinkler system is located at TA-54-215.

Dry chemical fire-suppression systems are located in the storage sheds.

Description of General Capabilities:
Fire extinguishers may be used by any qualified employee in the event of a small fire. The automatic dry-pipe sprinkler system is heat activated. Protection Technology Los Alamos (PTLA) and the Los Alamos County Fire Department (LACFD) are alerted when this system has been activated.

Fire alarm pull boxes are located inside TA-54-37, TA-54-39, TA-54-51, TA-54-60, TA-54-117, TA-54-210, and TA-54-221.

Description of General Capabilities:
Fire alarms may be activated by any employee in the event of a fire to notify the LACFD and PTLA.

There are fire hydrants located near TA-54-37 and the southeast corner of TA-54-62. These fire hydrants supply water at an adequate volume and pressure to satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart V, 264.32, revised January 1, 1997.

A freeze-proof faucet is located approximately 25 feet east of TA-54-31.

SPILL CONTROL EQUIPMENT:

Shovels (located in TA-54-46)
Oversized drums (various locations on site)
Absorbent (various locations on site)

Spill kits are located throughout Area L. Each kit includes bags of Zorball, caustic neutralizer, acid neutralizer, and an inventory of tools and supplies.

Refer to footnotes at end of table.

Table E-1 (Continued)

Emergency Equipment at Technical Area (TA) 54, Area L[a]

COMMUNICATION EQUIPMENT:

Telephones are located in TA-54-32, TA-54-37, TA-54-51, TA-54-60, TA-54-62, TA-54-117, TA-54-185, TA-54-210, TA-54-211, and TA-54-221.

Paging phones and evacuation alarms are located at the northeast end of TA-54-32, the exterior west end of TA-54-215, at TA-54-37, and at TA-54-62.

Additional equipment includes two-way radios and portable telephones.

Description of General Capabilities:
The evacuation alarm is a pulsating sound that can be heard throughout Area L. The fire alarm is a double slow-whoop sound.

DECONTAMINATION EQUIPMENT:

Emergency shower and eyewash stations are located immediately east of TA-54-31, at TA-54-215, at TA-54-35, and at TA-54-39.

Material Safety Data Sheets (MSDS) are available in TA-54-46.

Description of General Capabilities:
Emergency shower and eyewash stations are used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs for the chemical(s) should be obtained prior to working with hazardous or mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Personnel at Area L are required to use appropriate personal protective equipment (PPE) to protect themselves from the hazards found in the workplace under normal conditions. This PPE may include gloves, steel-toed shoes, and safety glasses. Additional PPE may be required during an unusual hazardous situation or during sampling and can be found in the spill kits or at TA-54-50.

Self-contained breathing apparatus are located in TA-54-50.

Gloves, goggles, safety glasses, coveralls, and face shields are found in the spill kits located throughout Area L.

---

[a]Equipment types and locations are subject to change.

Table E-2

Emergency Equipment at Technical Area (TA) 54, Area G[a]

FIRE CONTROL EQUIPMENT:

Halon, water, and/or carbon dioxide fire extinguishers are available at TA-54-2, TA-54-8, TA-54-11, TA-54-20, TA-54-33, TA-54-48, TA-54-49, TA-54-92, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, and TA-54-412.

Description of General Capabilities:
Fire extinguishers may be used by any qualified employee in the event of a small fire. For larger fires, Protection Technology Los Alamos (PTLA) and the Los Alamos County Fire Department (LACFD) are alerted.

Dry-chemical fire suppression systems are available at TA-54-1027, TA-54-1028, TA-54-1030, and TA-54-1041.

A dry-pipe fire suppression system is available at TA-54-412.

Fire alarm pull stations are available at TA-54-2, TA-54-11, TA-54-33, TA-54-48, TA-54-49, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-273, TA-54-283, TA-54-375, and TA-54-412.

Description of General Capabilities:
Fire alarms may be activated by any employee in the event of a fire to notify the LACFD and PTLA.

Several fire hydrants are located in Area G. These fire hydrants will supply water at an adequate volume and pressure to satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 264.32, revised June 14, 2000.

SPILL CONTROL EQUIPMENT:

Spill control stations and/or portable spill kits are located at TA-54-8, TA-54-11, TA-54-20, TA-54-33, TA-54-48, TA-54-49, TA-54-92, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, and TA-54-412.

Each spill kit generally includes bags of Zorball and an inventory of tools and supplies.

Refer to footnotes at end of table.

Table E-2 (Continued)

Emergency Equipment at Technical Area (TA) 54, Area G[a]

COMMUNICATION EQUIPMENT:

Pole-mounted paging telephones are located near TA-54-33, TA-54-48, TA-54-49, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, and TA-54-283, inside TA-54-2, and at TA-54-11, and TA-54-412.

Evacuation alarm buttons are located at or near TA-54-2, TA-54-11, TA-54-33, TA-54-48, TA-54-49, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, TA-54-412, and at various muster stations.

Additional equipment includes portable two-way radios located at muster stations.

Description of General Capabilities:
Telephones and alarms are located throughout Area G. Paging telephones are equipped with public address capabilities. Evacuation alarms have horns mounted on telephone poles throughout Area G. The evacuation alarm is a high-pitched wailing sound that can be heard throughout Area G.

DECONTAMINATION EQUIPMENT:

Portable eyewash stations equipped with first aid kits are located in TA-54-33, TA-54-224, and TA-54-412.

One permanent, hard-plumbed eyewash station and a safety shower are located in TA-54-33.

Material Safety Data Sheets (MSDS) and waste characterization documentation are available in the event of an exposure.

Description of General Capabilities:
Emergency shower and eyewash stations are used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs for the chemical(s) should be obtained prior to working with hazardous or mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Personnel at Area G are required to use appropriate personal protective equipment (PPE) to protect themselves from the hazards found in the workplace under normal conditions. This PPE may include gloves, steel-toed shoes, and safety glasses. Additional PPE may be required during an unusual hazardous situation and can be found in the spill kits or at various locations listed below.

Gloves and goggles or safety glasses are available in the spill kits located at TA-54-8, TA-54-11, TA-54-20, TA-54-33, TA-54-48, TA-54-49, TA-54-92, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, and TA-54-412.

Refer to footnotes at end of table.

Table E-2 (Continued)

Emergency Equipment at Technical Area (TA) 54, Area G[a]

OTHER:

Continuous air monitors and giraffe monitors (or other appropriate air monitoring equipment***)*** are located in TA-54-33, TA-54-48, TA-54-49, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, TA-54-412, TA-54-1027, and TA-54-1028 for detection of airborne radioactive constituents.

Heavy equipment available on site includes:

- Scraper
- Bulldozer
- Front-end loader

Portable emergency generators

Vehicles available to evacuate personnel from Area G include:

- All-terrain vehicles
- Pickup truck
- Flat-bed truck
- Daihatsu vehicles
- Vans

[a]Equipment types and locations are subject to change.

Table E-3

Emergency Equipment at Technical Area (TA) 54 West[a]

FIRE CONTROL EQUIPMENT:

Halon fire extinguishers are available at TA-54-38 in the high and low bays and at the outdoor container storage unit.

Description of General Capabilities:
Fire extinguishers may be used by any employee in the event of a small fire. Protection Technology Los Alamos (PTLA) and the Los Alamos County Fire Department (LACFD) are alerted when the automatic dry-pipe sprinkler system has been activated.

A dry-pipe sprinkler system is available throughout TA-54-38, including the loading dock area. The dry-pipe sprinkler system is heat activated in the high bay and at the loading dock. It is smoke activated in the low bay.

Fire alarm pull boxes are available inside TA-54-38 at the main entrance, in the high bay, and in the low bay.

Description of General Capabilities:
Fire alarms may be activated by any employee in the event of a fire to notify the LACFD and PTLA.

A fire hydrant is located approximately 220 feet west of TA-54-38 near the entrance to TA-54 West. This fire hydrant supplies water at adequate volume and pressure to satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 264.32, revised June 14, 2000.

A wall hydrant is located on the northwest side of TA-54-38.

Freeze-proof faucets are located on the northwest, southwest, and southeast sides of TA-54-38.

SPILL CONTROL EQUIPMENT:

A mobile response kit is located at TA-54-38. The kit includes sorbent socks, pillows, and sheets; goggles; and large plastic bags.

COMMUNICATION EQUIPMENT:

Telephones with public address (PA) capabilities are located in TA-54-38 in the high bay, in the low bay, and outside the main entrance. An emergency telephone is also located outside the main entrance.

Description of General Capabilities:
Telephones with PA capabilities for internal and external communication are available for use by any employee. The evacuation alarm is a high-pitched wailing sound that can be heard throughout TA-54-38 and TA-54-34. The fire alarm is a double slow-whoop sound. Fire and evacuation alarms are activated in the event of a fire or evacuation.

Refer to footnotes at end of table.

Table E-3 (Continued)

Emergency Equipment at Technical Area (TA) 54 West[a]

DECONTAMINATION EQUIPMENT:

Safety showers and eyewash stations are located in TA-54-38 in the high bay and on the loading dock.

Material Safety Data Sheets (MSDS) are located at the TA-54-38 muster area (approximately 120 feet northwest of TA-54-38) and in the TA-54-38 main entry area.

Description of General Capabilities:
Safety showers and eyewashes are used by personnel who receive a chemical splash to the skin or to the eyes. Specific MSDSs for the chemical(s) being managed should be obtained prior to working with mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Personnel at TA-54 West are required to use appropriate personal protective equipment (PPE) to protect themselves from the hazards found in the workplace under normal conditions. This PPE includes gloves, steel-toed shoes, and safety glasses. Additional PPE may be required during an unusual hazardous situation and can be found in the spill kits.

Gloves, goggles, safety glasses, coveralls, and face shields are found in the spill kits located at TA-54-38.

All workers located within the operating limits of a crane (fixed or mobile) wear hard hats.

[a]Equipment types and locations are subject to change.

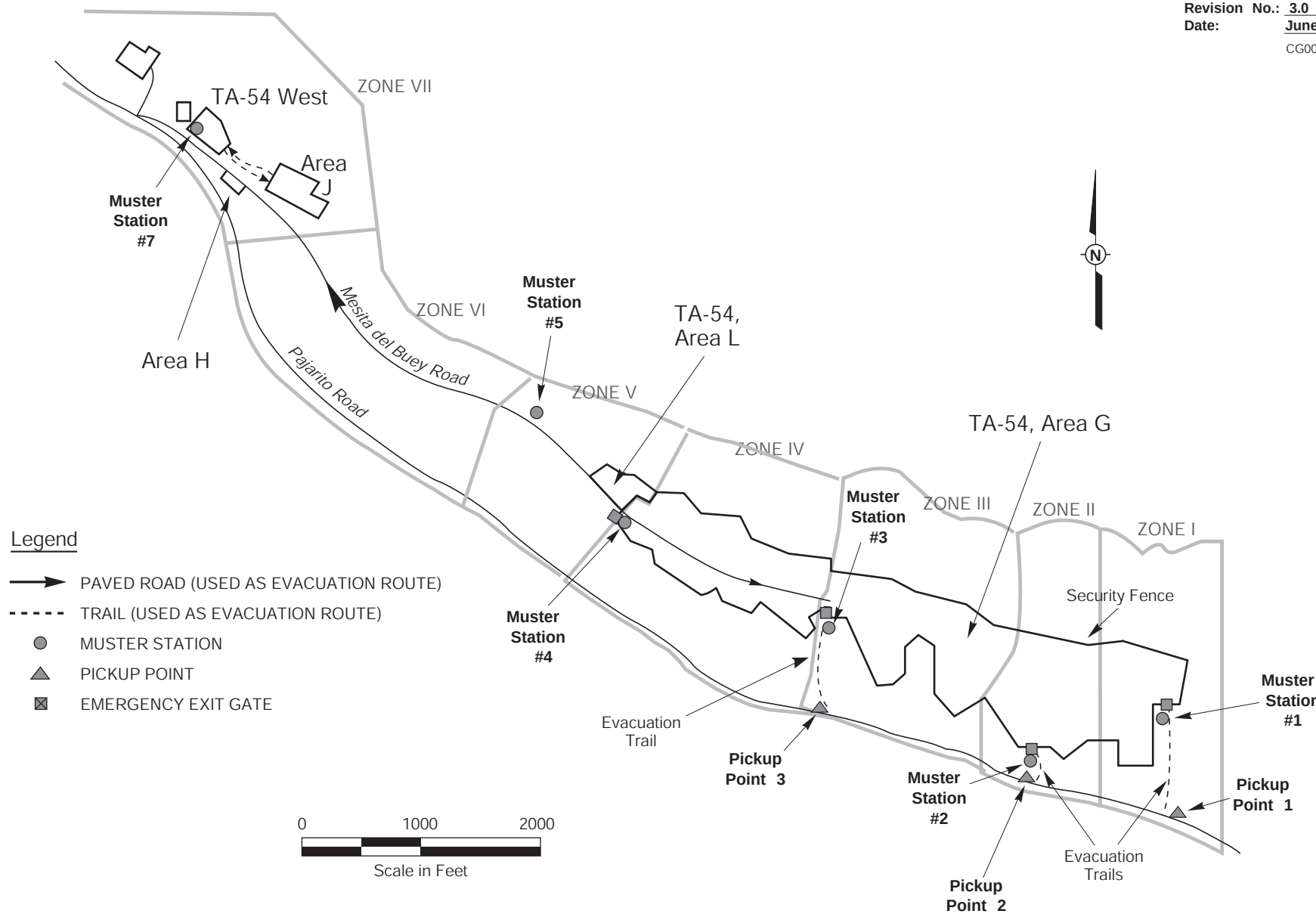

Figure E-1
Evacuation Roads, Trails, and Zones; Emergency Exit Gates; Muster Stations; and Pickup Points at Technical Area (TA) 54

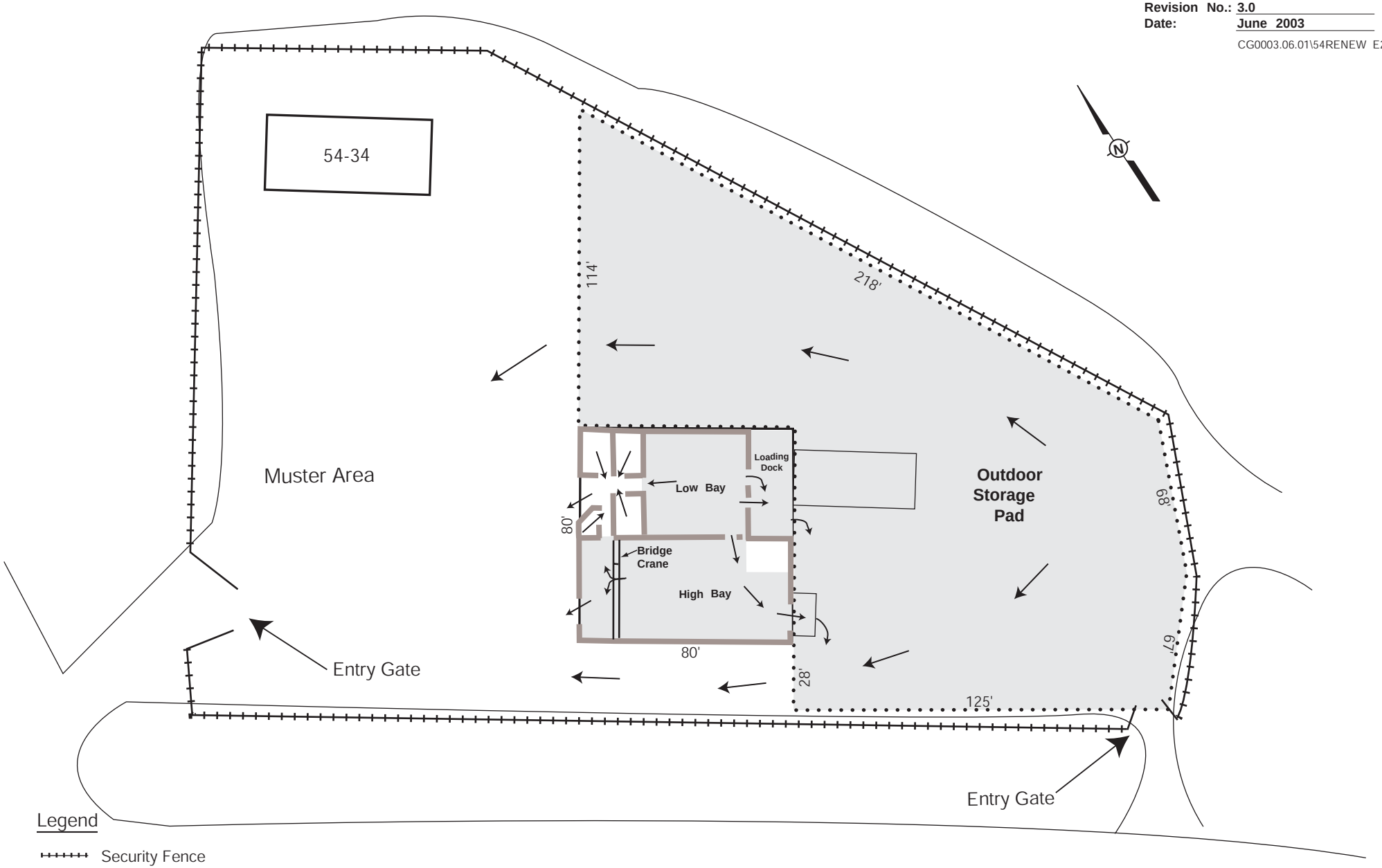

Figure E-2
Evacuation Routes at Technical Area (TA) 54 West

ATTACHMENT F

CLOSURE PLAN FOR TECHNICAL AREA 54
CONTAINER STORAGE UNITS

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ASTM	American Society for Testing and Materials
COPC	contaminant of potential concern
CSU	container storage unit
DOE/NNSA	U.S. Department of Energy, National Nuclear Security Administration
D&D	decontamination and decommissioning
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
m^3	cubic meters
MLLW	mixed low-level waste
MSDS	Material Safety Data Sheet
MTRUW	mixed transuranic waste
NMED	New Mexico Environment Department
PPE	personal protective equipment
QA/QC	quality control/quality assurance
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SW-846	"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
SWRC	Solid Waste Regulatory Compliance Group
TA	technical area

ATTACHMENT F
CLOSURE PLAN FOR TECHNICAL AREA 54
CONTAINER STORAGE UNITS

The information provided in this closure plan addresses the applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(13), revised June 14, 2000 [6-14-00], and 20.4.1 NMAC, Subpart V, Part 264, Subparts G, H, and I [6-14-00]. This closure plan describes the activities necessary to close the container storage units (CSU) at Los Alamos National Laboratory (LANL) Technical Area (TA) 54.

Closure of the TA-54 CSUs will involve removal or decontamination of hazardous wastes and hazardous waste residues after the active storage period for the CSUs. Closure activities will include removal of any remaining waste, decontamination or removal of contaminated equipment and the unit structure, and verification that all residues have been removed. In the event that closure by removal and decontamination for a CSU cannot be met, the closure plan will be modified to include alternative decontamination demonstrations or alternative closure requirements, as necessary. Closure activities will minimize the need for further maintenance, preclude the release of hazardous waste or hazardous constituents to environmental media, and be protective of human health.

This closure plan will be used to provide guidance and permit conditions for the partial closure of all the CSUs at TA-54, which include the CSUs at Area L, Area G, and TA-54 West. There are several types of CSUs at TA-54 that meet various storage requirements, both by waste type and different waste management programs. Closure of the TA-54 CSUs will occur separately and over the active life of the TA-54 facility, which is not anticipated to end before 2050. There is a high potential that decontamination procedures, analytical verification procedures, and the environmental characterization of TA-54 will change and improve over the active life of the facility. Therefore, this closure plan describes the general closure activities for the different types of storage structures at TA-54 and establishes the procedure of submitting a separate detailed TA-54 CSU-specific sampling and analysis plan (SAP) to the New Mexico Environment Department (NMED) for approval at the time of closure for each CSU. The SAP will provide the required level of detail to assure that closure performance standards are met, consistent with the appropriate decontamination and verification requirements existing at the time of closure.

This plan is organized as follows:

- General closure information (Section F.1)
- Description of the TA-54 CSUs (Section F.2)
- Closure procedures for the TA-54 CSUs (Section F.3)
- Sampling and analysis plan (Section F.4)

Until closure is complete and certified in accordance with 20.4.1 NMAC § 264.115 [6-14-00], as discussed in Section F.1.6, a copy of the approved closure plan and any approved revisions will be on file at LANL's Solid Waste Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy National Nuclear Security Administration (DOE/NNSA) Los Alamos Site Office (LASO).

F.1 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13) and 20.4.1 NMAC, Subpart V, Part 264, Subparts G, H, and I [6-14-00], as applicable.

F.1.1 Closure Performance Standard [20.4.1 NMAC § 264.111]

The TA-54 CSUs will be closed to meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and I [6-14-00].

F.1.2 Partial and Final Closure Activities [20.4.1 NMAC § 264.112(d)]

Partial Resource Conservation and Recovery Act (RCRA) closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. Partial closure at TA-54 will consist of closing one or more of the TA-54 CSUs, while leaving the other units at LANL in operation. Partial closure (hereinafter simply referred to as closure) will be deemed complete when the waste has been removed from the CSU; the CSU and related equipment, structures, and areas have been decontaminated, if necessary; closure by removal and/or decontamination of hazardous waste and hazardous waste residues has been verified; the closure certification has been submitted to the NMED; and the NMED has approved the closure.

Final RCRA closure of the LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each waste management unit, including all previous closures as well as land-based units where closures have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED, and the NMED has approved the final closure.

F.1.3 General Closure Schedule [20.4.1 NMAC §§ 264.112(b)(6), 264.112(e), and 264.113]

Closure of the TA-54 facility is anticipated to occur in the year 2050; however, closure of any TA-54 CSU may occur at any time before then. Written notification will be provided 45 days before the start of closure activities for each TA-54 CSU. However, pursuant to 20.4.1 NMAC § 264.112(e) [6-14-00], removing hazardous wastes and decontaminating or dismantling equipment in accordance with an approved closure plan may be conducted at any time before or after notification of closure. Closure activities will begin according to the requirements of 20.4.1 NMAC § 264.112(d)(2) [6-14-00]. Treatment, removal, or disposal of hazardous wastes will begin in accordance with the approved closure plan, as required by 20.4.1 NMAC § 264.113(a) [6-14-00], within 90 days after final receipt of waste at the hazardous or mixed waste management unit. This timeframe will be met as long as facilities are available for treatment or disposal of these wastes. In the event that closure activities cannot begin at a unit within 90 days, LANL will notify the Secretary of the NMED in accordance with the extension requirements in 20.4.1 NMAC § 264.113(a) [6-14-00]. Closure activities will be completed in accordance with the requirements of 20.4.1 NMAC § 264.113(b) [6-14-00]. Closure will be conducted in accordance with the general schedule presented in Table F-1. Further details regarding the schedule of closure activities on a CSU-specific basis will be included with the TA-54 CSU-specific closure SAP discussed in Section F.4 of this plan. In the event that closure of a CSU is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC § 264.113(b) [6-14-00]. In addition, the demonstrations in 20.4.1 NMAC § 264.113(a)(1) and (b)(1) [6-14-00] will be made in accordance with 20.4.1 NMAC § 264.113(c) [6-14-00].

F.1.4 Amendment of the Closure Plan [20.4.1 NMAC § 264.112(c)]

In accordance with 20.4.1 NMAC § 264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the approved closure plan
- There is a change in the expected year of closure
- Unexpected events occur during closure that require modification of the approved closure plan
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC §§ 264.90(f) and/or 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

F.1.5 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for closure actions.

F.1.6 Closure Certification [20.4.1 NMAC § 264.115]

Within 60 days after completion of closure of each CSU at TA-54 or final closure of the facility, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit or facility has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE/NNSA and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC § 264.115 [6-14-00]. A copy of the

certification and supporting documentation will be maintained by both DOE/NNSA LASO and SWRC.

F.1.7 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the TA-54 CSUs will be maintained by the DOE/NNSA or another authorized federal agency for as long as necessary to prohibit public access. The security fence at the TA-54 boundary will be maintained to ensure that public access into TA-54 is prevented.

F.1.8 Closure Reports

Upon completion of RCRA closure activities at a TA-54 CSU, a closure report will be prepared and provided to the Secretary of the NMED. The report will document closure and contain, for example, the following:

- A copy of the certification described in Section F.1.6
- A general summary of closure activities
- Any significant variance from the approved closure plan and the reason for the variance
- A summary of any sampling data associated with the closure
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data)
- Storage or disposal location of hazardous/mixed waste resulting from closure activities
- A certification of accuracy of the report.

F.1.9 Survey Plat and Post-Closure Requirements [20.4.1 NMAC §§ 264.116 and 264.117 through 264.120]

For closure, LANL intends to remove hazardous waste and associated constituents from the CSU undergoing closure, remove or treat soil contaminated with hazardous wastes or hazardous waste residues resulting from storage operations, and remove or decontaminate structures and equipment contained in the unit. If decontamination to the cleanup levels approved in the CSU-specific closure SAP cannot be achieved, LANL intends to dispose of or otherwise manage the contaminated structures, equipment, soil, or other media. If decontamination to these cleanup levels is not

achievable, LANL may propose an alternate demonstration of decontamination, as circumstances indicate.

If a CSU cannot be closed as described above, LANL will conduct post-closure or equivalent activities in accordance with Appendix G in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. A survey plat indicating the location and dimensions of the CSU with respect to permanently surveyed benchmarks will be submitted to the local zoning authority (i.e., Los Alamos County) and to the NMED at the time of submission of the certification of closure. The plat filed with the local zoning authority will contain a prominently displayed note, which states the obligation of LANL and DOE/NNSA to restrict disturbance of the unit in accordance with the applicable regulations in 20.4.1 NMAC, Subpart V, Part 264, Subpart G. Post-closure notices will be filed with appropriate authorities, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE/NNSA will file a "Land Use Restriction Notice" or equivalent document with the County of Los Alamos and other authorized agencies. Within 60 days after completion of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00].

F.2 DESCRIPTION OF THE TA-54 CSUs

This section provides a general description of TA-54 and the TA-54 CSUs. LANL does not currently intend to reduce the areal extent or the design capacities of the CSUs at TA-54 during the active life of those units. Estimated annual quantities for the CSUs at TA-54 are provided in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application," hereinafter referred to as the LANL General Part A.

TA-54 is located on top of Mesita del Buey, an east-west trending mesa that is bordered on the north by Cañada del Buey and on the south by Pajarito Canyon. The elevation at TA-54 is approximately 6,800 feet. TA-54 is used primarily for waste management. It includes four material disposal areas, one each at Areas G, H, J, and L. It also includes hazardous/mixed waste storage areas and numerous supporting offices. The Radioassay and Nondestructive Testing Facility (TA-54-38) is located in the western part of TA-54 (TA-54 West).

The TA-54 CSUs are located at Area L, Area G, and TA-54 West. There are two CSUs at Area L, nine CSUs at Area G, and two CSUs at TA-54 West, as indicated below.

The two Area L CSUs are the aboveground CSU within the fence and the Storage Shafts CSU (Shafts 36 and 37).

The nine Area G CSUs are:

- Storage Domes 229, 230, 231, and 232, and Pad 9;
- TA-54-412, Storage Dome 226, and Pad 1;
- Storage Dome 48 and Pad 3;
- Pad 10 (former Pads 2 and 4) and the transuranic waste characterization facilities;
- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7;
- Storage Domes 153 and 283 and Pad 6;
- Storage Shed 8;
- TA-54-33, and;
- Storage Dome 375 and Pad 11.

The two TA-54 West CSUs are the Indoor CSU at TA-54-38 and the Outdoor CSU at and adjacent to TA-54-38.

F.2.1 Estimate of Maximum Waste in Storage

The maximum total capacity of hazardous and mixed waste potentially in storage at any time at the aboveground CSU within the fence at Area L is 407,880 gallons. The maximum total capacity of mixed waste potentially in storage at any time in the Storage Shafts CSU at Area L is 600 gallons. The estimate of the total maximum inventory of hazardous and mixed waste stored in Area L over the active life (1980 to 2003) is 23,150 cubic meters (m^3). The maximum total inventory of hazardous waste potentially disposed of in the regulated unit at Area L is 42,050 cubic feet.

The maximum total capacity of hazardous and mixed waste potentially in storage at any time at the Area G CSUs is 4,506,590 gallons, as shown below:

- Storage Domes 229, 230, 231, and 232 and Pad 9 = 1,446,720 gallons;
- TA-54-412, Storage Dome 226, and Pad 1 = 502,920 gallons;
- Storage Dome 48 and Pad 3 = 213,840 gallons;
- Pad 10 (former Pads 2 and 4) and the transuranic waste characterization facilities = 319,770 gallons;

- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7 = 623,480 gallons;
- Storage Domes 153 and 283 and Pad 6 = 597,300 gallons;
- Storage Shed 8 = 11,880 gallons;
- TA-54-33 = 108,240 gallons, and;
- Storage Dome 375 and Pad 11 = 682,440 gallons.

The estimate of the total maximum inventory of mixed waste stored in Area G over the active life (1990 to 2003) is 6,691 m^3. The maximum total inventory of hazardous waste disposed of in the two regulated units at Area G is 8.1 m^3.

The maximum total capacity of mixed waste potentially in storage at any time at the Indoor CSU at TA-54 West is 3,080 gallons. The maximum total capacity of mixed waste potentially in storage at any time at the Outdoor CSU at TA-54 West is 8,580 gallons. The maximum total inventory of mixed waste stored on site over the active life of TA-54 West (1995 to 2003) is estimated to be 137,500 gallons.

F.2.2 Description of Stored Waste

The TA-54 CSUs are used for storage of hazardous waste, mixed low-level waste (MLLW), and mixed transuranic waste (MTRUW). The hazardous waste stored in the TA-54 CSUs was generated from research and development activities, general facility operations, decontamination and decommissioning (D&D) operations, and environmental restoration (ER) activities throughout LANL. Mixed waste is any solid waste that has both a hazardous waste component (as defined by 20.4.1 NMAC, Subpart II, Part 261) and a radioactive waste component (as defined by DOE Order 435.1, “Radioactive Waste Management” [DOE, 1999]). The MLLW stored in the TA-54 CSUs was generated during research and development activities, radioactive material processing and recovery operations, general facility operations, D&D operations, and ER activities at various TAs throughout LANL. The MTRUW stored in the TA-54 CSUs was generated during research activities, radioactive material processing and recovery operations, D&D operations, and ER activities at various TAs throughout LANL. Information on the hazardous component(s) of all wastes that can be stored at the TA-54 CSUs is provided in the LANL General Part A. Additional information on waste-generating activities at LANL is available in the waste analysis plan in Appendix B of the LANL General Part B.

F.3 CLOSURE PROCEDURES FOR THE TA-54 CSUs

Closure activities at the TA-54 CSUs will involve the removal of hazardous wastes and/or residues, decontamination or removal of the storage structures and associated waste management equipment with subsequent appropriate disposition, and verification of decontamination.

F.3.1 Removal of Waste

Prior to the initiation of closure activities, wastes will be removed from the TA-54 CSU to be closed. Containers will be removed from each CSU primarily with forklifts and/or cranes. Small containers may be handled manually or with a dolly. Containers will be placed onto closed bed trucks, flatbed trucks, forklifts, or trailers for transport. Appropriate shipping papers will accompany the wastes during transport. RCRA-regulated waste containers will be moved to an approved on-site CSU or to an off-site permitted treatment, storage, or disposal facility.

F.3.2 Closure Procedure and Decontamination

To the extent possible, all contaminated structures and equipment at the TA-54 CSU to be closed will be decontaminated. Structures and equipment that cannot or will not be decontaminated will be removed, containerized, and managed in compliance with appropriate waste management regulations. Decontamination will be verified by sampling and analysis. All sampling conducted during closure activities will be done as generally discussed in Section F.3.4 and as included in the CSU-specific SAP (see Section F.4). Sampling and analysis will be done in accordance with appropriate quality assurance/quality control (QA/QC) procedures as required by the individual analytical technique or the authority for the relevant standard methods (e.g., "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" [*SW-846*]; American Society for Testing and Materials [ASTM]). Closure will be conducted in accordance with the general schedule presented in Table F-1, as amended by TA-54 CSU-specific SAPs submitted prior to the actual closures.

F.3.3 Preliminary Closure Activities

F.3.3.1 Safety Precautions

Job hazards associated with closure activities will be identified, controls developed, and workers briefed before closure activities are conducted, in accordance with LANL safety procedures. Personnel involved in closure activities will wear appropriate personal protective equipment (PPE), specified by the Health Physics Group and the Industrial Hygiene and Safety Group, and will follow good hygiene practices to protect themselves from exposure to hazardous and/or mixed waste. The level of PPE that will be required will depend upon the physical hazards present and the levels of radiological and/or chemical contamination that are detected, if any. All workers involved in closure activities will be required to have appropriate training (see Attachment D in this application and Appendix D in the LANL General Part B). Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

F.3.3.2 Background Determination

Before any decontamination activity begins, background levels for potential hazardous waste constituents will be determined. Decontamination and verification sampling procedures may involve wash water sampling, swipe sampling, soil sampling, or other methods available at the time of closure. Background samples will be obtained from clean water, cleaning equipment, and detergent solutions if wash water methods are used to decontaminate TA-54 CSUs. Background samples will be obtained for the material to be decontaminated or for any sampling materials used in swipe sampling analysis used for verification purposes. Appropriate background samples and/or concentrations derived from LANL studies developed under the LANL corrective action or other programs will be used to determine hazardous constituent background/baseline levels. Details of appropriate background levels and/or necessary samples and collection techniques will be included in the TA-54 CSU-specific SAP, as discussed in Section F.4 of this closure plan.

F.3.3.3 Structural Assessment

Before decontamination activities begin, the base or secondary containment of each CSU will be inspected for any cracks or conditions that could potentially lead to loss of wash water containment if wash water procedures will be used for decontamination. Preventive maintenance inspections are conducted routinely (i.e., weekly) at each CSU. If any defects, deterioration, damage, or hazards affecting containment have developed after the most recent preventive maintenance inspection was conducted, appropriate remedial actions (including sampling, repairs, maintenance, or replacement) will be completed before decontamination activities begin. If a crack or gap is present, a swipe sample or a representative sample of the media will be taken (e.g., asphaltic concrete or concrete) to determine the presence of contamination. The sample will be analyzed for hazardous contaminants of potential concern (COPC) determined through review of the chemical properties of the waste stored during the operating history of the CSU and through an evaluation of the history of any spills that may have occurred at the CSU. If contamination is detected, the surface flaw will be decontaminated prior to repairing the crack/gap. Complete or partial removal (e.g., cold milling) of the material may be performed until contamination is no longer detected. If partial removal is successful in eliminating the contamination, it will be assumed that the remaining material, including underlying soil, is clean.

After any decontamination wash down process, the used wash water will be collected, transferred to containers, sampled, and analyzed for the appropriate parameters determined during the

documentation review. If the used wash water is nonhazardous and nonradioactive, it will be managed appropriately in accordance with LANL policy. Otherwise, the used wash water will be managed at an appropriate on-site facility.

F.3.4 Decontamination of the TA-54 CSUs

The TA-54 CSUs that may be decontaminated during closure activities are comprised of storage sheds, domes, and buildings; shafts; and asphaltic-concrete pads. The following discussion is organized by types of structures because the decontamination approach differs. These procedures are discussed generally, as specific details will be included in the SAPs to be submitted to the NMED for approval (see Section F.4 of this closure plan). If any portable equipment, structure walls, or floors cannot or will not be decontaminated, the contaminated portion will be disposed of in accordance with appropriate waste management regulations.

F.3.4.1 Decontamination of Storage Sheds, Domes, and Buildings

Decontamination of storage sheds, domes, and buildings will be initiated by washing the interior storage surfaces. The first step in decontamination will be to evaluate the CSU's operating record to determine the COPCs. The appropriate surfactant/solvent to be used in the wash water solution will be determined based upon the COPCs. General laboratory surfactants (e.g., Alconox®) will be used for the majority of washes where many COPC analytes are being sampled for, and specialized solvents may be used for more focused removal purposes.

Based on the review of the operating record (e.g., spills) and an evaluation of structural areas of potential concern (e.g., sumps, stained areas, low areas), preliminary decontamination focused on these areas may be conducted prior to the overall decontamination of the CSU. Prior to overall decontamination of a structure, any portable equipment will be wiped down with wash water solution. The structure walls and floors will then be wiped down with mops and/or sponges to minimize the amount of liquid waste generated as a result of decontamination activities. A portable berm, existing berm or sump, or other device (e.g., absorbent socks, plastic sheeting, wading pools) designed to collect and provide containment for used wash water will be used, as necessary.

After the walls and floors have been decontaminated, any recessed areas present (e.g., sumps) will be wiped down with wash water. The used wash water will collect in the recessed area; it will then be removed and transferred to an appropriate container(s). The recessed area will be wiped down again with wash water; this wash water will be minimized, collected with sponges and/or mops, and

transferred to the same appropriate container(s), where it will be sampled. The container(s) of used wash water will be stored appropriately, pending analysis for decontamination verification and waste characterization.

Used wash water samples may exhibit contamination due to leaching of storage structure walls or floors during wash down. If this is the case, record reviews (e.g., manufacturer's specifications, Material Safety Data Sheets [MSDS]) and additional analyses may be performed to determine if leaching of contaminants from the walls or floors contributed to the contaminant concentration in used wash water. If this additional evaluation confirms the structure walls or floors as the source of contamination, baseline concentrations for the clean wash water will be adjusted accordingly. If sampling and analysis indicate that hazardous constituents are present and are not attributed to leaching of contaminants from storage structure walls or floors, the wash cycles and analyses will continue until the structure or equipment has been decontaminated or the decision is made to manage it appropriately as contaminated waste. This material may be transported to and stored at other hazardous waste management locations to facilitate the closure process.

F.3.4.2 Decontamination of the Storage Shafts CSU (Shafts 36 and 37)

The Storage Shafts CSU (Shafts 36 and 37) at TA-54, Area L, contains radioactive isotope production lead stringers. Shaft 36 contains three stringers; Shaft 37 contains four stringers. Each stringer consists of two rectangular steel tubes, one partially inside the other. Each inner tube is filled with a mixture of concrete and lead shot. The outer tubes are filled with concrete only. The ends of the tubes are capped and the lower eight feet of each stringer is in a stainless-steel sheath. Each stringer assembly is also wrapped in plastic.

Because of the multiple containment barriers (i.e., concrete, steel tubes, stainless-steel sheath, and plastic wrap) between the lead and the shafts and because concrete and steel covers extend beyond the diameter of each shaft to prevent run-on into the shafts, it is anticipated that hazardous constituents will not be present in the shafts once the stringers are removed. Therefore, if the integrity of the plastic wrap and/or stainless-steel sheath surrounding the stringers appears uncompromised, sampling for hazardous constituents within the shafts will not be required. If the stainless-steel sheath appears corroded or damaged, samples will be obtained from the bottom of the shaft and analyzed for lead.

F.3.4.3 Decontamination of Asphaltic Concrete at the TA-54 CSUs

Potential closure activities of asphaltic concrete at the TA-54 CSUs include decontamination or removal. If the decision is made to decontaminate the asphaltic concrete, it will be wiped down with mops and/or sponges to minimize the amount of liquid waste generated as a result of decontamination activities. A portable berm, existing berm or sump, or other device (e.g., absorbent socks, plastic sheeting, wading pools) designed to collect and provide containment for used wash water will be used, as necessary. After the wash down process, the used wash water will be collected, sampled for analysis, and stored in appropriate containers at the site. Each asphaltic-concrete location may undergo several wash cycles; however, the option to remove the asphaltic concrete and manage it as hazardous waste may be exercised at any time after the initial wash cycle.

Used wash water samples may exhibit contamination due to leaching of the asphaltic concrete during wash down. If this is the case, record reviews (e.g., manufacturer's specifications, MSDSs) and additional analyses will be performed to determine if leaching from the asphaltic concrete contributed to the contaminant concentration in the used wash water. If this additional evaluation confirms the asphaltic concrete as the source of contamination, baseline concentrations for the clean wash water will be adjusted accordingly. Decontamination verification is discussed further in Section F.3.5.

If sampling and analysis indicate that hazardous constituents are present and are not attributed to leaching from the asphaltic concrete, the wash cycles and analyses will be repeated until the asphaltic concrete has been decontaminated or the decision is made to manage it appropriately as hazardous waste.

If the decision is made to not decontaminate the asphaltic concrete or to remove only the contaminated portions (e.g., by cold milling, see Section F.3.3.3), it will be totally or partially removed and disposed of appropriately in lieu of decontamination activities. The asphaltic concrete may be transported to and stored at other hazardous waste management locations to facilitate the closure process. If the asphaltic concrete is totally removed, soil samples will be collected from the area underlying the original asphaltic concrete. Soil sampling procedures are described in Section F.3.4.4. If removal of only the contaminated portion of the asphaltic concrete is successful, the underlying soil will be presumed to be uncontaminated and soil sampling will not be required.

F.3.4.4 Soil Sampling

In certain cases of closures at the TA-54 CSUs, soil removal may be conducted to meet the closure performance standards. Examples include detection of contamination that had migrated beyond TA-54 CSU asphaltic-concrete pads to the surrounding soil, and cases in which operating records indicate that a release of hazardous waste from storage structures to the surrounding soil has occurred. If records indicate that no release of hazardous waste to soils has occurred, soil sampling will not be conducted.

If collection of soil samples is determined to be necessary to demonstrate decontamination, appropriate background samples and/or concentrations derived from LANL studies (see Section F.3.3.2) will be used to determine background/baseline levels for decontamination verification. Sampling locations to determine the extent of contamination will be based upon a biased random sampling approach, including historical evidence of releases, physical evidence of distressed vegetation or visual staining, and any other information that indicates a potential contamination pathway. The number of samples, locations, depths, and sampling methods will be determined before closure and included in the TA-54 CSU-specific closure SAP, as discussed in Section F.4. Results from sampling will be compared to the background samples and/or baseline concentration levels included in the closure SAP. If analysis shows that the soil at the storage areas is contaminated, soil sampling results that are above the background/baseline levels will be used to identify the extent of soil contamination. Contaminated soils will either be treated in place or removed in layers and sampling conducted following removal of each layer. This procedure will be used to minimize the amount of soil removed. The removal and sampling process will be repeated until the decontamination criteria are achieved or it is decided to close the CSU as a landfill.

In the event closure of the CSU by removal and decontamination cannot be achieved, a post-closure plan will be prepared for the site as required by 20.4.1 NMAC § 264.118. The plan will include provisions to stabilize the site and will describe planned monitoring activities, maintenance activities, and the frequencies at which these activities will be performed, as required by 20.4.1 NMAC § 264.118.

F.3.4.5 Decontamination of Equipment

Prior to use, sampling personnel will ensure that all reusable and/or disposable sampling equipment to be used during decontamination in closure activities is clean. If reusable sampling equipment is used, sampling equipment rinsate blanks will be collected and analyzed in accordance with the

QA/QC procedures described in the closure SAP. Reusable decontamination equipment, including protective clothing and tools, used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash water solution (the closure SAP will include a discussion of wash water solutions). Residue and disposable decontamination equipment as well as reusable decontamination equipment that cannot be decontaminated will be containerized and managed appropriately at an approved on-site facility, depending on the regulated constituents present.

F.3.5 Decontamination Verification

Sufficient sampling and analysis will be required to demonstrate that hazardous waste residue is not present at the CSU after closure. Wash water sampling, swipe sampling, or other appropriate sampling and analysis methodologies may be used to verify decontamination. The verification sampling method will be determined at the time of development of the TA-54 CSU-specific closure SAP and will be based on factors such as COPCs and materials of construction for the storage structure. The SAP will establish the minimum number of verification samples based on the total surface area of the CSU. Using a biased random sampling approach, items, structures, and/or surfaces will be sampled for verification of decontamination. Sample bias will include known or likely areas of contamination, low areas, sumps, and known spill locations, as determined to be appropriate on a case-by-case basis.

For wash water-based decontamination verifications (e.g., asphaltic-concrete pads), the samples of clean wash water solution squeezed from mops and/or sponges prior to use will be collected as background before initial wash down of any CSU, as described in Section F.3.3.2 of this closure plan. The samples will be analyzed for the appropriate parameters, as presented in the closure SAP. Analytical procedures will conform to methods found in the most current version of *SW-846* (U.S. Environmental Protection Agency [EPA], 1986). Used wash down solutions will be analyzed for the same parameters. Areas will be considered contaminated if the used wash water solution shows a significant increase (i.e., determined using statistical methods defined in *SW-846*) in the analytical parameters over those in the clean wash water solution or does not meet other decontamination criteria in Section F.3.6. If subsequent wash downs are deemed necessary, an additional sample of clean wash water solution squeezed from mops and/or sponges prior to use will be taken for each additional wash down event.

Swipe sampling may be used on a case-by-case basis (e.g., for smooth or impervious surfaces such as metal and dome fabric) to determine verification of decontamination at the TA-54 CSUs.

Background for swipe samples will be determined by submitting an unused swipe and solvent sample for analysis. Swipe samples will be analyzed using approved methods, which will be included in the closure SAP. The rationale for when swipe sampling will be conducted will also be included in the SAP.

If other sampling methodologies have been developed at the time of closure for the TA-54 CSU, their use to determine decontamination will be addressed in the closure SAP.

For any sampling methodology, decontamination will be verified if the collected samples meet any of the decontamination criteria listed in Section F.3.6 of this closure plan. If the verification sampling indicates contamination higher than the approved values, additional sampling will be performed to establish the boundaries of contamination for large structures. After establishing the boundaries of contamination, the decontamination process will be repeated within those boundaries, using portable berms or other appropriate material to limit the potential for run-off from the affected area. An additional round of verification sampling will be performed for all of the areas previously determined to be contaminated. After each decontamination event and verification iteration, a decision will be made to repeat the process or remove contaminated materials and dispose of them properly.

F.3.6 Decontamination Criteria

Successful decontamination is defined as one of the following criteria:

- No detectable hazardous waste or hazardous waste constituents from container storage activities are found in the final sample.
- Detectable hazardous waste or hazardous waste constituents from container storage activities in the final sample are removed to statistically significant levels based on baseline concentrations in the clean wash water.
- Detectable hazardous waste or hazardous waste constituents from container storage activities in the final sample are at or below levels agreed upon with the NMED.
- Detectable hazardous waste or hazardous waste constituent concentrations from container storage activities do not significantly decrease after several wash downs. In such an event, hazardous constituents that pose an acceptable risk will be allowed to remain, as mutually agreed upon with the NMED.

An alternative demonstration of decontamination may be proposed and justified at the time of unit closure, as circumstances indicate. The Secretary of the NMED will evaluate the proposed

alternative in accordance with the standards and guidance then in effect and, if approved, incorporate the alternative into this closure plan.

F.4 SAMPLING AND ANALYSIS PLAN

Sampling and analytical procedures will be performed during the decontamination and verification activities associated with the closure of the TA-54 CSUs covered by this plan. These procedures will use standard approved methods (e.g., *SW-846*, ASTM), as appropriate, for making closure decontamination verification determinations. However, the TA-54 CSUs are not anticipated to undergo closure for a relatively long time, and it is probable that sampling and analytical methods will be revised and improved before closure. In order to alleviate the need for future closure plan and permit modifications until actual closure activities are scheduled, LANL will submit TA-54 CSU-specific closure SAPs to the NMED at the time of closure notification for review and approval.

The TA-54 CSU-specific closure SAPs will contain a detailed discussion of the available CSU information and proposed closure methodology to assure the closure performance standards are met. These closure SAPs for the TA-54 CSUs will include:

- A detailed discussion of site characteristics.
- The CSU operational history, to include descriptions of known spills, releases, and/or evidence of potential problems (e.g., visual stains, dead vegetation, solid waste management units).
- Chemical properties of the waste stored at the CSU.
- Determination of applicable COPCs.
- A hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures for decontamination methods for equipment, structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the specific CSU.
- Methods for sampling and analysis of contaminated media.
- Removal procedures for contaminated media, if necessary.

- Sampling methods for decontamination media and hazardous waste determination. The discussion should include the rationale for using wash water samples, swipe samples, soil samples, and/or other sampling methodology.

- Sampling methods for decontamination verification procedures. The discussion should include the statistical or judgmental basis for determining the number of verification samples needed and the constituents to be analyzed for.

- Sampling equipment decontamination and disposition procedures.

- Sample handling and documentation procedures.

- Analytical methods (including detection limits) and the rationale for their determination.

- Disposition of removed waste, decontamination media, or contaminated soils. This discussion should include an identification of proposed on- or off-site hazardous waste management facilities that may be used for final disposition and the types of wastes anticipated to be shipped.

- Decontamination criteria.

- Statistical basis for verification of decontamination, if applicable. The discussion should include information on determination of statistical increases in analytical parameters and numerical values for significant increases.

- Risk assessment procedures to be used, if necessary.

- Field and laboratory QA/QC procedures.

- Schedule of closure activities, including decontamination, sampling, analysis, potential removal of soils, and closure certification submittal.

- Identification of contact person or office.

F.5 REFERENCES

DOE, 1999, "Radioactive Waste Management," *DOE Order 435.1*, U.S. Department of Energy, Washington, D.C.

EPA, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

Table F-1

General Schedule for Closure Activities at Technical Area 54 Container Storage Units (CSU)

Activity	Maximum Time Required[a]
Submit CSU-specific sampling and analysis plan (SAP)	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Collect background samples (as specified in SAP)	-5 Days
Final receipt of waste	Day 0
Begin closure activities - removal of wastes	Day 5
Decontamination of structure(s) and/or equipment	Day 10
Perform verification sampling of the structure(s) and/or equipment	Day 20
Evaluate analytical data	Day 50
Perform additional decontamination (if necessary)	Day 55
Perform additional sampling (if necessary)	Day 60
Evaluate analytical data	Day 75
Perform asphaltic concrete decontamination and sampling (if necessary)	Day 80
Evaluate analytical data (if necessary)	Day 95
Perform soil sampling (if necessary)	Day 100
Evaluate analytical data	Day 120
Perform final cleanup (e.g., removal of decontaminated equipment and decontamination wastes)	Day 140
Verify decontamination	Day 150
Submit closure certification to NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously and/or may not require the maximum time listed. Extensions to this schedule may be requested, as needed.

ATTACHMENT G

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CFR	Code of Federal Regulations
CMP	corrugated metal pipe
CSU	container storage unit
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DVRS	Decontamination and Volume Reduction System
FRP	fiberglass-reinforced plywood
ft	feet/foot
ft^2	square feet/foot
HDPE	high-density polyethylene
HEPA	high-efficiency particulate air
LACFD	Los Alamos County Fire Department
LANL	Los Alamos National Laboratory
m^3	cubic meters
MLLW	mixed low-level waste
MSDS	Material Safety Data Sheet
MTRUW	mixed transuranic waste
PPE	personal protective equipment
ppmw	parts per million by weight
PTLA	Protection Technology Los Alamos
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
TA	technical area
TRU	transuranic
UV	ultraviolet

ATTACHMENT G
CONTAINER MANAGEMENT

The information provided in this attachment addresses the applicable container storage requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), § 270.15, and 20.4.1 NMAC , Subpart V, Part 264, Subpart I, revised June 14, 2000 [6-14-00]. This attachment provides an overview of current facility operations and waste management practices at Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) and complements the information provided in Section 2.0 of this permit renewal application. It includes detailed descriptions of the TA-54 container storage units (CSU) and the current waste management practices associated with them. Detailed drawings are included in this attachment. Other detailed information (e.g., technical specifications for prefabricated sheds, coatings, liners) is provided in Supplement G-1 of this attachment, and is provided for informational purposes only. Table G-1 summarizes applicable regulatory references and the corresponding location where the requirement is addressed in this permit renewal application.

G.1 GENERAL FACILITY OPERATIONS AND WASTE MANAGEMENT PRACTICES [20.4.1 NMAC, Subpart V, Part 264, Subpart I]

TA-54 consists of 130 acres atop Mesita del Buey and is used for storage of hazardous and mixed waste generated throughout LANL. A principal mission of TA-54 is to manage LANL waste safely and efficiently, consistent with federal and state regulations and U.S. Department of Energy (DOE) requirements. TA-54 has three separate areas where hazardous and/or mixed waste is stored; the three areas include Area L, Area G, and TA-54 West (Figure G-1). There are two CSUs at Area L, nine CSUs at Area G, and two CSUs at TA-54 West. These CSUs are described in Sections G.2, G.3, and G.4.

The following provides an overview of current facility operations and waste management practices that are applicable to the CSUs at TA-54. This overview includes a discussion of container handling and inspection; security and access control; preparedness and prevention; hazards prevention; special requirements for ignitable, reactive, or incompatible waste; and air emission standards for containers. Similar information specific to the Area L, Area G, and TA-54 West CSUs is provided in Sections G.2, G.3, and G.4 of this attachment. This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Specific waste management practices and procedures detailed herein are subject to change.

G.1.1 Container Handling and Inspection [20.4.1 NMAC §§ 264.171, 264.173, and 264.174]

Handling and inspection requirements for containers stored within the TA-54 CSUs are presented in Sections 2.5 and 2.7, respectively, of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC §§ 264.171, 264.173, and 264.174 [6-14-00].

G.1.2 Security and Access Control [20.4.1 NMAC §§ 270.14(b)(4) and 270.14(b)(19)(viii); 20.4.1 NMAC § 264.14]

The CSUs at TA-54 are provided security by both their locations on top of Mesita del Buey and by 8-foot (ft) industrial chain-link fences topped by razor wire or barbed wire. Additional security is provided by a system of facility access controls to ensure that only authorized personnel are granted access. These access controls also ensure that all facility personnel can be identified and located in an emergency.

Depending on national security conditions, a guard station will be manned west of the TA-54 timed vehicle-access control gate. During intervals of high national security, it is currently planned that guard stations will also control public access on Pajarito Road east and west of TA-54. Therefore, only properly identified LANL and DOE employees or individuals under their escort will have access to TA-54 during those times.

During low national security conditions, any access to the TA-54 administrative area for Areas L and G is limited by a timed vehicle-access control gate on the entrance road to TA-54. This gate is open during normal working hours from 6:00 a.m. to 6:30 p.m., Monday through Friday (except holidays). Gate hours are subject to change. Access to TA-54 West is by a manually operated gate on the west side of the facility. The gate is also open during normal working hours. Access to any part of TA-54 before or after normal working hours or on weekends requires approval of the appropriate Group Leader or Facility Manager at TA-54. TA-54 is patrolled by Protection Technology Los Alamos (PTLA) security personnel during non-operational hours to ensure that the gates are locked and that unauthorized entry has not occurred.

Anyone entering the fenced Area L and Area G waste management areas from the TA-54 administrative area must be “badged in” via access control at TA-54-245 before proceeding. Badging in is the process of identifying the person, assessing his/her security and training status using DOE security badges, and determining the need for an escort. Authorized personnel may

enter the fenced portions of Areas L and G only after negotiating additional access controls in the form of walk-through turnstiles and motorized vehicle gates. Each turnstile and vehicle gate is equipped with a badge reader to ensure authorized access only.

Resident personnel are required to badge in upon arrival and prior to leaving TA-54, Areas L and G, and TA-54 West. Nonresident personnel and visitors are required to badge or sign in and out at an access control point. Depending on their level of training, nonresident personnel may be required to be escorted in order to access TA-54, Areas L and G, and TA-54 West. Access to the Area L, Area G, and TA-54 West CSUs requires additional controls. These controls are described in Sections G.2.1, G.3.1, and G.4.1, respectively.

G.1.3 Preparedness and Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; and 20.4.1 NMAC § 270.14(b)(8)]

The following presents information on the waste management techniques used at TA-54 to comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. This includes a discussion of the emergency equipment required at the facility, testing and maintenance of this equipment, personnel access to communications or alarm systems, aisle space and storage configuration, and support agreements with outside agencies. Each CSU at TA-54 has been or will be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment, in accordance with 20.4.1 NMAC § 264.31.

G.1.3.1 Required Equipment [20.4.1 NMAC § 264.32]

Emergency equipment is located throughout TA-54 and includes internal communications, alarm systems, fire alarms, spill kits, and decontamination equipment. Detailed information on the required emergency and safety equipment located at the Area L, Area G, and TA-54 West CSUs is provided in Sections G.2.2, G.3.2 and G.4.2, respectively. For additional information, see Tables E-1, E-2, and E-3 in Attachment E of this permit renewal application.

G.1.3.2 Testing and Maintenance of Equipment [20.4.1 NMAC § 264.33]

The communication, alarm system, fire protection, spill control, and decontamination equipment located within TA-54 is inspected and/or tested according to the inspection schedule detailed in Appendix C in the most recent version of the “Los Alamos National Laboratory General Part B

Permit Application," hereinafter referred to as the LANL General Part B. Maintenance, repair, and replacement of emergency equipment are performed, as needed.

G.1.3.3 Access to Communications or Alarm System [20.4.1 NMAC § 264.34]

All personnel involved in waste management activities at TA-54 have immediate access to internal alarms or emergency communication devices, either directly or through visual or voice contact with another individual. These devices include fire alarms, evacuation alarms, paging telephones, radios, and cellular telephones. The nature and locations of these devices are specific to the Area L, Area G, and TA-54 West CSUs. Detailed information for Area L, Area G, and TA-54 West is provided in Sections G.2.2, G.3.2, and G.4.2, respectively.

G.1.3.4 Aisle Space and Storage Configuration [20.4.1 NMAC § 264.35]

Information on aisle space and storage configurations for the TA-54 CSUs is presented in Sections 2.1.1.3, 2.1.2.3, and 2.1.3.3 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC § 264.35 [6-14-00].

G.1.3.5 Support Agreements with Outside Agencies [20.4.1 NMAC § 264.37(a)]

DOE maintains support agreements and contracts with outside agencies for emergency response assistance. Information regarding these contracts and support agreements is provided in Section 2.1.2.4 of the LANL General Part B.

G.1.4 Hazards Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

The following discusses the general procedures, equipment, and structures that are currently used at TA-54 to prevent hazards. This includes preventing hazards during unloading of waste containers, preventing run-on and runoff, preventing contamination of the water supply, mitigating the effects of power outages, preventing undue exposure to personnel, and preventing releases to the atmosphere.

G.1.4.1 Preventing Hazards in Unloading [20.4.1 NMAC § 270.14(b)(8)(i)]

Waste containers are transported to the Area L, Area G, and TA-54 West CSUs by flatbed trucks, closed-box trucks, or trailers. The CSUs have design features that promote safe unloading and handling of waste containers from these trucks and trailers. Ramps are typically located at the vehicle entrances to the dome structures at the Area L and Area G CSUs. Shed 31 at Area L and Shed 8 at Area G have sloped entryways for container-handling equipment. The storage domes

have roll-up or roll-away vehicle access doors. The loading dock at TA-54 West allows access from the transport vehicles to the loading dock platform. These design features facilitate safe handling of containers in and out of the CSUs.

All waste containers at the TA-54 CSUs are handled in a manner that will not cause them to rupture or leak, as required in 20.4.1 NMAC § 264.173(b) [6-14-00]. Most containers are handled with forklifts (using drum grapplers, when appropriate) and are placed directly in the appropriate CSU. For larger containers, personnel can use a boom or, at TA-54 West and in portions of Area L, a bridge crane or mobile crane, respectively. At TA-54-412, waste containers (FRP crates, drums, and large boxes) are generally handled with forklifts, overhead cranes, and frictionless air pallets. Smaller containers are generally handled manually or with drum dollies. The use of proper handling equipment, appropriate to a container's size and weight, helps to prevent hazards while moving containers (e.g., when loading and unloading containers).

G.1.4.2 Preventing Run-on and Runoff [20.4.1 NMAC § 270.14(b)(8)(ii)]

Run-on and runoff control methods for the TA-54 CSUs are presented in Section 2.10 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC § 270.14(b)(8)(ii) [6-14-00].

G.1.4.3 Preventing Water Supply Contamination [20.4.1 NMAC § 270.14(b)(8)(iii)]

It is not anticipated that there will be any impact to groundwater or other water supplies as a result of routine waste-handling operations at TA-54 because engineering and operational controls ensure that run-on and runoff are minimized. Containers are stored inside structures or with second containment, as necessary. Water supply lines are under pressure and are equipped with backflow prevention devices. Therefore, no impact to water supplies as a result of storage at the TA-54 CSUs is expected.

The depth to groundwater is approximately 890 ft (Ball et. al., 2002, p. 30), and no perched aquifers have been identified beneath Mesita del Buey (LANL, 1998, p. 4-59). In 1985, test wells were installed in the canyons north and south of TA-54 to determine if perched water exists within canyon alluvium, to determine if perched water extends beneath Mesita del Buey, and to sample/monitor perched water, if present. Three test wells were installed in a tributary to Cañada del Buey; they include CDBO-1, CDBO-2, and CDBO-3. Test well CDBO-4 was installed further to the east in Cañada del Buey (see Figures 2-1 and 2-3 in Section 2.0). All four wells were dry; however, they

were completed as observation wells to monitor the alluvium for possible water in the future (LANL, 1995, pp. 116 and 127-128).

Three test wells were installed in Pajarito Canyon; they are PCO-1, PCO-2, and PCO-3 (LANL, 1995, pp. 116 and 129) (see Figures 2-1 and 2-3 in Section 2.0). These three wells are sampled annually for radionuclides, metals, and general inorganics; they are sampled triennially for organics. Sampling results are compiled annually in environmental surveillance reports and submitted to the New Mexico Environment Department. To ensure that the alluvial aquifer in Pajarito Canyon did not extend northward beneath Mesita del Buey, four test holes were drilled in the canyon floor north of the intermittent stream channel. These four test holes, designated PCM-1, PCM-2, PCM-3, and PCM-4, were dry. They were completed for use as moisture-access holes (LANL, 1995, pp. 115 and 130). It was concluded that perched water in Pajarito Canyon is confined to the alluvium in the stream channel and does not extend to the flank of the canyon (LANL, 1995, p. 113).

Five observation wells were installed in Cañada del Buey, mostly up-gradient from Area L, as part of a 1992 investigation for a proposed sanitary wastewater treatment plant. These wells, installed to study the effect of effluent release on the environment in the canyon, are CDBO-5, CDBO-6, CDBO-7, CDBO-8 and CDBO-9. In addition, two moisture-access holes (CDBM-1 and CDBM-2) were drilled north of Area L in 1992. Perched water was encountered in the canyon alluvium at wells CDBO-6 and CDBO-7. It was determined that the perched water at these locations is likely the result of operational discharges from well PM-4 (LANL, 1995, p. 114).

Regional well R-22, located on Mesita del Buey just east of Area G, was drilled to a total depth of 1,489 ft in 2000. Two potential perched zones and one regional zone of saturation were originally predicted at well R-22. The two zones that could potentially support perched water were predicted at a depth of 148 ft in the Cerros del Rio basalt and at a depth of 487 ft in the Puye Formation; the regional water table was anticipated to be at a depth of 922 ft in the Puye Formation. No water was encountered until the drillers first noted water at a depth of approximately 890 to 900 ft. The water is believed to be associated with the regional zone of saturation because the regional water table was projected to be at a similar depth, no obvious perching horizon was encountered, and saturation continued from 900 ft to the total depth drilled.

Regional well R-21, located in Cañada del Buey just north of Mesita del Buey, was drilled in 2002. A report describing this well will be provided to the NMED upon completion.

G.1.4.4 Mitigating Effects of Power Outages [20.4.1 NMAC § 270.14(b)(8)(iv)]

Electrical power is supplied to the structures at TA-54 to operate evacuation alarms, lighting, and various types of monitoring equipment. Battery backup systems (uninterruptible power systems) are provided at Areas G and L for the emergency evacuation alarm, which will continue to operate for eight hours. TA-54-412 has a backup generator that will provide electricity to the Decontamination and Volume Reduction System (DVRS) operations and its monitoring equipment to allow workers to safely cease operations and exit the building. TA-54-33 and TA-54-412 at Area G and TA-54-39 and TA-54-215 at Area L have battery-powered emergency lighting. Operations in each CSU are discontinued if the electrical power is not restored quickly. Specific procedures and contingencies have been developed to handle power outages at the Area L, Area G, and TA-54 West CSUs. These include the procedure to exit domes when electricity goes out. When power is restored, performance tests on monitoring equipment are conducted to ensure they are operating properly prior to allowing any workers to return to the domes. Based on the TA-54 procedures, the loss of electricity will not affect secondary containment or significantly affect health and safety issues.

TA-54 has a Maintenance Implementation Plan that addresses maintenance implementation for equipment associated with all facility operations. The plan provides the basis for planning, scheduling, and coordinating preventive and/or corrective maintenance to keep equipment associated with all facility operations in proper working order.

G.1.4.5 Preventing Undue Exposure [20.4.1 NMAC § 270.14(b)(8)(v)]

Personnel at the TA-54 CSUs are required to use appropriate personal protective equipment (PPE) to protect themselves from the hazards found in the workplace under normal conditions. Use of PPE protects workers from direct contact with and inhalation or ingestion of hazardous materials. At TA-54, PPE is used routinely during waste-handling operations and when responding to unusual hazardous situations. The different levels of PPE are defined by the Occupational Safety and Health Administration as follows:

- *Level D*: Coveralls; safety boots; safety glasses or goggles; hard hat; and appropriate gloves
- *Level C*: Full-face, air-purifying respirator with appropriate cartridges for the chemicals or hazards present; chemical-resistant suits; chemical-resistant safety boots or booties; and inner and outer gloves

- *Level B*: All Level C equipment plus self-contained breathing apparatus in place of a Level C full-face respirator
- *Level A*: All Level B equipment, plus a fully-encapsulating chemical-resistant suit.

Most waste-handling operations at the TA-54 CSUs require that personnel handling wastes or working in the CSUs wear modified Level D PPE, depending on the associated work hazards identified in job-specific hazard control plans. Modified Level D may include any item in Level D. There are instances where an increased level of PPE is required, such as during an emergency or unusual hazardous situation. If a situation arises during an emergency and an increased level of PPE is required, the PPE will be compatible with the wastes present. All personnel that use PPE are trained and qualified to use the equipment properly.

All personnel involved in waste-handling operations in the TA-54 CSUs are required to have training appropriate for their work. Training requirements are presented in Attachment D of this permit renewal application and in Appendix D of the LANL General Part B. Personnel are also required to review job hazards prior to performing waste-handling activities. Sampling plans, hazard control plans (which address monitoring equipment), and work authorizations are required, in accordance with LANL safety procedures. Personal monitoring equipment is established using the job hazard review process. Together, the required training, plans, and work authorizations help to prevent undue exposure to personnel.

G.1.4.6 Preventing Releases to the Atmosphere [20.4.1 NMAC § 270.14(b)(8)(vi)]

Releases to the atmosphere are limited at the TA-54 CSUs because containers are kept closed during storage. In routine hazardous waste and mixed low-level waste (MLLW) operations, the only exceptions to this practice are when, upon inspection, it is determined that a container currently in storage needs to be overpacked or repackaged in a new container, or during waste characterization or verification activities.

For MLLW and mixed transuranic waste (MTRUW), operations at TA-54-412 are contained in a pre-engineered metal structure to provide containment. An external secondary confinement structure surrounds the internal primary confinement structure. Both primary and secondary confinement structures are equipped with an air filtration system that includes a high-efficiency particulate air (HEPA) ventilation system to prevent the release of particulates to the environment.

The transuranic waste characterization facilities on Pad 10 (former Pads 2 and 4) will include glove boxes and hoods for managing mixed waste. The transuranic waste characterization facilities transportainers will provide external confinement for those operations. The equipment and the transportainers will have HEPA filtration systems to contain potential releases.

MTRUW containers are vented with one or more filters to allow any gases that are generated by radiolytic and microbial processes within a waste container to escape, thereby preventing over pressurization within the container. The HEPA-grade vent filters prevent the escape of any radioactive particulates.

G.1.5 Special Requirements for Ignitable, Reactive, or Incompatible Waste [20.4.1 NMAC §§ 264.17(a), 264.176, and 264.177(a)(b) and (c); 20.4.1 NMAC § 270.14(b)(9)]

Special requirements for ignitable, reactive, or incompatible waste at the TA-54 CSUs are presented in Section 2.8 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC §§ 264.17(a), 264.176, and 264.177(a)(b) and (c); and 20.4.1 NMAC §§ 270.14(b)(9) and 270.15(d) [6-14-00].

G.1.6 Air Emission Standards for Containers [40 CFR, Part 264, Subpart CC]

The hazardous wastes stored in containers at TA-54 may be subject to 20.4.1.500 NMAC (incorporating the Code of Federal Regulations [CFR], Title 40, Part 264, Subpart CC, "Air Emission Standards for Tanks, Surface Impoundments, and Containers") based on the applicability criteria specified in 40 CFR § 264.1080. Subpart CC standards for containers, as currently set forth by the U.S. Environmental Protection Agency, require that containers of hazardous waste be covered so that there are no detectable emissions of volatile organic compounds to the air. Inspection and monitoring requirements are also specified.

As indicated in 40 CFR § 264.1080(b)(6), these standards are not currently applicable to containers that are used solely for management of radioactive mixed waste in accordance with all regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act. The standards are also not applicable to containers of hazardous waste with less than 500 parts per million by weight (ppmw) volatile organics, containers of less than 0.1 cubic meters (m^3) (approximately 26 gallons) capacity, or that have received waste prior to the effective date of the regulation (December 6,

1996). The following management standards apply for hazardous wastes managed at LANL that do not meet any of the exemptions listed in 40 CFR §264.1080(b).

LANL requires that Subpart CC requirements be evaluated by the generator as part of the waste characterization process. Generator information is used to determine whether the concentration of volatile organics in a waste stream at the point of generation is less than 500 ppmw, or is equal to or greater than 500 ppmw, which is the threshold concentration for Subpart CC requirements. The generator documents this determination for that waste stream. In the event that this information is not available, the waste will be characterized in accordance with Appendix B of the LANL General Part B prior to being received by TA-54. Any hazardous waste that is newly-generated through the treatment or re-characterization of mixed waste at TA-54 will be characterized for the volatile organic content in accordance with Appendix B.

Three levels of air emission controls based on container design capacity are established in 40 CFR § 264.1086(b). TA-54 hazardous waste storage procedures require Level 1 controls based upon container design capacities. Containers of greater than 0.1 m^3 and less than 0.46 m^3 (approximately 119 gallons) capacity and that meet U.S. Department of Transportation (DOT) specifications under 49 CFR, Part 178, are kept closed during storage pursuant to 40 CFR § 264.1086(c)(3). Containers undergoing waste characterization activities may be opened for access for the purposes described in 40 CFR § 264.1086(c)(3). As required by 40 CFR § 264.1086(c)(4), these containers are subject to a visual inspection and monitoring program. On or before acceptance of the waste container at TA-54, the container is inspected to check for visible cracks, holes, gaps, or other open spaces into the interior of the container when the cover and closure devices are secured in the closed position, in accordance with 40 CFR § 264.1086(c)(1)(ii). This inspection is documented in uniform hazardous waste manifests. Pursuant to the Inspection Plan in Appendix C of the LANL General Part B, containers are inspected weekly at TA-54 to ensure that the containers remain closed during storage, thereby exceeding the requirements of 40 CFR § 264.1086(c)(4)(ii).

G.2 AREA L CONTAINER STORAGE UNITS [20.4.1 NMAC, Subpart V, Part 264, Subpart I]

The following provides specific information on current facility operations and waste management practices at the two Area L CSUs. This includes a discussion of security and access control, preparedness and prevention, hazards prevention, and design information for the Area L CSUs.

This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Detailed information is subject to change.

G.2.1 Security and Access Control [20.4.1 NMAC §§ 270.14(b)(4) and 270(b)(19)(viii); 20.4.1 NMAC § 264.14]

Security at the Area L CSUs is maintained by both artificial and natural barriers. These barriers prevent unauthorized entry of persons or livestock into Area L and satisfy the requirements of 20.4.1 NMAC §§ 264.14(a) and 264.14(b)(2) [6-14-00]. An 8-ft-high chain-link security fence with razor or barbed wire at the top surrounds the entire perimeter of Area L. Bilingual (i.e., English and Spanish) warning signs are posted on the fence at 50- to 75-ft intervals and can be seen from any approach to this area. The legends on the signs indicate "Danger—Hazardous Waste Storage Area" and "Unauthorized Persons Keep Out." The signs are legible from a distance of 25 ft. The security fence is inspected by on-site personnel and repairs are made, as necessary. An entry gate and station are located on Mesita del Buey Road at the west central portion of Area L. In accordance with 20.4.1 NMAC § 270.14(b)(19)(viii) [6-14-00], the locations of the security fence, entry gates, and entry stations are shown on Figure 2-1 in Section 2.0 of this permit renewal application. Cliffs on the north and south sides of Area L provide additional security as a natural barrier to discourage unauthorized entry.

Access to the Area L CSUs is controlled by a gate. Authorized resident personnel must badge in/out at the magnetic badge reader to enter or leave through the gate. Individuals who do not have a DOE-issued badge must be escorted after signing the visitor's log located in the administrative area's access control building. These procedures limit access to the Area L CSUs and provide a means of tracking personnel on site, should there be an emergency or evacuation.

G.2.2 Preparedness and Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; and 20.4.1 NMAC § 270.14(b)(8)]

The following presents information on the emergency equipment available at the Area L CSUs to comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. This includes the approximate locations of fire extinguishers, shower/eyewash stations, spill kits, windsocks, and communication/alarm systems.

Required Equipment [20.4.1 NMAC § 264.32]

Area L is equipped with an audible alarm system to alert personnel of a fire or the need to evacuate the area. This alarm can be activated by pulling a fire alarm or by pushing the evacuation alarm

button. These alarms are located throughout Area L and are connected to the Los Alamos County Fire Department (LACFD) through LANL's central alarm system at all times. In addition to the alarms, there are numerous telephones located in and around the structures within Area L. These telephones ensure that personnel can contact on-site and LANL emergency personnel at all times. Many of these telephones also serve as emergency paging phones so that information can be announced throughout the area. Windsocks are also located at strategic locations to indicate wind direction and strength.

Fire control equipment at Area L includes fire extinguishers (halon, water, carbon dioxide, and/or dry chemical), a dry-pipe sprinkler system, and dry chemical systems. The fire extinguishers are available at or near most structures within Area L for use by on-site personnel, depending on the size and fuel source of a fire. Dome 215 has an automatic dry-pipe sprinkler system that is heat activated in the event of a fire. Storage Sheds 68, 69, and 70 have dry chemical systems. Fire hydrants are located near TA-54-37 and the southeast corner of TA-54-62. The fire hydrants supply water at an adequate volume and pressure to satisfy the requirements of 20.4.1 NMAC § 264.32 [6-14-00].

Personal decontamination equipment at Area L includes emergency eyewash stations and showers. This equipment is for use by personnel in emergencies involving chemical and/or radiological materials. These stations are generally located near or inside structures where waste is being handled. Emergency shower and eyewash stations are currently located at or near TA-54-39, TA-54-31, TA-54-215, TA-54-216, and TA-54-35. Waste characterization documentation and/or Material Safety Data Sheets (MSDS) are also available in the event of a chemical exposure.

There are several spill kits available at Area L to mitigate small containable spills. These kits typically contain sorbents, neutralizers, PPE, and other equipment essential for containment of small spills. Trained personnel use the spill kits only if they know what has been spilled and they are sure their actions will not put themselves or others at risk. In addition to the spill kits, shovels for cleanup are stored in TA-54-46. Oversized drums and sorbents are also stored at various locations throughout Area L. For larger spills or other unusual hazardous situations, a variety of equipment is available to emergency personnel. This equipment includes forklifts, self-propelled loaders, and other heavy equipment from Area G.

G.2.3 Hazards Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

The Area L CSUs are designed and operated to minimize the possibility of a fire, explosion, or any unplanned releases of hazardous wastes or hazardous waste constituents which could threaten human health or the environment. The following discusses the procedures, equipment, and structures that are used at Area L to mitigate the effects of power outages. Prevention of run-on and runoff at Area L is discussed in Section 2.10.1 of this permit renewal application.

Mitigating Effects of Power Outages [20.4.1 NMAC § 270.14(b)(8)(iv)]

Electrical power is supplied to Area L to operate evacuation alarms, lighting, and various types of monitoring equipment. Operations at Area L are discontinued if the electrical power is not restored quickly or if there is the possibility of an ignition. A power failure will not affect containment at the Area L CSUs.

G.2.4 Area L CSUs [20.4.1 NMAC § 270.15]

The following describes the two CSUs at Area L (see Figure 2-1). The two CSUs are the aboveground CSU within the fence and the Storage Shafts CSU. The aboveground CSU within the fence is comprised of several storage structures (TA-54-215; TA-54-216; Storage Sheds 68, 69, and 70; Storage Shed 31; TA-54-32; TA-54-35; TA-54-36; TA-54-58; and TA-54-39) and the asphaltic concrete-covered area. General dimensions, containment features, and materials of construction are discussed in this section to fulfill the requirements of 20.4.1 NMAC §§ 270.15(a)(1) and (2) [6-14-00].

G.2.4.1 Aboveground CSU within the Fence

The aboveground CSU within the fence stores containers of hazardous waste and MLLW in solid and liquid form. Liquid wastes are stored primarily in structures that are designed for secondary containment; however, secondary containment pallets are also used. Secondary containment pallets are typically constructed of polyethylene or metal painted with a chemical-resistant coating (see Supplement G-1 for additional details, including compatibility). Polyethylene secondary containment pallets used at TA-54 are generally 50 inches long by 50 inches wide by 17 inches deep, with a designed capacity of 83 gallons. Currently, two sizes of metal secondary containment pallets are used at TA-54. One is 52 inches long by 52 inches wide by 6.5 inches deep, with a designed capacity of 57 gallons; the other is 60 inches wide by 60 inches long by 6.5 inches deep,

with a designed capacity of 77 gallons. The metal secondary containment pallets are coated with chemically-resistant urethane.

The stressed- or tensioned-membrane fabric used on Storage Dome 215 and Canopy 216 at the aboveground CSU within the fence at Area L are similar. This fabric is coated with ultraviolet (UV)-stabilized plasticized polyvinyl chloride (PVC). It is fungus-resistant and certified flame-retardant (i.e., self-extinguishing). See Supplement G-1, SPRUNG Instant Structures, for additional details.

Storage Dome 215

Storage Dome 215 (TA-54-215) is 60 ft wide, approximately 266 ft long, and 26 ft high (see Figure G-2). It is an arch frame-supported stressed-membrane structure. The dome is of modular construction and uses light construction materials (i.e., aluminum framework with membrane/fabric covering). It is equipped with 14 personnel doors and two roll-up doors. The dome's pad is equipped with a 6-inch-high, 8-inch-wide concrete ring wall that surrounds the perimeter of the dome, and the dome is anchored to the concrete ring wall with anchor bolts. A ramp is located at the vehicle entrance to the dome and allows vehicles and container handling equipment to pass safely over the ring wall. The ring wall and the ramp prevent run-on into the dome. Any liquid that might accumulate within the storage dome (e.g., liquids resulting from fire-suppression activities) is contained within the ring-walled area. Liquid that may result from fire-suppression activities and that is in excess of the capacity inside the ring wall is collected in a double-walled holding tank connected to TA-54-215 by a double-walled pipe.

All waste containers at TA-54-215 are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. All liquid wastes are stored on secondary containment pallets that have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any accumulated liquids are removed and collected for characterization as described in Section 2.6 of this permit renewal application.

Canopy 216

Canopy 216 (TA-54-216) is approximately 33 ft wide and 120 ft long (see Figure G-3). This storage structure consists of a rigid aluminum frame that supports a tensioned membrane. A series of aluminum I-beam trusses, spanning the width of the structure, comprise its framework. The

membrane is integrally connected to the frame to provide a fully-tensioned fit for the roof and one side of the structure. The membrane on the remaining three sides of the structure can be rolled down to provide further containment or protection from the weather. The canopy frame is anchored to a sloped asphaltic-concrete pad.

All waste containers at TA-54-216, including gas cylinders, are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers, baskets) to prevent contact with accumulated liquids. All liquid wastes are stored on secondary containment pallets that have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any accumulated liquids are removed and collected for characterization as described in Section 2.6 of this permit renewal application.

Storage Sheds 68, 69, and 70

Storage sheds 68, 69, and 70 are prefabricated sheds constructed of steel (see Supplement G-1, Safety Storage Building, Model 22). Each shed measures approximately 23 ft long, 9 ft wide, and 8.5 ft high. Access to these storage sheds is obtained through one of three sets of double doors. Storage Shed 68 has three separate compartments, with one door leading to each compartment. Storage Sheds 69 and 70 each have two separate compartments, with one door leading to the smaller compartment and two doors leading to the larger compartment. The sheds are elevated by design, which prevents run-on.

Each shed is constructed with liquid-tight sumps to ensure containment of any potential leaks or spills and to prevent runoff. The floor of each shed consists of a metal grate that covers the sump areas. Containers are placed directly on the metal grates, which prevent contact with liquids that may have accumulated in the sumps. The interior of each shed and sump is coated with chemically-resistant epoxy paint. The designed sump storage capacity of each shed is 750 gallons, which exceeds the amount necessary to hold 10% of the total storage capacity of each shed (1,760 gallons; see Supplement 2-1). Shed 68 has three separate compartments (see Figure G-4), each having its own sump with individual capacities of 250 gallons. Sheds 69 and 70 have two separate compartments (see Figure G-4), each having its own sump. One compartment consists of two thirds of the surface area (and capacity) of Sheds 69 and 70. The capacity of this compartment's sump is 500 gallons; the smaller compartment's sump capacity is 250 gallons. Additional engineering details and technical specifications for these sheds are provided in Supplement G-1.

Potential liquids that might accumulate within the sump areas (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

Storage Shed 31

Storage Shed 31 is a prefabricated shed constructed of steel. It measures approximately 14 ft long, 13 ft wide, and 8 ft high (see Figure G-4). The shed sits on a concrete foundation that has a raised edge and is surrounded by asphaltic concrete that is sloped away from the shed to prevent run-on.

The shed has three separate liquid-tight recessed sumps in the concrete foundation that are each covered with a steel grate (see Figure G-4). Containers are stored on the steel grates, which prevent contact with liquids that may have accumulated in the sumps. The sumps and the concrete foundation are coated with chemically-resistant paint. Two of the sumps are approximately 6 ft long by 4 ft wide; the third sump is approximately 7 ft long by 6 ft wide. All three sumps are 5 inches deep. The total capacity of the three sumps is approximately 285 gallons, which exceeds the amount necessary to hold 10% of the total storage capacity of the shed (1,320 gallons; see Supplement 2-1). Potential liquids that might accumulate within the sumps (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-32

TA-54-32 (see Figure G-5) consists of a concrete pad that is 116.5 ft long by 15.5 ft wide. The structure is covered by a 117.75-ft-long by 25.75-ft-wide canopy. The canopy provides protection from the weather. The concrete pad is bermed by a 1-ft-wide, 6- to 8-inch-high concrete curb. This curbed area is divided into six separate containment cells to segregate wastes with different hazard classes. The curb prevents run-on of storm water.

Each containment cell consists of a recessed sump covered with a grate flooring on which containers are stored (see Figure G-6); this prevents contact with liquids that may have accumulated in the sumps. The cells are separated by metal partitions above the flooring. The concrete sumps are treated with chemical-resistant epoxy filler-sealer and protective coating, providing an impervious seal to contain any potential leaks, spills, or accumulation of precipitation (see Supplement G-1 for details). Cells 1 and 6 are approximately 26.5 ft long by 13.5 ft wide by 1 ft deep, with a sump capacity of 2,675 gallons each. Cells 3 and 5 are approximately 16.8 ft long by 13.5 ft wide by 1 ft deep, with a sump capacity of 1,700 gallons each. Cells 2 and 4 are approximately 13.5 ft long by 11.2 ft wide by 1 ft deep, with a sump capacity of approximately 1,130 gallons each. These sump capacities exceed the amount necessary to hold 10% of the maximum

storage capacity for TA-54-32 (see Supplement 2-1). Potential liquids that might accumulate within the containment cells (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-35

TA-54-35 (see Figure G-7) consists of a concrete pad that measures 31.5 ft long by 31.5 ft wide. The area is covered by a 136-ft-long, 48-ft-wide canopy that provides protection from the weather. The pad has a 6-inch-high concrete berm that prevents run-on and runoff of liquids. The bermed area has an elevated ramp on one side to allow access for equipment to move waste containers. The ramp also helps to prevent run-on of precipitation and runoff of any accumulated liquids.

The bermed secondary containment area of the pad is approximately 29.5 ft long by 24.5 ft wide by 8 inches deep (see Figure G-8). Stored waste containers are elevated on pallets to prevent contact with any potential accumulated liquids. The concrete berms and the base of the concrete pad are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any leaks, spills, or accumulation of precipitation. The secondary containment capacity of the bermed area is approximately 3,570 gallons, which exceeds the amount necessary to hold 10% of the maximum storage capacity for TA-54-35 (15,840 gallons; see Supplement 2-1). Potential liquids that might accumulate within the bermed area (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-36

TA-54-36 (see Figure G-7) is a 33-ft-long by 31.5-ft-wide concrete pad. It is covered by a 136-ft-long, 48-ft-wide canopy that provides protection from the weather. The pad is surrounded by a 1-ft-wide berm that varies from 6 inches to 1 ft in height. The berm prevents run-on and runoff of liquids.

The bermed secondary containment area of the pad is approximately 30.5 ft long by 30 ft wide by 9 inches deep (see Figure G-8). The berm and the base of the concrete pad are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any leaks, spills, or accumulation of precipitation. The secondary containment capacity of the bermed area is approximately 4,595 gallons, which exceeds

the amount necessary to hold 10% of the maximum storage capacity for TA-54-36 (13,200 gallons; see Supplement 2-1).

The pad also contains a Perma-Con® structure. The Perma-Con® is constructed of 4-ft-wide, 8- or 4-ft-long, 22-gauge stainless-steel panels that interlock in a self-supporting structural steel framework. The Perma-Con® system can be assembled into multiple configurations (see Supplement G-1 for additional details on the Perma-Con®). The Perma-Con® is 28 ft wide by 28 ft long by 12 ft high. It is equipped with a 20-ft-long observation room that attaches to the main enclosure. The main enclosure has two personnel doors and an 8-ft-wide roll-up door. The floor in the main enclosure is the concrete pad covered with multiple layers of heavy duty plastic sheeting that are taped together and are extended approximately 1 ft up the sides of the Perma-Con®. The Perma-Con® has a tarp covering its roof to provide additional protection from the elements, thereby preventing the influx of precipitation, including melting snow.

All waste containers at TA-54-36 are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Potential liquids that might accumulate within the bermed area or the Perma-Con® (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-58

TA-54-58 (see Figure G-7) measures 33 ft long by 31.5 ft wide. It is covered by a 136-ft-long, 48-ft-wide canopy that provides protection from the weather. The pad has a 1-ft-wide berm that varies from 6 inches to 1 ft in height. The berm prevents run-on and runoff of liquids. The bermed area has an elevated ramp on one side to allow access for equipment to move waste containers. The ramp also helps to prevent run-on of precipitation and runoff of any accumulated liquids.

The bermed secondary containment area of the pad is approximately 30.5 ft long by 25 ft wide by 6 inches deep (see Figure G-8). Stored waste containers are elevated on pallets to prevent contact with any potential accumulated liquids. The berm and the base of the concrete pad are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any leaks, spills, or accumulation of precipitation. The secondary containment capacity of the bermed area is approximately 2,850 gallons, which exceeds the amount necessary to hold 10% of the maximum storage capacity for TA-54-58 (15,840 gallons;

see Supplement 2-1). Potential liquids that might accumulate within the bermed area (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-39 and Containment Pad

TA-54-39 measures 40 ft long by 40 ft wide (see Figure G-9). It is a metal panel building set on a concrete foundation with a metal canopy attached to the south side of the building. The rectangular metal canopy measures 83 ft long by 46 ft wide.

There are two areas associated with TA-54-39 that provide secondary containment. These areas include Room 101, located inside the building, and a containment pad located at the south end of the building.

Room 101 (see Figure G-10) inside TA-54-39 has a 6-inch-high concrete curb that surrounds the room. The curb and floor of this 878 square foot (ft^2) room are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any potential leaks, spills, or accumulation of precipitation. The secondary containment capacity for Room 101 is approximately 3,280 gallons, which exceeds the amount necessary to hold 10% of the maximum storage capacity of the room (9,900 gallons; see Supplement 2-1).

The containment pad at the south end of TA-54-39 consists of two sections. The pad is covered by a metal canopy, which provides protection from the weather. The eastern section of the containment pad is constructed of asphaltic concrete and measures 83 ft long by 23 ft wide. The western section of the containment pad is approximately 58 ft long by 16 ft wide (see Figure G-10) and is surrounded by a 1-ft-high concrete curb, which prevents run-on and runoff of liquids. The concrete floor and curb are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any potential leaks, spills, or accumulation of precipitation. The curbed area slopes toward a sump for collection of any accumulated liquids. The secondary containment capacity for the western section of the TA-54-39 containment pad is approximately 7,120 gallons, which exceeds the amount necessary to hold 10% of the maximum storage capacity of this section of the containment pad (15,180 gallons; see Supplement 2-1).

All waste containers stored at TA-54-39 are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Potential liquids that might accumulate within Room 101 or within the western section of the containment pad (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

Asphaltic Concrete-Covered Areas

The asphaltic concrete-covered areas consist of a 4- to 6-inch-thick asphaltic concrete over a base course. Asphaltic concrete-covered areas are typically sloped 1 to 1.5% to facilitate drainage (see Figure 2-1). Some areas include a 6-inch-high, 8-inch-wide asphaltic-concrete berm to prevent run-on and runoff.

All waste containers on the asphaltic concrete-covered areas are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. All liquid wastes are stored on secondary containment pallets that have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any accumulated liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.2.4.2 Storage Shafts CSU

The Storage Shafts CSU is comprised of two retrievable storage shafts, Shafts 36 and 37. This CSU is located in the northwest corner of Area L. It stores highly radioactive mixed waste lead stringers that were used to hold targets in the particle beam operated at TA-53. Shaft 36 is constructed of 30-inch-diameter corrugated metal pipe (CMP); Shaft 37 is constructed of 48-inch-diameter CMP (see Figures G-11 and G-12). Each shaft has a welded metal plate and a 1-ft-deep concrete plug at the base. Shaft 36 is 27.25 ft deep; Shaft 37 is 35.75 ft deep. The annular space in the ground surrounding the CMP is filled with crushed tuff to 48 inches from the surface and concrete to the surface. Each shaft has a steel cover. At the surface, the CMP is raised above a concrete pad, which extends from the edge of the pipe to prevent infiltration of precipitation. The shafts are also covered with one or two 4-ft-long, 4-ft-wide concrete blocks that rest on railroad ties for stability.

The Storage Shafts CSU stores only solid-form wastes and, as stated above, a concrete pad extends outward from each shaft to prevent infiltration of precipitation. Therefore, in accordance with 20.4.1 NMAC § 264.175(c)(1), a containment system for this CSU is not required. The CMP is compatible with the lead stringer wastes; thus, the requirements of 20.4.1 NMAC § 264.172 are met. The shafts are kept closed during storage and the wastes are not stored in a manner that may rupture the shafts or cause them to leak, which meets the requirements of 20.4.1 NMAC § 264.173. Weekly inspections are conducted at this CSU, as described in Section C.2 of the Inspection Plan in Appendix C of the LANL General Part B. This satisfies the requirements of 20.4.1 NMAC § 264.174.

G.3 AREA G CONTAINER STORAGE UNITS [20.4.1 NMAC, Subpart V, Part 264, Subpart I]

The following provides specific information on current facility operations and waste management practices at the Area G CSUs. This includes a discussion of security and access control, preparedness and prevention, hazards prevention, and design information for the Area G CSUs. This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Detailed information is subject to change.

G.3.1 Security and Access Control [20.4.1 NMAC §§ 270.14(b)(4) and 270.14(b)(19)(viii); 20.4.1 NMAC § 264.14]

Security at the Area G CSUs is maintained with both artificial and natural barriers. These barriers prevent unauthorized entry of persons or livestock into Area G and satisfy the requirements of 20.4.1 NMAC §§ 264.14(a) and 264.14(b)(2) [6-14-00]. An 8-ft-high chain-link security fence with razor wire at the top surrounds the entire perimeter of Area G. Bilingual (i.e., English and Spanish) warning signs are posted on the fence at approximately 50- to 75-ft intervals and can be seen from any approach to this area. The legends on the signs indicate "Danger—Hazardous Waste Storage Area" and "Unauthorized Persons Keep Out." The signs are legible from a distance of 25 ft. Two entry gates are located on Mesita del Buey Road at the west end of Area G, and an entry station is located adjacent to the inner gate. TA-54 is patrolled by PTLA security personnel during non-operational hours to ensure that the gates are locked and that unauthorized entry has not occurred. The security fence is also inspected by on-site personnel and repairs are made, as necessary. In accordance with 20.4.1 NMAC § 270.14(b)(19)(viii) [6-14-00], the locations of the security fence, entry gates, and entry stations are shown on Figure 2-3 in Section 2.0 of this permit renewal application. In addition to the fence and entry station, cliffs on the north and south sides outside of Area G provide natural barriers to discourage unauthorized entry.

Access to the Area G CSUs is controlled by a gate. Authorized resident personnel must badge in/out at the magnetic badge reader to enter or leave through the gate. Individuals who do not have a DOE-issued badge must be escorted after signing the visitor's log located in the administrative area's access control building. These procedures limit access to the Area G CSUs and provide a means of tracking personnel on site, should there be an emergency or evacuation.

G.3.2 Preparedness and Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; and 20.4.1 NMAC § 270.14(b)(8)]

The following describes the emergency equipment available at the Area G CSUs to comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. This includes the approximate locations of fire extinguishers, shower/eyewash stations, spill kits, windsocks, and communication/alarm systems.

Required Equipment [20.4.1 NMAC § 264.32]

PPE and emergency equipment supplies are stored at various locations throughout Area G. All personnel who may be required to use PPE and emergency equipment are trained in its use. In addition, essential information for emergency personnel is located at the main gate to Area G in the event of an emergency after normal working hours, or if Area G personnel are unavailable.

Area G is equipped with an audible alarm system to alert personnel of a fire or the need to evacuate the area. The alarms can be activated by pulling a fire alarm or by pushing the evacuation alarm button. Fire alarms, evacuation alarms, and strobe lights are in place at strategic locations to alert personnel of emergency conditions. These alarms are located throughout Area G and are connected to the LACFD through LANL's central alarm system at all times. Personnel working in Area G also carry pagers, cellular telephones, or two-way radios. Emergency paging telephones are in place so that information can be announced throughout the area. This equipment ensures that personnel can contact on-site and LANL emergency personnel at all times. Windsocks are at strategic locations to indicate wind direction and strength.

There are different types of monitoring equipment located at the Area G CSUs that are used to qualitatively and/or quantitatively evaluate airborne contaminants. Alarms and strobe lights warn personnel when airborne concentrations exceed preset limits.

Fire control equipment is located throughout Area G. This equipment includes halon, water, and/or carbon dioxide fire extinguishers, dry-chemical fire suppression systems, fire blankets, and several fire hydrants. Trained personnel can use the fire extinguishers and fire blankets to extinguish small, non-chemical fires. For larger fires, PTLA and the LACFD are alerted. The fire hydrants supply water at adequate volume and pressure to satisfy the requirements of 20.4.1 NMAC § 264.32 [6-14-00].

Eyewash stations, showers, and other first aid/decontamination equipment are maintained at various locations within Area G. They are for use by personnel in emergencies involving chemical and/or radiological materials. Waste characterization documentation and/or MSDSs are available in the event of a chemical exposure. First aid equipment can be used to treat injuries until trained medical personnel arrive at the scene.

Spill control equipment is maintained at various structures within Area G. Trained personnel use this equipment to mitigate small, containable spills if they know what has been spilled and are sure their actions will not put themselves or others at risk. PPE is also maintained at various structures within Area G and is available for use during routine and non-routine operations to protect personnel from exposure to chemical and radiological contaminants. Warning tapes and barricades are used to post areas and prevent unauthorized entry into restricted areas. Heavy equipment is also available at Area G to move heavy objects.

G.3.3 Hazards Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

In accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00], the Area G CSUs have been or will be designed and operated to minimize the possibility of a fire, explosion, or any unplanned releases of hazardous wastes or hazardous waste constituents which could threaten human health or the environment. The following discusses the procedures, equipment, and structures used at Area G to mitigate the effects of power outages. Prevention of run-on and runoff at Area G is discussed in Section 2.10.2 of this permit renewal application.

Mitigating Effects of Power Outages [20.4.1 NMAC § 270.14(b)(8)(iv)]

Electrical power is supplied to the Area G CSUs to operate lighting and other electrical and monitoring equipment. Evacuation alarms located throughout Area G are equipped with a battery backup and will continue to operate for eight hours during a power failure. Operations in Area G

are discontinued temporarily if electrical power is not restored quickly or if container handling equipment fails. However, neither a power nor an equipment failure would affect containment at the Area G CSUs.

Although not needed during daytime operations, emergency lighting for Area G consists of individual battery-pack halogen units located in TA-54-33 and TA-54-412. These lights are actuated by a loss of line voltage and are reset upon resumption of line voltage. A trickle charger keeps the self-contained battery pack at full charge and allows these lighting units a minimum of 30 minutes operability.

G.3.4 Area G CSUs [20.4.1 NMAC § 270.15]

The following describes the nine CSUs at Area G. The nine CSUs include the following:

- Storage Domes 229, 230, 231, and 232, and Pad 9;
- TA-54-412, Storage Dome 226, and Pad 1;
- Storage Dome 48 and Pad 3;
- Pad 10 (former Pads 2 and 4) and transuranic waste characterization facilities;
- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7;
- Storage Domes 153 and 283, and Pad 6;
- Storage Shed 8;
- TA-54-33, and;
- Storage Dome 375 and Pad 11.

General dimensions, containment features, and materials of construction are provided to fulfill the requirements of 20.4.1 NMAC §§ 270.15(a)(1) and (2) [6-14-00].

The CSUs at TA-54 are used to store containers of hazardous waste, MLLW, and MTRUW in solid and liquid form. Liquid wastes are stored primarily in structures that are designed for secondary containment; however, secondary containment pallets are also used. Secondary containment pallets are typically constructed of polyethylene or metal painted with a chemical-resistant coating (see Supplement G-1 for additional details, including compatibility). Polyethylene secondary containment pallets used at TA-54 are generally 50 inches long by 50 inches wide by 17 inches deep, with a designed capacity of 83 gallons. Two sizes of metal secondary containment pallets are typically used at TA-54. One is 52 inches long by 52 inches wide by 6.5 inches deep, with a designed capacity of 57 gallons; the other is 60 inches long by 60 inches wide by 6.5 inches deep, with a designed capacity of 77 gallons. The metal secondary containment pallets are coated with chemically-resistant urethane.

G.3.4.1 Storage Domes 229, 230, 231, and 232, and Pad 9 CSU

Storage Domes 229, 230, 231, and 232 are located on Pad 9 at the east end of Area G. The irregularly-shaped, asphaltic-concrete pad is approximately 570 ft long and 275 ft wide (see Figure 2-3). The asphaltic concrete is 4 to 6 inches thick. Each dome is approximately 246 ft long and 88 ft, 7 inches wide (see Figures G-13a, G-13b, G-14a, and G-14b). The domes consist of a rigid aluminum frame that supports a tensioned-membrane (see Supplement G-1 for additional details on domes). A series of aluminum I-beam trusses spanning the width of the structures comprise the dome framework. The membrane material is a polyester fabric coated with UV-stabilized plasticized PVC. The material is fungus-resistant and fire-retardant (i.e., self-extinguishing). The membrane is integrally connected to the frame to provide a fully tensioned fit. Each dome is equipped with personnel doors and a roll-up door for vehicle access. The domes are anchored to a concrete ring-wall with anchor bolts.

The interior floor perimeter of each dome is surrounded with a minimum 6-inch-high, 6-inch-wide asphaltic-concrete curb. A ramp is located at the vehicle entrance to each dome, which allows vehicles and container handling equipment to pass safely over the curbs and prevents run-on into the domes. The asphaltic-concrete pad is sloped 1 to 1.5% towards one end to allow any accumulated liquids to be contained within the curbed area at one end of the dome.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons.

The floor of Dome 230 is designed for secondary containment of liquids. The asphaltic-concrete floor is sloped (1%) towards a concrete sump at the east end of the dome (see Figure G-15). The asphaltic-concrete floor and curbs in Dome 230 are lined with a double layer of 40 mil high-density polyethylene (HDPE), and the sump is lined with a single layer of 40 mil HDPE, creating an impervious layer to contain any liquids that might accumulate (see Supplement G-1 for details on HDPE liners). The secondary containment capacity for Dome 230, which includes the sump and curbed area, is approximately 48,255 gallons, which exceeds the amount necessary to hold 10% of the total storage capacity of the dome (330,000 gallons; see Supplement 2-1). Any liquid that might

accumulate within these storage domes (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets or curbed area or, at Dome 230, in the sump and curbed area. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.2 TA-54-412, Storage Dome 226, and Pad 1 CSU

TA-54-412 and Storage Dome 226 are located on Pad 1 in the northeastern portion of Area G (see Figure 2-3). The irregularly-shaped, asphaltic-concrete pad is approximately 358 ft long and 213 ft wide, and is 4 to 6 inches thick.

TA-54-412 (see Figure G-16) is a one story building that is approximately 220 ft long by 60 ft wide (13,200 ft^2). It consists of two structures: an internal primary confinement structure that houses the DVRS processing operations; and an external secondary confinement structure, which surrounds the primary confinement structure. The external secondary confinement structure (hereinafter referred to as "building") provides protection from the elements and a temperature-controlled space for the internal structures and associated process equipment. A 16-ft by 16-ft roll-up vehicle-access door is located on the north end of the building. The roll-up vehicle access door opens to the secondary confinement structure area and serves as a pass-through for moving DVRS feed-stock waste into the primary confinement structure. There is also vehicle access on the south end of the building for removal of compacted waste from DVRS operations.

The floor and foundation of the building are concrete and the floor is painted with an epoxy sealant (see Supplement G-1 for details). The concrete slab provides a structural foundation for the building and the shearer/baler system, and provides a direct working surface for movement of FRP boxes and processing equipment. The concrete slab is above grade to direct potential run-on away from the building. The floor in the building is sloped to a sump that has a grating cover to provide traction and a level working surface. The sump is treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details).

The primary confinement structure is housed entirely within the building and consists of five interconnected enclosures or cells. The system is approximately 150 ft long by 50 ft wide by 16 ft high and sits directly on the sealed concrete floor. The primary confinement structure is constructed of 6-inch-thick, two-hour fire-rated sandwich panels made of 16-gauge steel and gypsum wallboard, measuring 40 ft wide by 4 or 8 ft long. The structure interlocks in a self-

supporting steel framework that can be assembled into multiple configurations. The primary confinement structure has five cells, each of which is used for a specific function of the DVRS process. The cells are equipped with both personnel and large roll-up doors so that personnel, equipment, and material can access the structure and move from one cell to the next.

A cell is used to sort and segregate transuranic (TRU) waste and MTRUW, and contains various tools used to dismantle the FRP boxes; other cells are used for decontamination and packaging; and a final cell contains the shearer and baler used to compact waste items. The shearing and baling process takes place within a tightly sealed compartment. Waste containers that need to be dismantled are processed using circular saws, reciprocating saws, hammers, pry bars, and other tools, as needed. Waste containers are moved with trucks, forklifts, air pallets, and hand dollies.

The primary and secondary confinement structures are built to meet criteria specified in DOE-STD-1020-92, "*Natural Phenomena Hazards Design and Evaluation Criteria for DOE Facilities"* (DOE, 1992), for Performance Criteria 2 structures. Performance Criteria 2 structures include active fire suppression, emergency communications, and confinement systems that provide important safety functions related to emergency handling or hazard recovery, and are designed to protect the health and safety of workers and visitors during active operations. The building contains fire protection piping and heating, ventilation, and air conditioning ducting, and is a two-hour code-compliant fire-rated building. Panels in the primary confinement structure are the same material as the two-hour fire-rated wall construction with additional supports. A dry-pipe fire-protection system provides coverage for the primary confinement structure. A water collection area in the south end of the building provides for containment of any potential leaks, spills, or accumulated water resulting from the activation of the fire protection system. Liquids that potentially accumulate within the sump area (e.g., liquids resulting from fire-suppression activities) are collected for characterization, as described in Section 2.6 of this permit renewal application. Negative ventilation air pressure is maintained throughout the building and primary confinement structure, with discharge through a multi-stage HEPA-filtered stack.

Storage Dome 226 is approximately 286 ft long and 88 ft, 7 inches wide (see Figures G-17a and G-17b). The design and materials of construction for Dome 226 are the same as for domes described in Section G.3.4.1. The dome is equipped with personnel doors and a roll-up door for vehicle access. It is anchored to the concrete ring wall with anchor bolts.

The interior floor perimeter of Dome 226 is surrounded with a minimum 6-inch-high, 6-inch-wide asphaltic-concrete curb. A ramp is located at the vehicle entrance to the dome, which allows vehicles and container handling equipment to pass safely over the curb and prevents run-on into the dome. The asphaltic-concrete pad is sloped 1 to 1.5% towards one end to allow any accumulated liquids to be contained within the curbed area at one end of the dome.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate within this dome (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets or curbed area. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.3 Storage Dome 48 and Pad 3 CSU

Storage Dome 48 is located at the eastern end of Area G on Pad 3. Pad 3 is constructed of asphaltic concrete to a thickness of four inches, and is approximately 339 ft long and 50 ft wide. Storage Dome 48 is 285 ft long and 50 ft wide, and has a peak height of 24 ft (see Figure G-18). The design and materials of construction for Dome 48 are the same as for the domes described in Section G.3.4.1. The dome is equipped with a double-panel rolling door at the south end of the dome and eight personnel doors, located approximately every 80 ft along the dome's length, allow for adequate access both by vehicles and by personnel. The interior perimeter of the dome is surrounded by a 6-inch-high, 8-inch-wide asphaltic-concrete curb, which helps prevent run-on into and runoff from the dome. An asphaltic-concrete ramp located at the vehicle entrance allows vehicles and container handling equipment to pass safely over the curb. The dome is anchored to Pad 3 with standard drift pins.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any

liquid that might accumulate within this dome (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets or curbed area. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.4 Pad 10 (former Pads 2 and 4) and Transuranic Waste Characterization Facilities CSU

Pad 10 will be constructed at the location of former Pads 2 and 4. The irregularly-shaped pad is planned to measure approximately 350 ft long by 250 ft wide and will be constructed of asphaltic concrete (see Figures 2-3 and 2-8). The transuranic waste characterization facilities and container storage will be located on this pad.

The transuranic waste characterization facilities will consist of mobile and/or modular units equipped with instruments and equipment for waste characterization and repackaging. The transuranic waste characterization facilities may include the following: drum-loading or receiving unit(s); equilibration units(s); gas mobile characterization unit(s); mobile repack units; and nondestructive radioassay unit(s).

All waste containers at this CSU will be stored on pallets or otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes will have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate (e.g., precipitation, liquids resulting from fire-suppression activities) will be contained within the secondary containment pallets. These liquids will be removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.5 Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7 CSU

This CSU is located in the south-central portion of Area G, and consists of three pads, two domes, and eight sheds (see Figure 2-3). Storage Dome 49 is located on Pad 5, and Storage Dome 224 is located on Pad 8. The storage sheds are located on Pad 7. The pads are constructed of asphaltic concrete. Pad 5 is approximately 500 ft long, 65 ft wide, and 4 inches thick. It is sloped approximately 2% from north to south. Pad 8 is approximately 150 ft long, 95 ft wide, and 3 inches

thick. It is sloped approximately 1% from west to east. Pad 7 is approximately 200 ft long, 64 ft wide, and 4 inches thick. It is sloped approximately 1% from west to east.

Storage Dome 49 is 440 ft long and 60 ft wide, and has a peak height of approximately 26 ft (see Figure G-19). The design and materials of construction for Dome 49 are the same as for the domes described in Section G.3.4.1. The dome is equipped with a double-panel rolling door at the north end of the dome and six personnel doors to allow for adequate access both by vehicles and by personnel. The interior perimeter of the dome is surrounded by a 6-inch-high, 8-inch-wide asphaltic-concrete curb, which helps prevent run-on into and runoff from the dome. An asphaltic-concrete ramp located at the vehicle entrance to Dome 49 allows vehicles and container handling equipment to pass safely over the curb. The dome is anchored to Pad 5 with standard drift pins.

Storage Dome 224 is approximately 110 ft long and 60 ft wide, with a peak height of 26 ft (see Figure G-20). The design and materials of construction for Dome 224 are essentially the same as for the domes described in Section G.3.4.1. This dome is anchored to Pad 8 with anchor bolts. It is equipped with a single-panel roll-up door at the north end and four personnel doors to allow adequate access by vehicles and by personnel. A 1-ft, 8-inch wide by 2-ft, 4-inch deep concrete ring wall surrounds the interior of Dome 224.

Storage Sheds 144, 145, 146, and 177 are prefabricated sheds constructed of steel. Each shed measures 6 ft long, 5 ft wide, and 9 ft high (see Supplement G-1, Ideal Environmental Products, Model C). Access to each shed is obtained through a single door. The sheds are elevated by design, which prevents run-on. Each shed is constructed with a liquid-tight sump to ensure containment of any potential leaks or spills and to prevent runoff. The floor of each shed is constructed of steel and has a metal grate that covers the entire sump area. Containers are placed directly on the metal grates, which prevent contact with liquids that may have accumulated in the sumps. The interior of each shed and sump is coated with chemically-resistant epoxy paint. The designed sump storage capacity of each shed is 120 gallons (see Supplement G-1, Ideal Environmental Products, Model C), which exceeds the amount necessary to hold 10% of the total storage capacity of each shed (330 gallons; see Supplement 2-1). Additional engineering details and technical specifications for these sheds are provided in Supplement G-1.

Storage Sheds 1027, 1028, 1029, and 1041 have the same basic design specifications as Sheds 68, 69, and 70 described in Section G.2.4.1. Each shed is equipped with three sets of double doors

on one side of the shed for ease of access. Sheds 1027, 1028, 1030, and 1041 contain a single compartment and sump within each shed (see Figure G-21). The designed storage capacity of each sump is 750 gallons, which exceeds the amount necessary to hold 10% of the total capacity of each shed (1,760 gallons; see Supplement 2-1). Additional engineering details and technical specifications for these sheds are provided in Supplement G-1.

Dome 224 is designed for secondary containment of liquids (see Figure G-22). The asphaltic-concrete floor is sloped 0.5% towards a concrete sump in the center of the dome. A ramp at the entrance to the dome allows movement of waste containers and prevents run-on. The floor, sump, and curbs are lined with a double layer of HDPE (80 mil and 40 mil) creating an impervious layer to contain any liquids that might accumulate (see Supplement G-1 for details on HDPE liners). The secondary containment capacity for Dome 224 is approximately 19,150 gallons, which exceeds the amount necessary to hold 10% of the total storage capacity of the dome (95,040 gallons; see Supplement 2-1).

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate within the domes and sheds (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets, curbed areas, or sumps (where present). These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.6 Storage Domes 153 and 283 and Pad 6 CSU

This CSU is located in the north-central portion of Area G, and consists of two domes on a pad (see Figure 2-3). Storage Domes 153 and 283 are located on Pad 6. The design and materials of construction for Domes 153 and 283 are the same as for domes described in Section G.3.4.1. Pad 6 is constructed of asphaltic concrete, and is approximately 633 ft long, 99 ft wide, and 4 inches thick. It is sloped approximately 1.2% from west to east.

Dome 153 is approximately 326 ft long and 60 ft wide, with a peak height of 26 ft (see Figure G-23). A double-panel rolling door is located at the west end of the dome, and 10 personnel doors are

located approximately every 40 to 125 ft along the dome's length. Dome 283 is approximately 250 ft long and 60 ft wide, with a peak height of 26 ft (see Figure G-24). A double-panel rolling door is located at the east end of the dome, and 10 personnel doors are located approximately every 50 ft along the dome's length. These accesses allow adequate traffic flow of vehicles and personnel into and out of the dome. A 6-inch-high, 8-inch-wide asphaltic-concrete curb surrounds the interior perimeter of both domes to help prevent run-on and runoff. An asphaltic-concrete ramp is located at the vehicle entrance of each dome to allow vehicles and container-handling equipment to pass safely over the curb. Domes 153 and 283 are anchored to Pad 6 with standard drift pins.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate within the domes (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets and curbed areas. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.7 Storage Shed 8 CSU

Storage Shed 8 is located in the north-central portion of Area G (see Figure G-25). The shed is 40 ft long and 16 ft wide, and has a 14-ft-high galvanized steel roof that slopes to the north. The siding of Storage Shed 8 is constructed of galvanized steel and the foundation is constructed of concrete. Two overhead doors and one personnel door on the south side of the shed allow both vehicles and personnel to access the shed. The shed also has a 6-inch high, 8-inch-wide asphaltic-concrete curb to prevent runoff. A concrete slab on the south side of the shed is sloped away from the shed's foundation to prevent run-on.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate (e.g., precipitation, liquids resulting from fire-suppression activities) is

contained within the secondary containment pallets and curbed area. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.8 TA-54-33 CSU

TA-54-33 is located in the north-central portion of Area G and consists of a dome attached to a concrete-block building (see Figure G-26). This CSU is used for waste storage and potential or future waste characterization activities. The dome and building are located on a concrete foundation surrounded by an asphaltic-concrete pad. The concrete slab is 8 inches thick and overlies 6 inches of base course. The concrete-block building attached to the dome is approximately 40 ft long and 34 ft wide. The dome is 157 ft long and 50 ft wide, with a peak height of 24 ft. A double-panel rolling door is located at the west end of the dome for vehicle access. A single-panel rolling door is located at the southeast end of the dome for container-handling access. Two personnel doors are located approximately 40 ft apart along the north wall of the dome. Two additional personnel doors are located in the concrete-block building; one on the west side, and one on the east side. In addition, two overhead doors are located on the north side of the building to allow free movement of personnel and container-handling equipment between the building and the dome. The interior perimeter of the dome is surrounded with a 6-inch-high, 8-inch-wide concrete curb to prevent run-on and runoff. The concrete floors of Rooms 100, 100A, 100B, 100C, and 105 also slope inward to prevent runoff.

The design and materials of construction for the TA-54-33 dome are the same as for domes described in Section G.3.4.1. The dome's aluminum frame is directly connected to the building, which extends approximately 5 ft into the dome. Inside the dome, the concrete foundation is sloped to a 6-inch-wide centralized concrete drainage trench that is covered with 12-inch-wide steel grating. The trench slopes toward a steel sump located at the east end of the dome. Two additional trenches, located in Rooms 100A and 100B, are perpendicular to and feed into the main trench. A floor drain in Room 105 connects with the trench in Room 100A.

The steel sump is located within a concrete basin that has 8-inch-thick walls, a 9-inch-thick base, and measures approximately 15 ft long by 7 ft wide by 6 ft deep. The sump is approximately 14 ft long by 6.5 ft wide by 5 ft deep and has a capacity of 3,473 gallons. A primary holding tank associated with the sump is located in a concrete basin that is 15 ft long by 12 ft wide by 5.5 ft deep and has a capacity of approximately 7,405 gallons. A secondary holding tank associated with the sump is located in a separate concrete basin that is 12 ft long by 12 ft wide by 5.5 ft deep and has a

capacity of approximately 5,924 gallons. These basins have the capacity to contain any spills or leaks resulting from a potential overflow or breach of the holding tanks.

The discussions of the trench and holding tank system at TA-54-33 are provided for completeness and informational purposes only. The trench and tank system, including all associated structures and systems (e.g., basins, piping) do not require a Resource Conservation and Recovery Act (RCRA) permit.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the curbed area of the dome, within the sump, within the building, or within secondary containment pallets. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.9 Storage Dome 375 and Pad 11 CSU

Storage Dome 375 is located in the western portion of Area G and is used for storage of hazardous waste, MLLW, and MTRUW. It measures approximately 300 ft long by 100 ft wide (see Figure G-27). The building is an aluminum A-frame truss design that is anchored to a concrete ring wall. The dome is of modular construction utilizing a membrane/fabric covering. It is equipped with 14 personnel doors and two roll-up doors, one each at the east and west ends of the building. Ramped entrances allow for safe movement of container handling equipment and vehicle access. The storage dome is located on Pad 11, which is constructed of asphaltic-concrete and measures approximately 478 ft long by 137 ft wide. Pad 11 is approximately 4 inches thick and slopes approximately 1 to 2% to the southeast.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any

liquid that might accumulate (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the building and/or within secondary containment pallets. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.4 TA-54 WEST CONTAINER STORAGE UNITS [20.4.1 NMAC, Subpart V, Part 264, Subpart I] The following provides specific information on current facility operations and waste management practices at the TA-54 West CSUs. This includes a discussion of security and access control, preparedness and prevention, hazards prevention, and design information for the TA-54 West CSUs. This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Detailed information is subject to change.

G.4.1 Security and Access Control [20.4.1 NMAC §§ 270.14(b)(4) and 270.14(b)(19)(viii); 20.4.1 NMAC § 264.14]

Security at TA-54 West is maintained by both artificial and natural barriers. These barriers prevent unauthorized entry of persons or livestock into TA-54 West and satisfy the requirements of 20.4.1 NMAC §§ 264.14(a) and 264.14(b)(2) [6-14-00]. An 8-ft-high chain-link security fence with barbed wire at the top surrounds the entire perimeter of TA-54 West. Bilingual (i.e., English and Spanish) warning signs are posted on the fence at 50- to 75-ft intervals and can be seen from any approach to this area. The legends on the signs indicate "Danger—Hazardous Waste Storage Area" and "Unauthorized Persons Keep Out." The signs are legible from a distance of 25 ft. TA-54 West is patrolled by PTLA security personnel during non-operational hours to ensure that the gates are locked and that unauthorized entry has not occurred. The entire security fence is also inspected by on-site personnel and repairs are made, as necessary. In accordance with 20.4.1 NMAC § 270.14(b)(19)(viii) [6-14-00], the locations of the security fence, entry gates, and entry stations are shown on Figure 2-14 in Section 2.0 of this permit renewal application. In addition to the fence and entry station, cliffs on the north side of TA-54 West provide a natural barrier to discourage unauthorized entry.

Authorized individuals are permitted access to the Indoor CSU at TA-54-38 through the badge reader at the west entrance to the building. Visitors, subcontractors, and other personnel that do not have a badge must gain access to the building by contacting an authorized person, and must sign the visitor logbook. When leaving TA-54-38 to go to the adjacent building (TA-54-34) or the Outdoor CSU, it is not necessary for authorized personnel to use the badge reader to exit TA-54-

38. If leaving TA-54 West completely, however, authorized personnel must badge out at the badge reader. Visitors must always sign out on the visitor logbook when leaving the building.

G.4.2 Preparedness and Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

The following presents information on the emergency equipment available at the TA-54 West CSUs to comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. This includes the approximate locations of the fire extinguishers, shower/eyewash stations, spill center, and communication systems.

Required Equipment [20.4.1 NMAC § 264.32]

TA-54-38 is equipped with an audible alarm system to alert personnel of fire or the need to evacuate the area. Fire alarm pull stations are located throughout the building and can be activated in the event of a fire. Strobe lights mounted at the fire alarms and at TA-54-34, just north of TA-54-38, flash upon activation of the fire alarms to visually alert personnel. The alarm system can also be activated by using evacuation alarm buttons located near the entrances to the building. Upon activation of the evacuation alarm system, horns sound to alert personnel of emergency conditions. The building's manual fire alarm pull stations at TA-54 West are connected to the LACFD through LANL's central alarm system at all times. The evacuation alarm system is a local system that notifies occupants in TA-54-38 and TA-54-34 of a local emergency. Additionally, a roll-up door between the high and low bays has heat sensitive links attached to a safety chain that melt at a certain temperature and cause the door to close.

TA-54-38 is also equipped with telephones to provide adequate communication and to summon external emergency assistance, if necessary. Paging telephones are located throughout the building and are used to contact on-site personnel. Paging telephones are also used in the event of an emergency to communicate the nature and location of hazardous conditions to personnel in the area. The alarm system is interrupted when the paging telephone system is activated to allow personnel to hear the announcement. Additionally, an emergency telephone is located outside the main entry area. Personnel working within the building can also use these telephones to summon assistance from local emergency response teams in case of emergency.

Fire control equipment is available for use within TA-54-38 and at the Outdoor CSU. Portable halon fire extinguishers are located in the high bay, low bay, and at the Outdoor CSU. The fire extinguisher located by the east personnel entrance door in the low bay can also be used at the

loading dock. Depending on the size of the fire and the fuel source, fire extinguishers can be used by on-site personnel. However, LANL policy encourages immediate evacuation of the area and notification of appropriate emergency personnel. TA-54-38 is equipped with a smoke-activated dry-pipe sprinkler system in the low bay and with heat-activated dry-pipe fire suppression systems in the high bay and at the loading dock. A fire hydrant installed according to National Fire Protection Association standards is located approximately 220 ft west of TA-54-38 near the west entrance to TA-54 West. Water is supplied to the fire hydrant by a municipal water system through 8-inch pipes at an adequate volume and pressure to satisfy the requirements of 20.4.1 NMAC § 264.32 [6-14-00].

A portable chemical spill center is maintained within TA-54-38. It contains sorbents and PPE. Personnel working anywhere within the building have access to this spill center. Trained personnel use this equipment to mitigate small containable spills when they are certain their actions will not put themselves or others at risk. Personnel decontamination equipment available includes a safety shower and eyewash located in the high bay and a safety shower and eyewash on the loading dock.

G.4.3 Hazards Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

In accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00], the TA-54 West CSUs are designed and operated to minimize the possibility of a fire, explosion, or any unplanned releases of hazardous wastes or hazardous waste constituents which could threaten human health or the environment. The following discusses the specific procedures, equipment, and structures used at TA-54 West to mitigate the effects of power outages. Prevention of run-on and runoff at TA-54 West is discussed in Section 2.10.3 of this permit renewal application.

Mitigating Effects of Power Outages [20.4.1 NMAC § 270.14(b)(8)(ii)]

Electrical power is supplied to TA-54-38 through a transformer located north of the building. In the event of a power failure, operations in the building cease. If electrical power is not restored quickly or if container handling equipment fails, containment at the TA-54 West CSUs is not affected. Monitoring equipment alarms are operated by supplied power, but will continue to operate on a backup battery. Emergency lighting is equipped with backup batteries.

G.4.4 TA-54 West CSUs [20.4.1 NMAC § 270.15]

The following describes the two CSUs at TA-54 West. The two CSUs include the Indoor CSU and the Outdoor CSU. The Indoor CSU is comprised of the low bay and the high bay at TA-54-38. The Outdoor CSU is comprised of the storage pad surrounding the north, east, and south sides of TA-54-38 and the loading dock at TA-54-38. The CSUs at TA-54 West are used to store MLLW and MTRUW in solid form. General dimensions, containment features, and materials of construction are discussed in this section to fulfill the requirements of 20.4.1 NMAC §§ 270.15(a)(1) and (2) [6-14-00].

G.4.4.1 Indoor CSU

TA-54-38 is constructed of 36-ft-high precast concrete panel walls topped by prestressed double-T concrete roof sections. Its foundation consists of a 6-inch reinforced concrete slab on compacted fill. The building is divided into several offices and houses the Indoor CSU, which includes the low bay and the high bay (see Figure G-28).

The low bay is approximately 40 ft wide and 34 ft long. An 8-ft-wide by 12-ft-high roll-up door is located at the east end and opens to an outdoor loading dock. A second 8-ft-wide by 12-ft-high roll-up door is located in the southeast corner and opens into the high bay. The walls and floor of the low bay are coated with industrial grade enamel paint.

The high bay is approximately 40 ft wide and 80 ft long. The high bay is used for loading TRU waste and MTRUW into Transuranic Package Transporter-II containers. It is equipped with 14-ft-wide by 18-ft-high roll-up doors on the east and west ends to allow convenient, indoor loading of the tractor-trailers that transport shipments of waste to the Waste Isolation Pilot Plant. The high bay floor is unpainted and slopes at an angle of 1.5 degrees toward a central trench and sump. The trench is 5 inches wide, 6 inches deep, and 50 ft long. The entire length of the trench is covered with a metal grate and is designed to hold precipitation and snow melt from tractor-trailers. The sump is locked out. Potential liquids that accumulate within the sump area (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.4.4.2 Outdoor CSU

The Outdoor CSU consists of the loading dock at TA-54-38 and the storage pad located on the north, east, and south sides of TA-54-38. The loading dock is 16 ft wide by 38 ft, 10 inches long

and is covered by a metal awning. The platform is constructed of 6-inch cast-in-place concrete and is located approximately 4 inches above grade.

The boundary of the storage pad is delineated by the fence surrounding the pad. The approximate dimensions of the pad at the Outdoor CSU are shown on Figure 2-14**.** The pad is constructed of asphaltic concrete to a thickness of approximately 4 inches and slopes toward the curbed edges (see Figure 2-14 in Section 2.0). This slope allows for storm water to run off the pad. Storage containers on this pad are elevated either by design or on a pallet.

Mobile radioassay trailers and storage sheds for supplies and equipment are also stored on the pad at the Outdoor CSU.

G.5 REFERENCES

Ball, T., M. Everett, P. Longmire, D. Vaniman, W. Stone, D. Larssen, K. Greene, N. Clayton, and S. McLin, 2002, "Characterization Well R-22 Completion Report," Los Alamos National Laboratory report LA-13893-MS, Los Alamos New Mexico.

DOE, 1992, "*Natural Phenomena Hazards Design and Evaluation Criteria for DOE Facilities,"* DOE-STD-1020-92.

LANL, 1998, "Hydrogeologic Workplan," May 1998, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1995, "Geologic and Hydrologic Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface Water Stations in the Los Alamos Area," LA-12883-MS, January 1995.

Table G-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.15	Specific requirements for containers:	
§270.15(a)	A description of the containment system to demonstrate compliance with §264.175 including at a minimum:	2.6, G.2.4, G.3.4, G.4.4
§270.15(a)(1)	Basic design parameters, dimensions, and materials of construction	G.2.4, G.3.4, G.4.4
§270.15(a)(2)	How the design promotes drainage or how containers are kept from contact with standing liquids in the containment system	2.6, G.2.4, G.3.4, G.4.4
§270.15(a)(3)	Capacity of the containment system relative to the number and volume of containers to be stored	2.6, Supplement 2-1
§270.15(a)(4)	Provisions for managing run-on	2.10, G.2.4, G.3.4, G.4.4
§270.15(a)(5)	How accumulated liquids can be analyzed and removed to prevent overflow	2.6
§270.15(b)	For storage areas that store containers holding wastes that do not contain free liquids, a demonstration of compliance with §264.175(c) includes:	2.1.3.2
§270.15(b)(1)	Test procedures and results or other documentation or information to show that the wastes do not contain free liquids	2.1.3.2
§270.15(b)(2)	A description of how the storage area is designed or operated to drain or remove liquids or how containers are kept from contact with standing liquids	2.1.3.2, G.4.4
§270.15(c)	Provide sketches, drawings, or data demonstrating compliance with §264.176 (location of buffer zone and containers holding ignitable or reactive wastes) and §264.177(c) (location of incompatible wastes), where applicable	2.8
§270.15(d)	Where incompatible wastes are stored or otherwise managed in containers, a description of the procedures used to ensure compliance with §264.177(a) and (b) and §264.17(b) and (c)	2.8
§270.15(e)	Information regarding air emission control equipment as required in §270.27	G.1.6
§270.27(a)	If applicable, specific information requirements for air emissions for containers:	G.1.6

Table G-1 (Continued)

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.27(a)(2)	Identification of each container area subject to the requirements of 40 CFR Part 264, Subpart CC and certification by the owner or operator that the requirements are met	G.1.6
§270.27(a)(3)	Documentation that each enclosure used to control air emissions from containers are in accordance with the requirements of §264.1086(b)(2)(i) includes information prepared by the owner or operator or manufacturer or vendor describing the enclosure design and certification that the enclosure meets the specifications listed in §265.1087(b)(2)(ii)	Not applicable (NA)
§270.27(a)(5)	Documentation for each closed-vent system and control device installed in accordance with the requirements of §264.1087 that includes design and performance information as specified in §270.24(c) and (d)	NA
§270.27(a)(6)	An emission monitoring plan for both Method 21 and control device monitoring methods. The plan must include:	NA
§270.27(a)(6)	monitoring point(s)	NA
§270.27(a)(6)	monitoring methods for control devices	NA
§270.27(a)(6)	monitoring frequency	NA
§270.27(a)(6)	procedures for documenting exceedances	NA
§270.27(a)(6)	procedures for mitigating noncompliances	NA

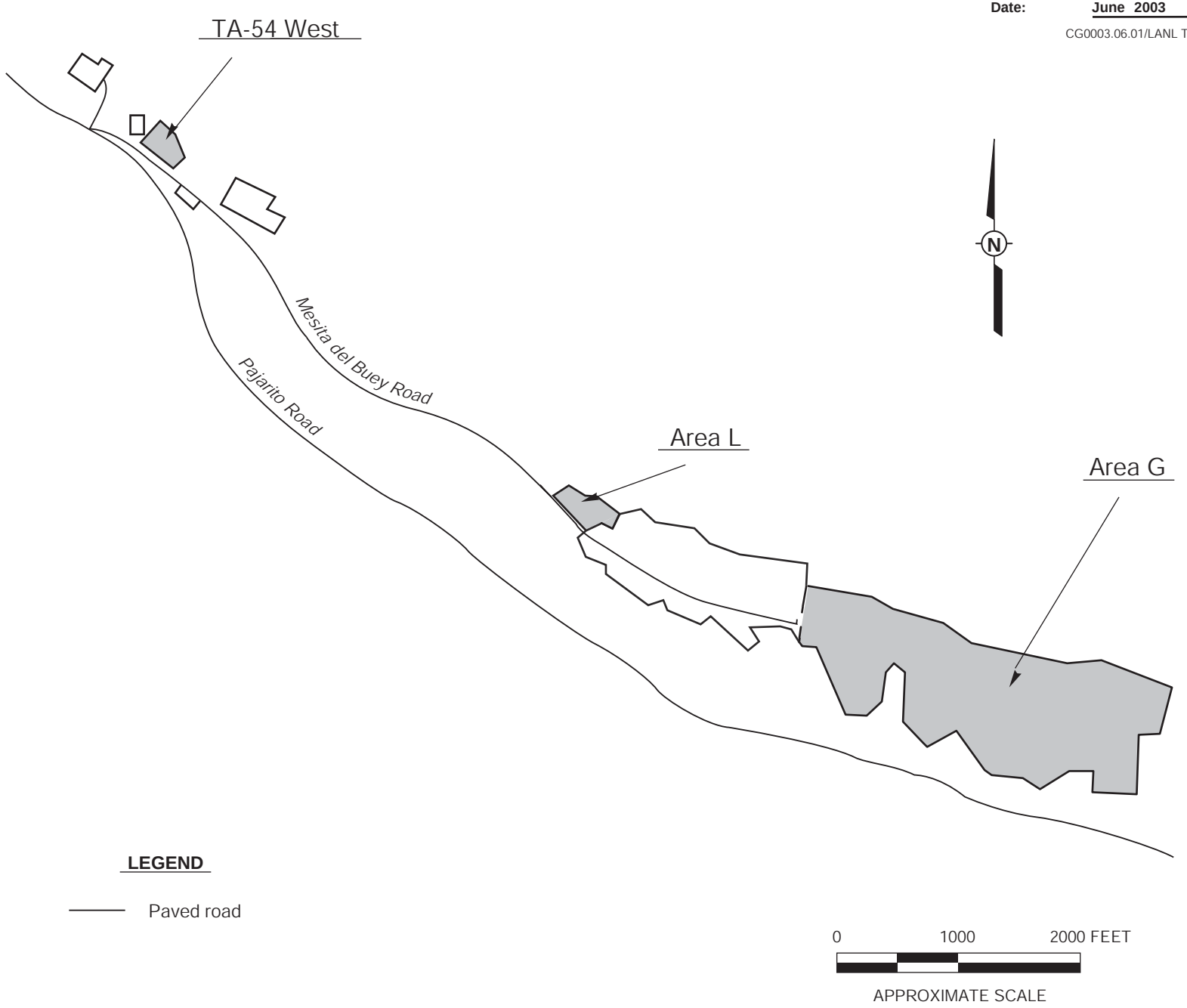
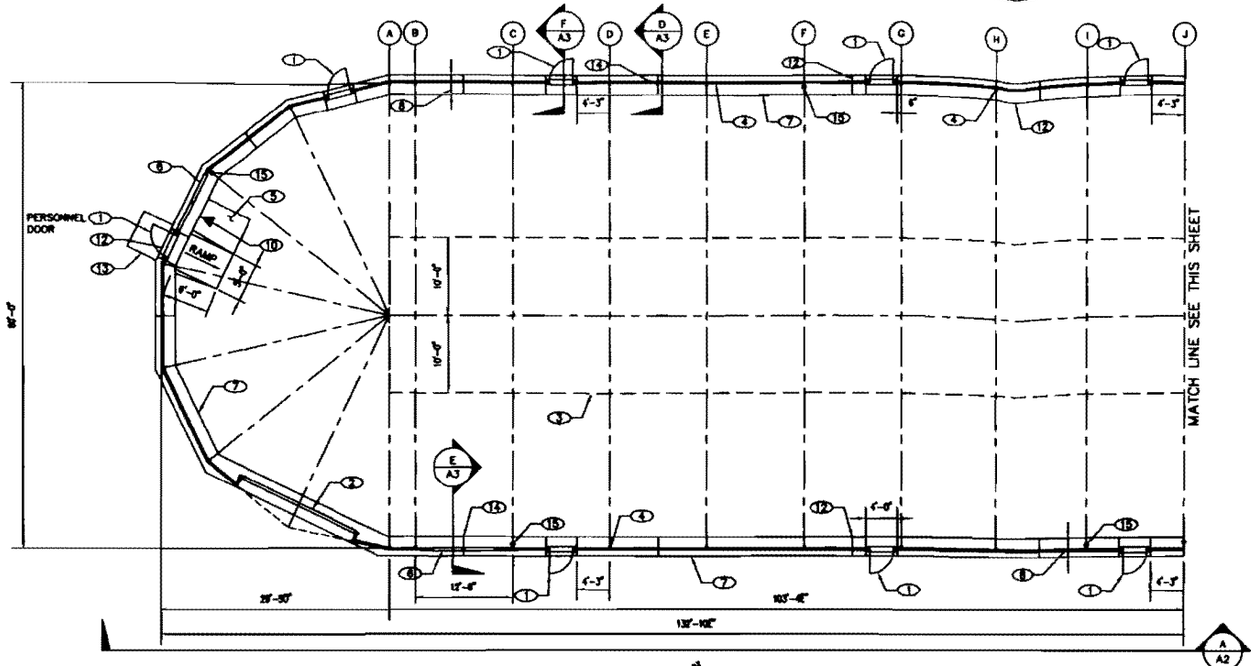
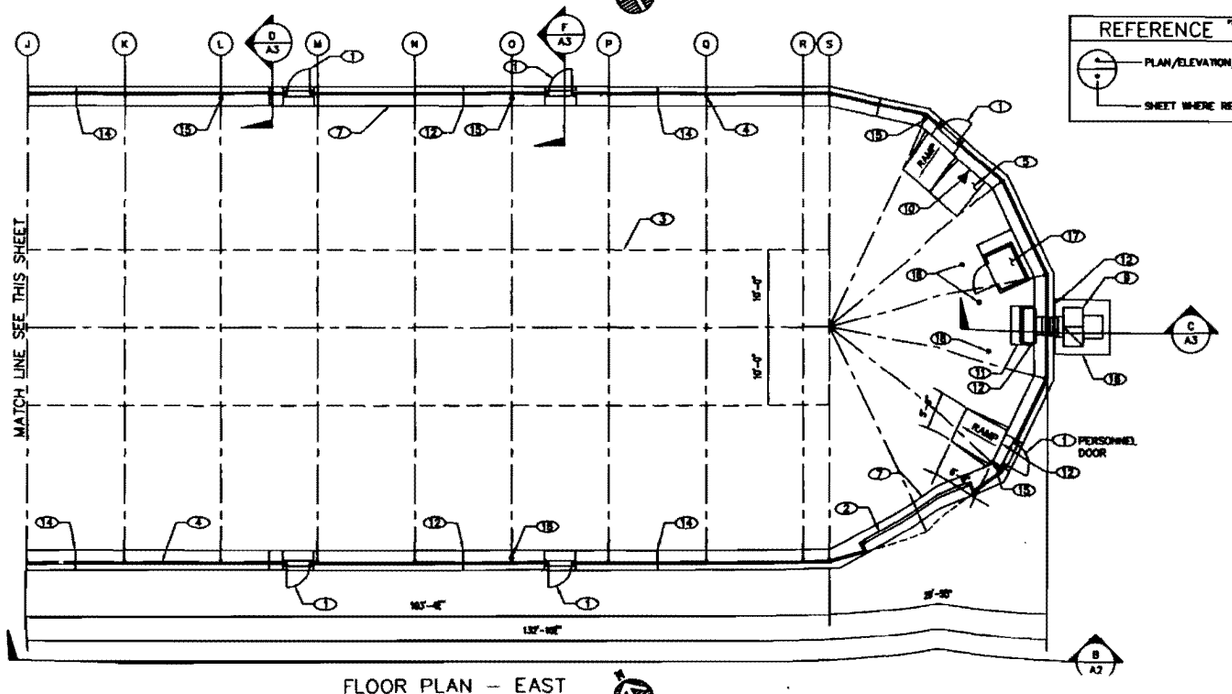


Figure G-1

Technical Area (TA) 54 Site Location Map



FLOOR PLAN – WEST



FLOOR PLAN – EAST

KEYED NOTES

1. 3'-0" x 6'-8" PERSONNEL DOOR (2), EXIT DOORS (12).
2. 16'-0" x 16'-0" OVERHEAD ROLL-UP DOOR.
3. SKYLIGHT AREA (ABOVE).
4. STEEL STRUCTURAL FRAME AND FABRIC COVER.
5. CONCRETE EYEWASH PAD. SEE SHEET C5 DETAIL 3.
6. WALL LOUVER. SEE SHEET A3 SECTION E.
7. CONCRETE RINGWALL AND CONTAINMENT CURB. PROVIDE CONTRACTION JOINTS @ 20 FEET ON CENTER MAXIMUM. SEE SHEET A3 DETAIL 1. PROVIDE EXPANSION JOINTS AT 120 FEET ON CENTER MAXIMUM. SEE SHEET A3 DETAIL 2. LOCATE JOINTS HALFWAY BETWEEN FRAMES.
8. RINGWALL WIDTH AS REQUIRED BY DOME MANUFACTURER.
9. EXHAUST FAN PLENUM. SEE SHEET M2 DETAIL 2.
10. EYEWASH. SEE SHEET M2 DETAIL 1.
11. EXHAUST PLENUM PAD. SEE SHEET C5 DETAIL 2.
12. 8" EXPANSION JOINTS.
13. CONCRETE STOOP.
14. CONTRACTION JOINT TYPICAL UNLESS NOTED OTHERWISE.
15. FIRE EXTINGUISHER. (GFE)
16. EXHAUST FAN PAD. SEE SHEET C3 DETAIL 2.
17. SPRINKLER RISER CLOSET AND CONCRETE SLAB, FOR DETAILS. SEE SHEET A4.
18. FOR PLACEMENT OF BOLLARDS. SEE SHEET A4, ENLARGED PLAN.

LEGEND

- ELEVATION SYMBOL
- CENTERLINE OF DOME AND/OR FRAME
- CONCRETE
- ROLL-UP DOOR
- ASPHALT PAVING
- AGGREGATE BASE COURSE
- SUBGRADE
- ALUMINUM
- METAL STUD PARTITION
- SKYLIGHT MATERIAL

REFERENCE "BUBBLE" DESCRIPTION

- PLAN/ELEVATION/DETAIL REFERENCE NUMBERS
- SHEET WHERE REFERENCE IS LOCATED

NO.	DATE	CLASS REVIEW	REVISIONS
1	4/86		AS-BUILT WITH CHANGES
2	3-27-85		FOR: ADDED SPRINKLER RISER CLOSET AND SKYLIGHT

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS

Figure G-2
Storage Dome 215

BLDG. 54-215 TA-84

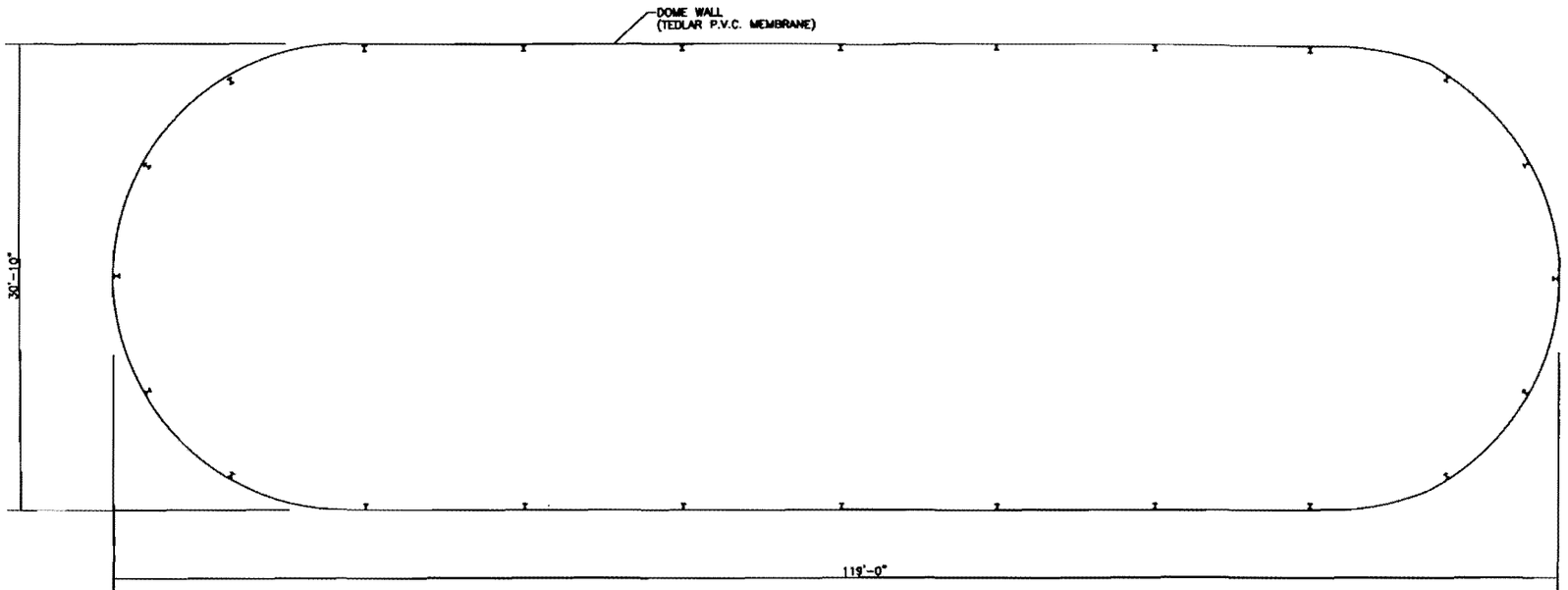
DRAWN	S HAUGLAND
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	S KOPPMAN
DATE	6/10/84

DESIGNED DAVID DOBBS
REGISTERED DAVID POWELL
APPROVED CORY HUSKINS

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

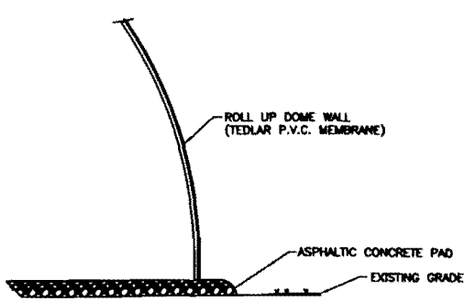
SHEET A1 9/25

PROJECT ID 14020
DRAWING NO. C49510
REV. 2

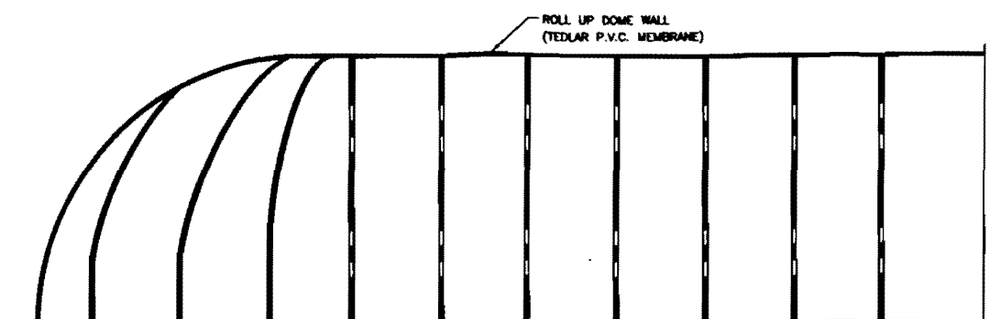


PLAN
NOT TO SCALE

N



SECTION
NOT TO SCALE



ELEVATION
NOT TO SCALE

NO	DATE	CLASS/REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

Facility & Waste Operations
Waste Facility Management
TA-54

Figure G-3
Canopy 216

DRAWN	J. FULK
VERIFIED	R. WERNER
CHECKED	R. LECHEL
RELEASED	
DATE	09-29-03

SUBMITTED R. LECHEL | RECOMMENDED | APPROVED B. MCLAIN

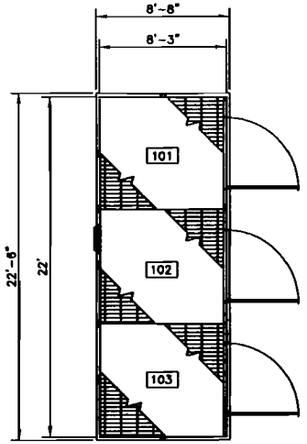
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 1

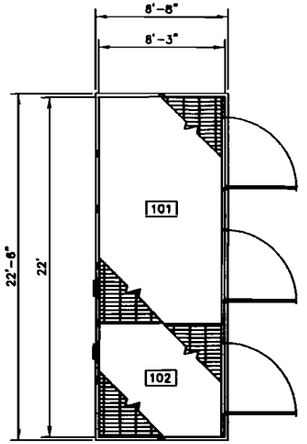
CLASSIFICATION | REVIEWER | DATE

PROJECT ID

DRAWING NO SK-54-L-03 REV



54-68



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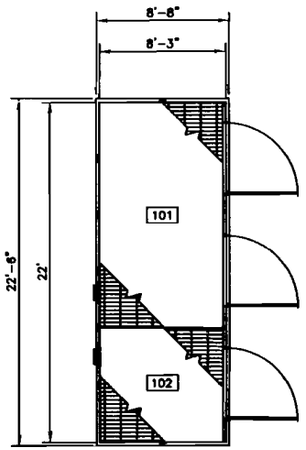
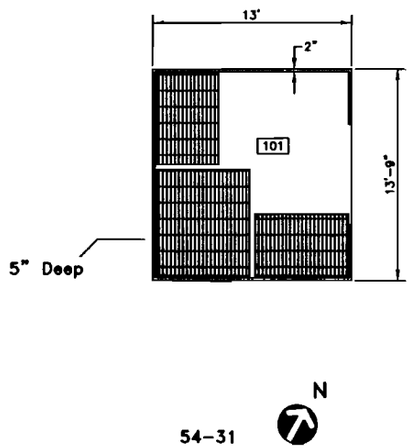


54-70



54-31

FIRST FLOOR PLAN

LEGEND

LOUVER
METAL SIDING
WINDOW
WOOD OR METAL STUD

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G-4
Storage Sheds 31, 68, 69, and 70
Secondary Containment

BLDGS 68, 69, 70, 31 TA-54

DRAWN	C. SAMORA
VERIFIED	C.E.S./C.D.S
CHECKED	H. SALAZAR
RELEASED	H. SALAZAR
DATE	09-07-93

SUBMITTED: JERRY FORTE
RECOMMENDED: FRED THOMPSON
APPROVED: ED LOPEZ

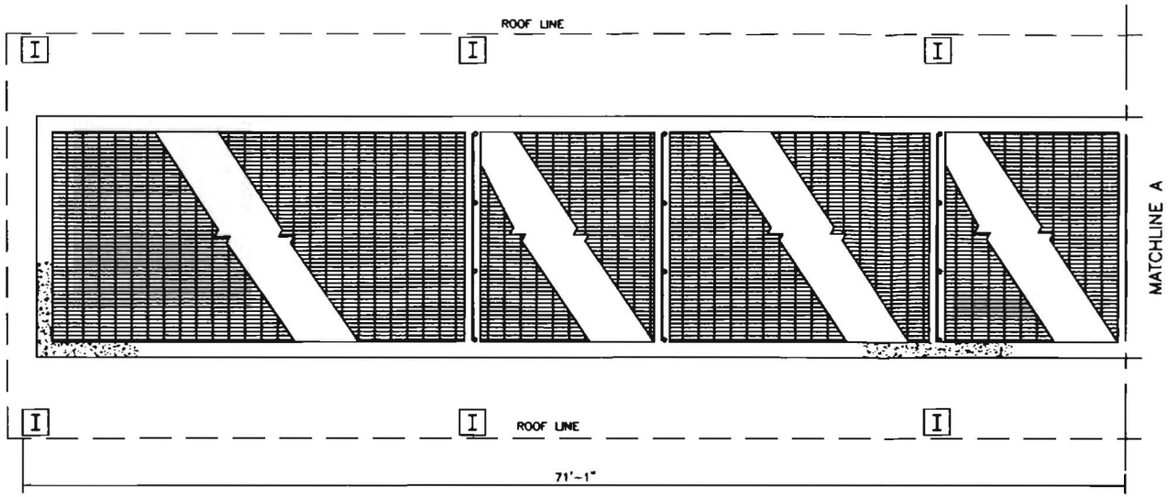
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

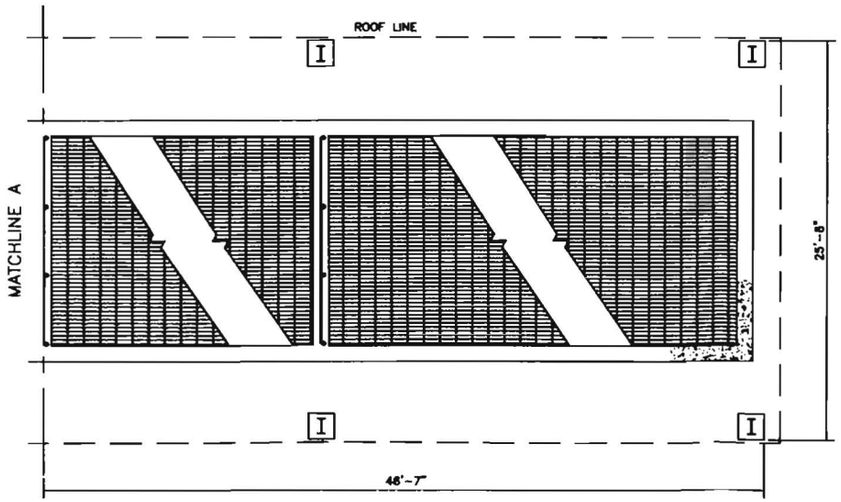
SHEET A8 21 OF 36

CLASSIFICATION REVIEWER: H. SALAZAR DATE

PROJECT ID: 014292
DRAWING NO: AB113
REV

FIELD VERIFIED 04-01-93





FIRST FLOOR PLAN

N

LEGEND

COLUMNS CONCRETE
I BEAM
POST

NO	DATE	CLASS/REV	DESCRIPTION	DRN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G-.
TA-54-3:

DRAWN	C. SAMORA
VERIFIED	C.F.S/C.D.S
CHECKED	H. SALAZAR
RELEASED	H. SALAZAR
DATE	09-07-63

BLDG 32 TA-54

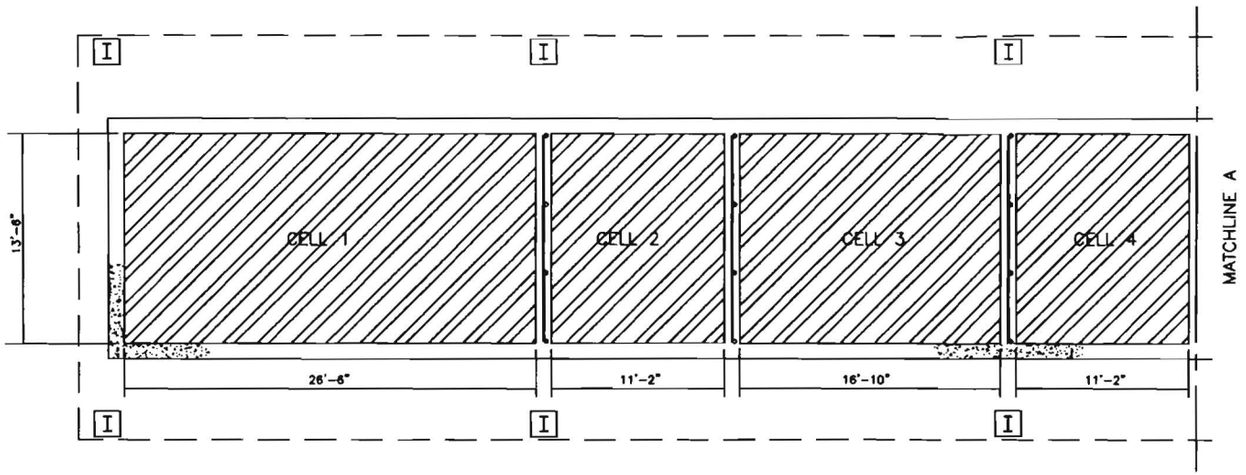
SUBMITTED: JERRY FORTE
RECOMMENDED: FRED THOLFSON
APPROVED: ED LOPEZ

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET A5 18 OF 36

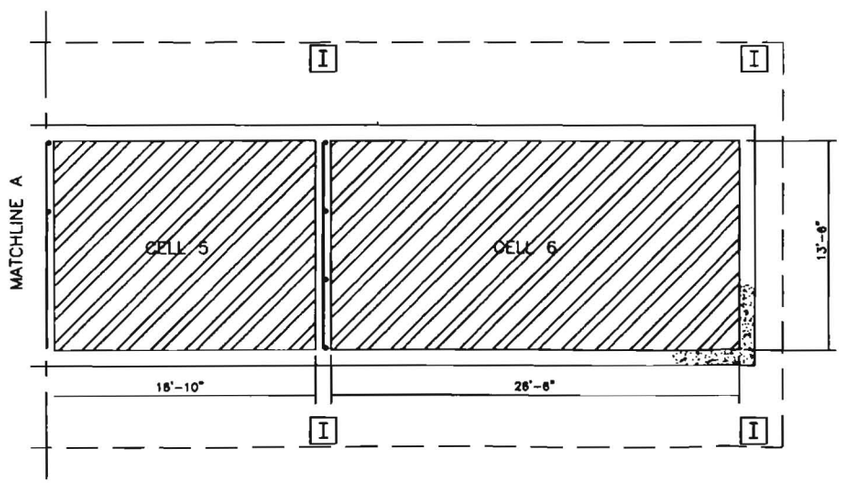
CLASSIFICATION REVIEWER H. SALAZAR DATE

PROJECT ID 014292 DRAWING NO AR113 REV



LEGEND

12" DEPTH



FIRST FLOOR PLAN

N

NO	DATE	CLASS REV	DESCRIPTION	DRWN	VER	CHKD	REL	SUB	REC	APP

Facility & Waste Operations
Waste Facility Management

TA-54 FWMU-54

Figure G--6
TA-54-32
Secondary Containment

DRAWN	J. FULK
VERIFIED	J. FULK
CHECKED	R. LECHEL
RELEASED	D. MCLAIN
DATE	06-02

BLDG 32 TA-54

SUBMITTED: R. LECHEL | RECOMMENDED: | APPROVED: D. MCLAIN

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

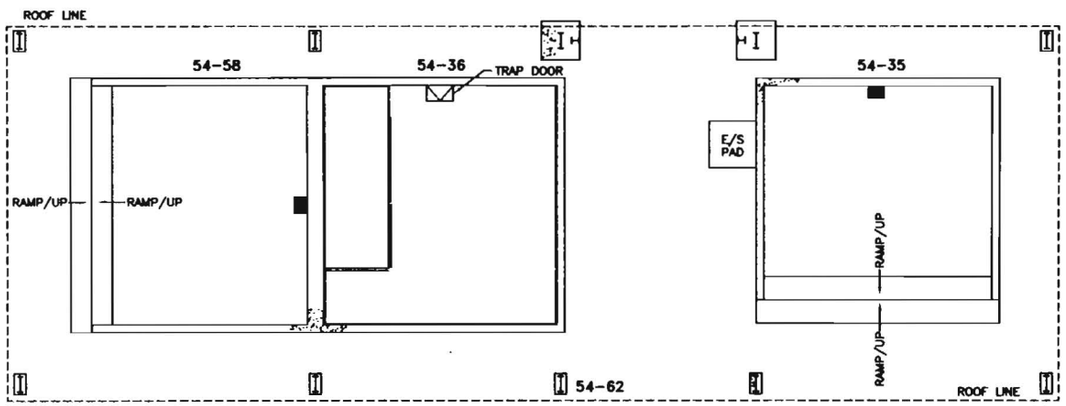
SHEET A5 1 OF 1

CLASSIFICATION | REVIEWER | DATE

PROJECT ID | DRAWING NO | REV

LEGEND

o o	COLUMNS
	CONCRETE
I	I BEAM
E/S	EMERGENCY SHOWER



FIRST FLOOR PLAN

N

NO	DATE	CLASS REV	DESCRIPTION	DRWN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G-7
TA-54-35, -36, -58, and -62

DRAWN	C. SAMORA
VERIFIED	C.E.S./C.D.S
CHECKED	H. SALAZAR
RELEASED	H. SALAZAR
DATE	00-00-00

BLDGS 62, 58, 36, 35 TA-54

SUBMITTED	RECOMMENDED	APPROVED
JERRY FORTE	FRED THOMPSON	FRED THOMPSON

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SHEET 1 OF 1

CLASSIFICATION REVIEWER H. SALAZAR DATE

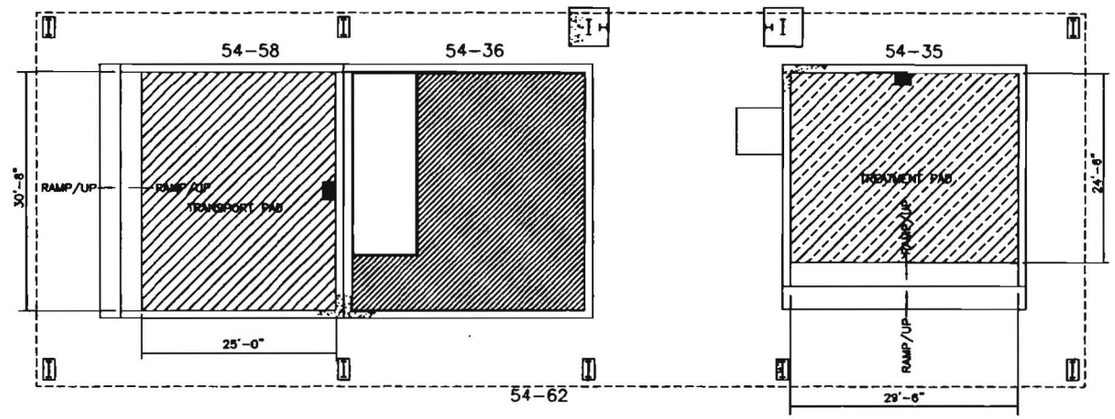
PROJECT ID DRAWING NO REV

LEGEND

6" DEPTH

8" DEPTH

10" DEPTH



FIRST FLOOR PLAN

N

NO	DATE	CLASS REV	DESCRIPTION	DRAWN	VER	CHKD	REL	SUB	REC	APP

Facility & Waste Operations
Waste Facility Management

TA-54 FWMU-54

Figure G-8

TA-54-35, -36, and -58
Secondary Containment

DRAWN	J. FULK
VERIFIED	J. FULK
CHECKED	R. LECHEL
RELEASED	D. MCLAIN
DATE	08-02

BLDGS 35, 36, 58 TA-54

SUBMITTED	RECOMMENDED	APPROVED
R. LECHEL		D. MCLAIN

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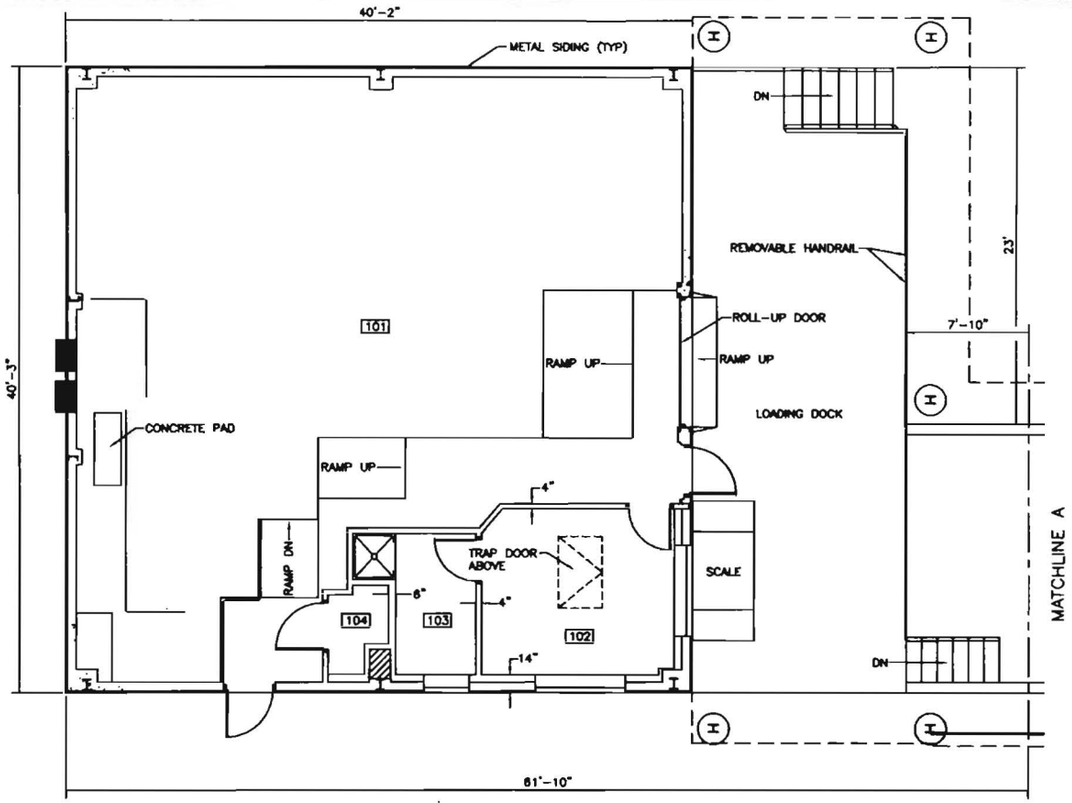
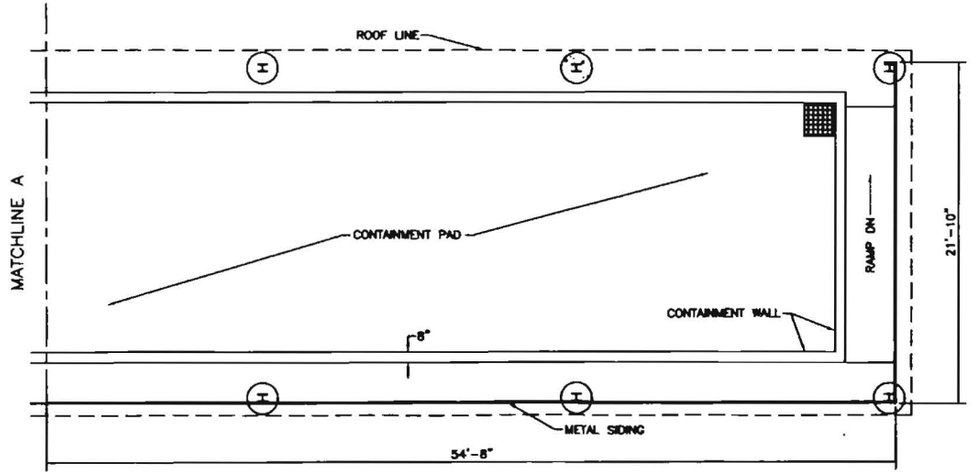
SHEET 1 OF 1

CLASSIFICATION REVIEWER DATE

PROJECT ID DRAWING NO REV





FIRST FLOOR PLAN

N

ROOM INFORMATION CHART

RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE
101	1,376	102	135	103	60
104	21	UTILITY	5	–	–

TOTAL ROOM NET SQUARE FOOTAGE = 1,595

GROSS SQUARE FOOTAGE = 2,172

LEGEND

O	COLUMNS
CONCRETE	CONCRETE
I	I BEAM
LOUVER	LOUVER
UTILITY SPACE	UTILITY SPACE
WINDOW	WINDOW
WOOD OR METAL STUD	WOOD OR METAL STUD

NOTES

1. ALL EXTERIOR WALLS ARE 8" THICK UNLESS OTHERWISE NOTED.
2. ROOM NET SQUARE FOOTAGE IS COMPUTED BY MEASURING FROM THE INSIDE FACE OF EXTERIOR WALLS TO THE CENTERLINE OF ALL OTHER WALLS.
3. GROSS SQUARE FOOTAGE IS EQUAL TO ALL FLOOR AREA (INCLUDING ALL OPENINGS IN FLOOR SLABS) MEASURED TO THE OUTER SURFACES OF EXTERIOR OR ENCLOSING WALLS, AND INCLUDES ALL FLOORS, MEZZANINES, HALLS, VESTIBULES, STAIRWELLS, SERVICE AND EQUIPMENT ROOMS, PENTHOUSES, ENCLOSED PASSAGES AND WALKS, FINISHED USABLE SPACE WITH SLOPING CEILINGS (SUCH AS ATTIC SPACES) HAVING 5 FEET OR MORE HEADROOM, AND APPENDED COVERED SHIPPING OR RECEIVING PLATFORMS AT TRUCK OR RAILROAD CAR HEIGHT. ALSO INCLUDED IN GROSS FLOOR AREA, BUT CALCULATED ON ONE-HALF OF ACTUAL FLOOR AREA, ARE COVERED OPEN PORCHES, PASSAGES AND WALKS, WITH APPENDED UNCOVERED RECEIVING AND SHIPPING PLATFORMS AT TRUCK AND RAILROAD HEIGHT.

NO	DATE	CLASS REV	DESCRIPTION	DRW	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure 3-9
TA-54--39

DRAWN	C. SANDOVAL
VERIFIED	C.F.S/C.D.S
CHECKED	M. SALAZAR
RELEASED	M. SALAZAR
DATE	08-07-03

BLDG 30 TA-54

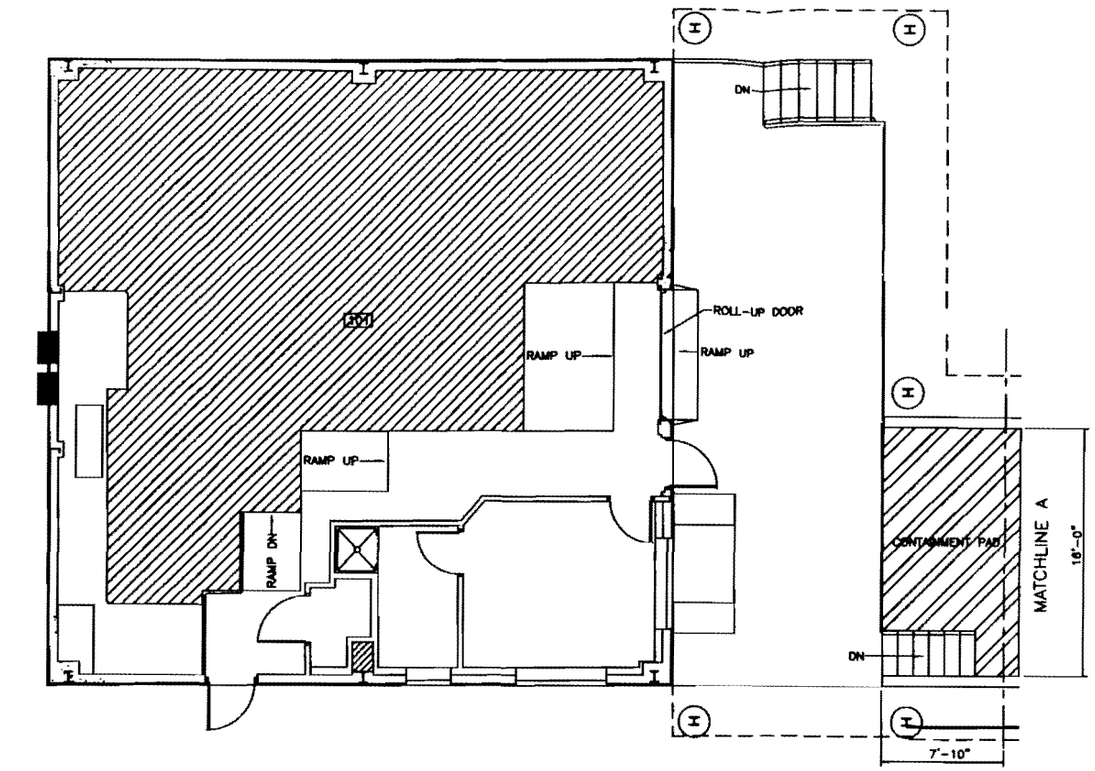
SUBMITTED	RECOMMENDED	APPROVED
JERRY PORTE	FRED THOMPSON	FRED THOMPSON

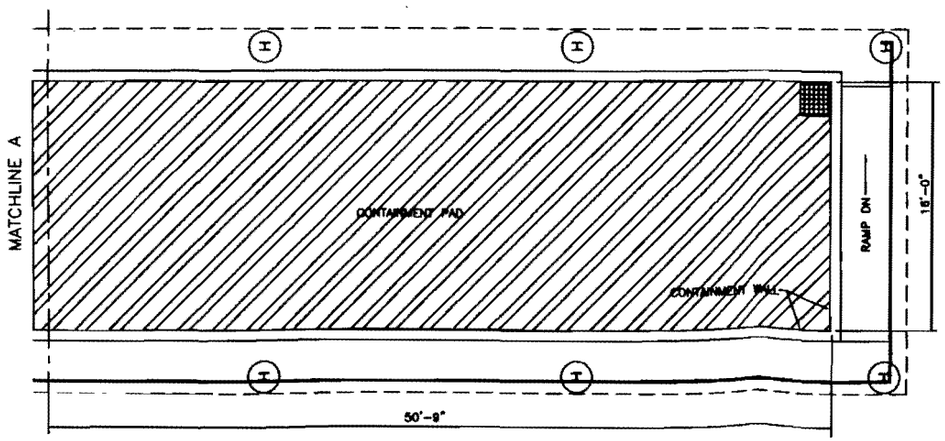
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 1

CLASSIFICATION REVIEWER M. SALAZAR DATE

PROJECT ID	DRAWING NO	REV
7556	AR211	





FIRST FLOOR PLAN

N

LEGEND

6" DEPTH

12" DEPTH

NO	DATE	CLASS REV	DESCRIPTION	DWN	VCR	CHKD	REL	SUB	REC	APP

Facility & Waste Operations
Waste Facility Management
TA-54 PFMU-54

Figure C-10
TA-54-39
Secondary Containment

DRAWN	J. FULK
VERIFIED	J. FULK
CHECKED	R. LECHEL
RELEASED	D. Mobbs
DATE	08-02

BLDG 39 TA-54

SUBMITTED R. Lechel | RECOMMENDED | APPROVED D. Mobbs

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 1

CLASSIFICATION REVIEWER DATE

PROJECT ID

DRAWING NO SK-54-L-06

REV 0

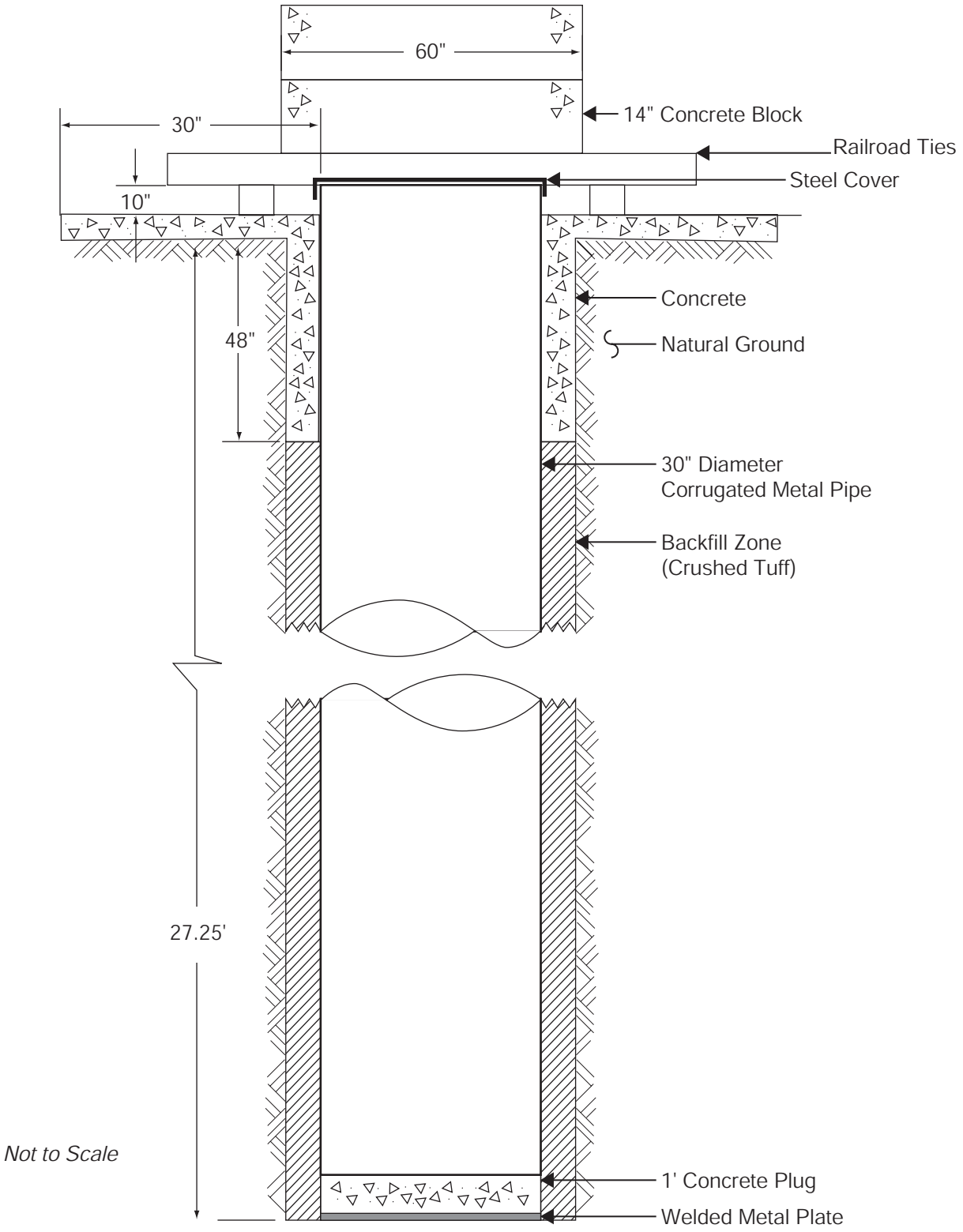


Figure G-11
Shaft 36

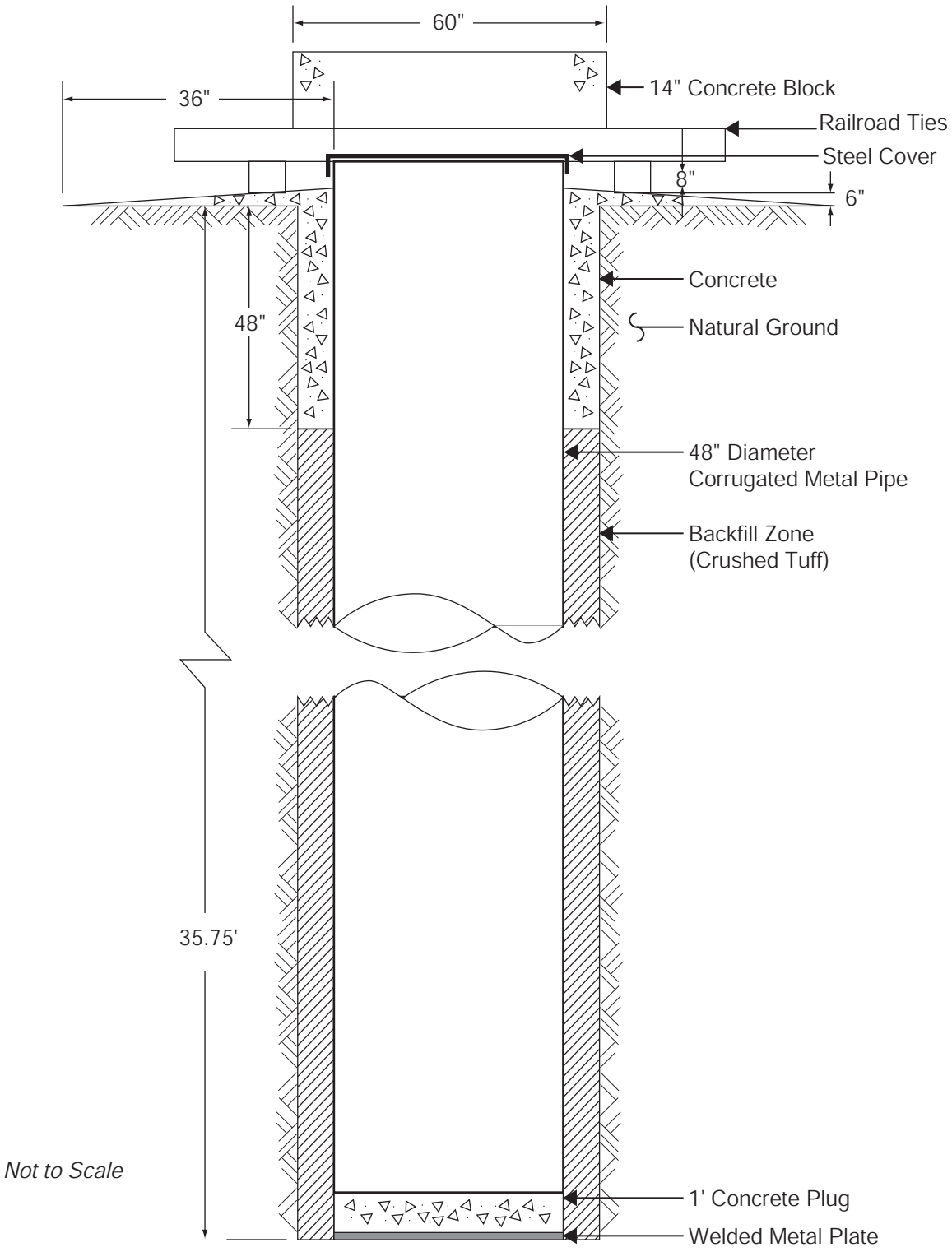
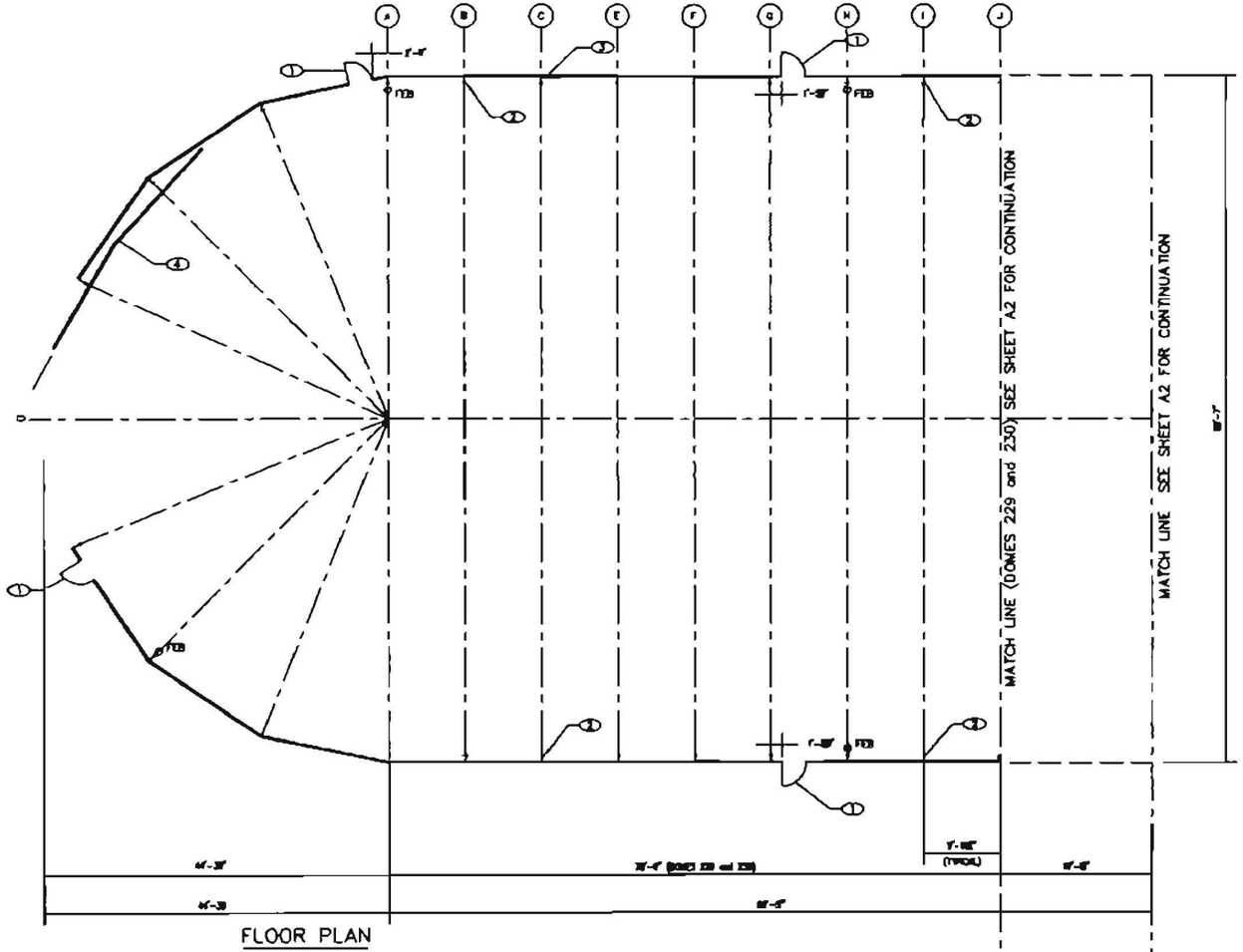
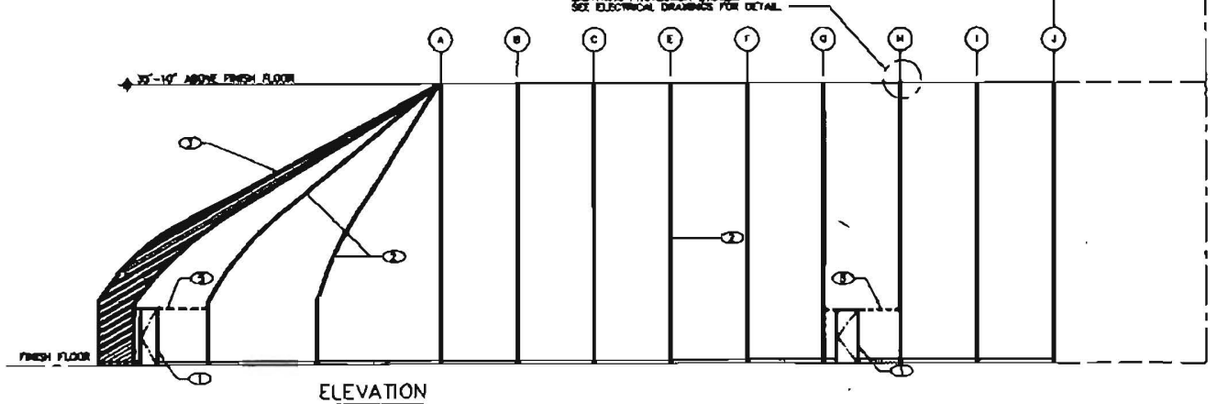


Figure G-12

Shaft 37



FLOOR PLAN



ELEVATION

NOTES

A DOMES ARE CONTRACTOR FURNISHED AND INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B STORAGE DOME LOCATION AND SIZE ARE AS FOLLOWS:

BUILDING #	DOME	SIZE	PHASE
~~54-227~~	~~PAD 1'S~~	~~[illegible]~~	~~PHASE II-S~~
~~54-228~~	~~PAD 1'S~~	~~[illegible]~~	~~PHASE IV-S~~
54-229	A	246'-1" x 88'-7"	PHASE I-S
54-230	B	246'-1" x 88'-7"	PHASE I-S
~~54-231~~	~~D~~	~~[illegible]~~	~~PHASE II-S~~
~~54-232~~	~~D~~	~~[illegible]~~	~~PHASE II-S~~

C DOME(S) SHOWN ON THESE DRAWINGS ARE BASED ON DOMES MANUFACTURED BY SPRUNG INSTANT STRUCTURES. SEE SPECIFICATION SECTION 13122 FOR OTHER APPROVED DOME MANUFACTURERS AND ASSOCIATED CONTRACTOR RESPONSIBILITIES.

KEYED NOTES

1. 3'-0" x 6'-8" METAL PERSONNEL DOOR.
2. ALUMINUM FRAME. (TYPICAL)
3. MODULAR RELOCATABLE STRUCTURE (DOME).
4. DOUBLE PANEL HORIZONTAL ROLLING DOOR.
5. ALUMINUM SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.

LEGEND

— - — CENTERLINE OF DOME AND/OR FRAME.

✦ ELEVATION SYMB

SEE COVER SHEET FOR ADDITIONAL RECORD DRAWING INFORMATION

THIS DRAWING SET WAS DEVELOPED FOR FOUR PHASES. BID ONLY WORK DESIGNATED AS PHASE I-S. WORK DESIGNATED AS BELONGING TO PHASE II-S, PHASE III-S OR PHASE IV-S IS FOR INFORMATION ONLY.

RECORD DRAWING
DECEMBER 1998

NO.	DATE	CLASS REVIEW	REVISION	DSN	DCS	CHKD	REL	ENG	ASC	APP
1	12/90		AS-BUILT WEIGHT CHANGES							

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS

Figure G-13a
Storage Domes 229 and 230

BLDG. TA-54

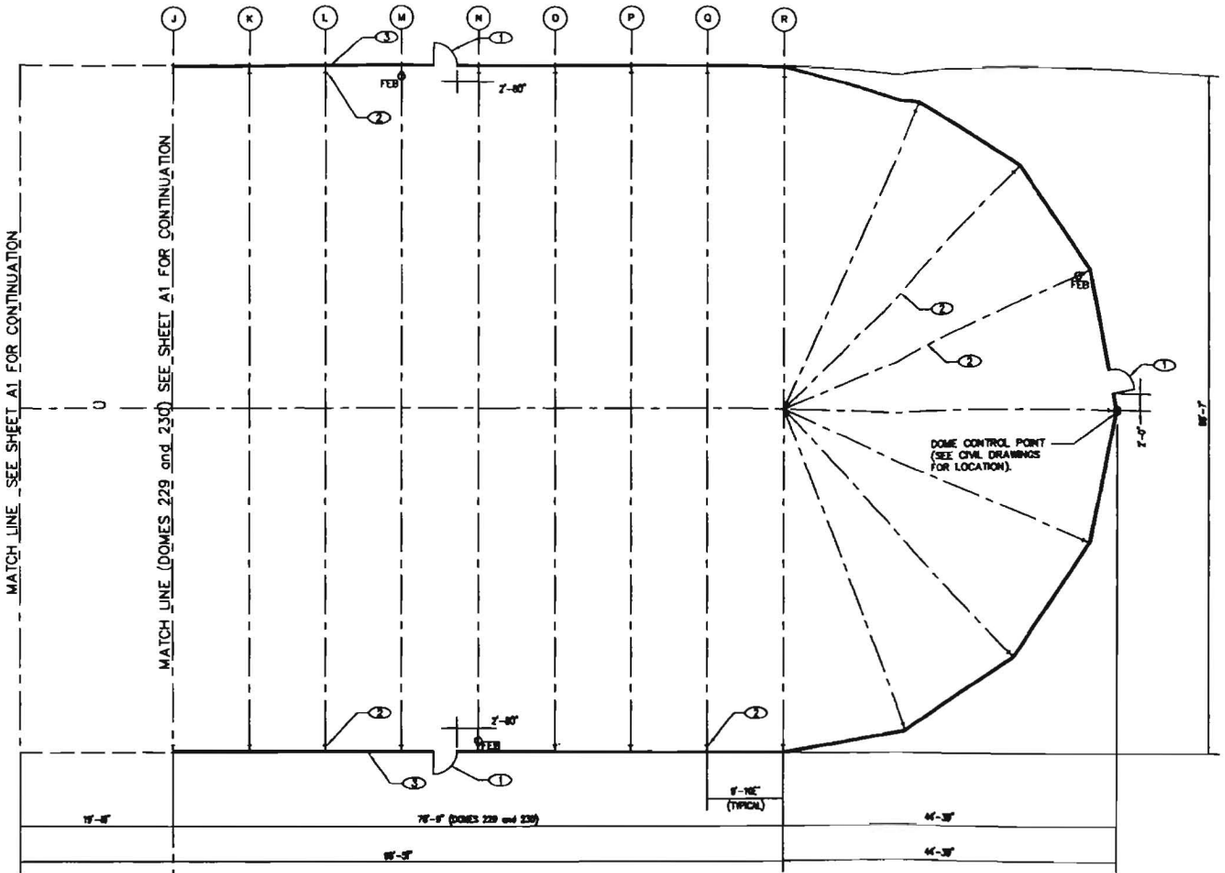
F PHILLIPS
J JAMBARD
G JONES
J JAMBARD
6/8/94

DAVID WEBER
DAVID LOWELL
CURT HOBBINS

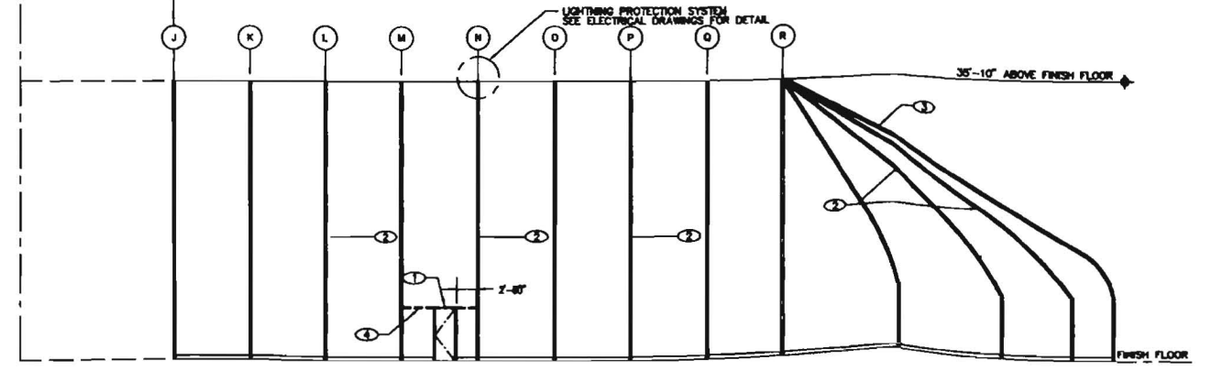
Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET A1 27/41

PROJECT ID 17868
DRAWING NO. C49421
REV. 1



FLOOR PLAN



ELEVATION

NOTES

A DOMES ARE CONTRACTOR FURNISHED AND INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B STORAGE DOME LOCATION AND SIZE ARE AS FOLLOWS:

BUILDING	DOME	SIZE	PHASE
~~54-227~~	~~PAD 4'S~~	~~265'-0" x 88'-7"~~	~~PHASE III-S~~
~~54-228~~	~~PAD 4'S~~	~~265'-0" x 88'-7"~~	~~PHASE IV-S~~
54-229	A	246'-1" x 88'-7"	PHASE I-S
54-230	B	246'-1" x 88'-7"	PHASE I-S
~~54-231~~	~~C~~	~~246'-1" x 88'-7"~~	~~PHASE II-S~~
~~54-232~~	~~D~~	~~246'-1" x 88'-7"~~	~~PHASE II-S~~

C DOME(S) SHOWN ON THESE DRAWINGS ARE BASED ON DOMES MANUFACTURED BY SPRUNG INSTANT STRUCTURES. SEE SPECIFICATION SECTION 13127 FOR OTHER APPROVED DOME MANUFACTURERS AND ASSOCIATED CONTRACTOR RESPONSIBILITIES

KEYED NOTES

1. 3'-0" x 6'-8" METAL PERSONNEL DOOR.
2. ALUMINUM STRUCTURAL FRAME.
3. MODULAR RELOCATABLE STORAGE STRUCTURE (DOME).
4. ALUMINUM SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.

LEGEND

— — — CENTERLINE OF DOME AND/OR FRAME.

✦ ELEVATION SYMBOL.

SEE COVER SHEET FOR ADDITIONAL RECORD DRAWING INFORMATION

THIS DRAWING SET WAS DEVELOPED FOR FOUR PHASES. BID ONLY WORK DESIGNATED AS PHASE I-S. WORK DESIGNATED AS BELONGING TO PHASE II-S, PHASE III-S OR PHASE IV-S IS FOR INFORMATION ONLY.

NO.	DATE	CLASS REVIEW	REVISION	DWN	DES	CHKD	MGR	ENG	REG	APP
1	12/98		AS-BUILT WITHOUT CHANGES							

RECORD DRAWING
Date DECEMBER 1995
These drawings have been revised based on the construction records of the owner. While the information submitted by the owner will be assumed to be reliable, the Engineer will not be responsible for the accuracy of the information nor for errors or omissions which may appear in the record document as a result thereof.

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN DIEGO

Figure G-1.b
Storage Dome 229
and 230

BLDG. TA-54

DRAWN	F PHILLIPS
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	J JARRARD
DATE	6/6/94

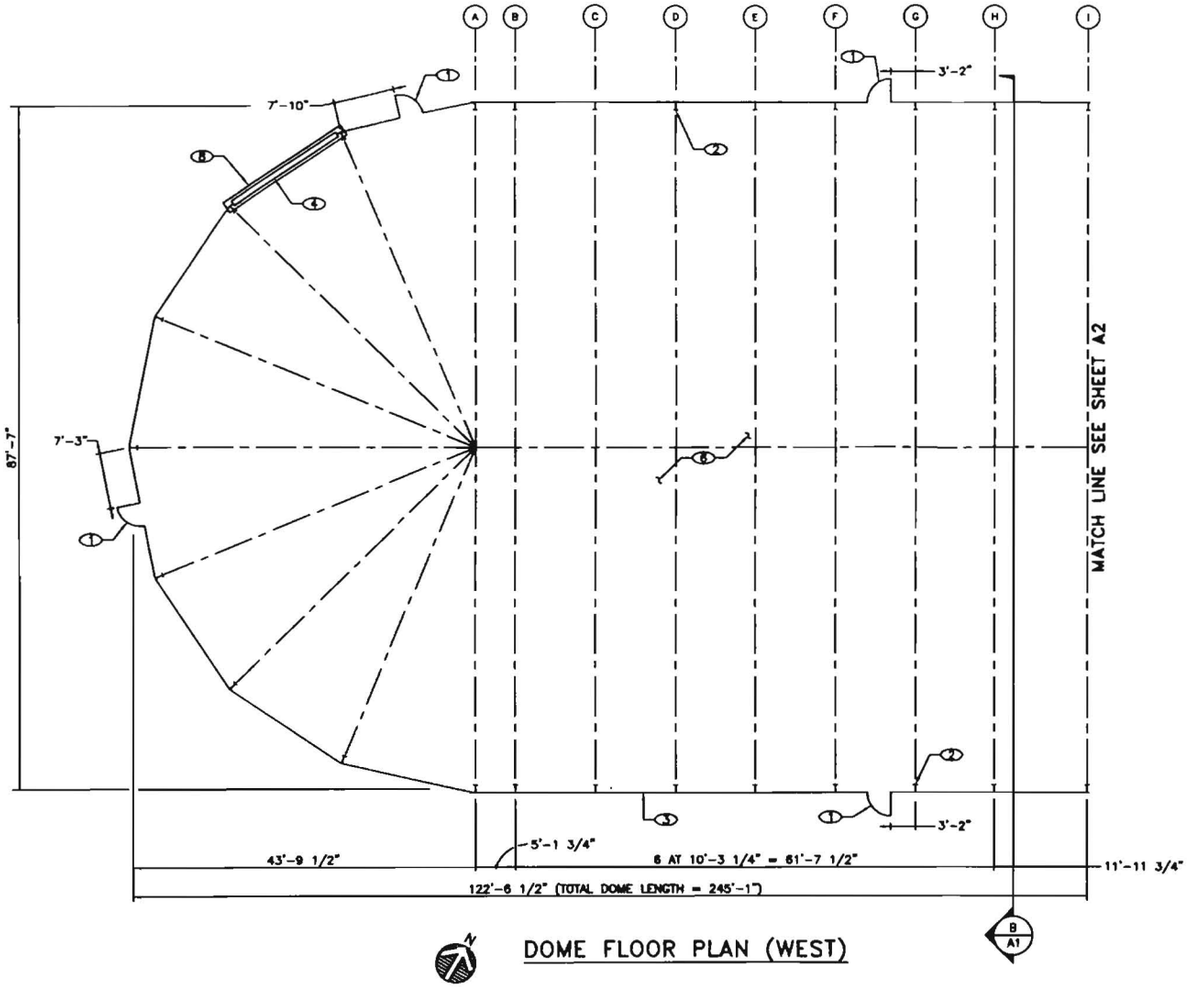
SUBMITTED: DAVID DOZIER
RECOMMENDED: DAVID PORZEL
APPROVED: CORY HIGGINS

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

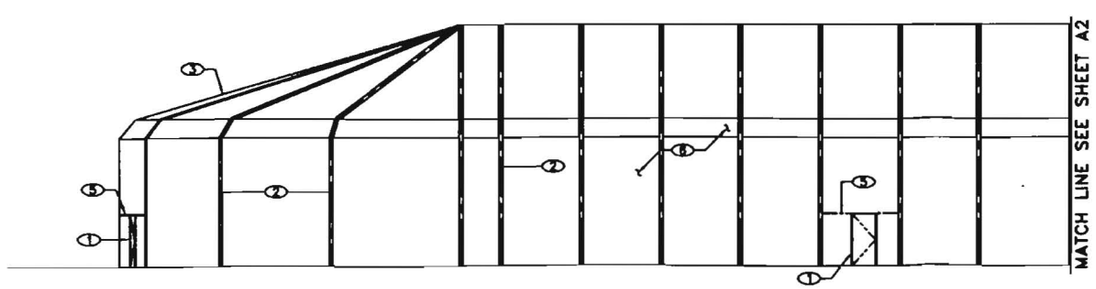
SHEET A2 28 of 41

CLASSIFICATION REVIEWER DATE

PROJECT ID 13868
DRAWING NO. C49421
REV. 1



DOME FLOOR PLAN (WEST)



ELEVATION (WEST) A/A1

NOTES

A MODULAR RELOCATABLE STRUCTURE (DOME) WILL BE GFE FOR CONTRACTOR INSTALLATION. DOME MANUFACTURER WILL FURNISH UNASSEMBLED DOME COMPONENTS INCLUDING PERSONNEL DOORS WITH THRESHOLDS AND OVERHEAD COILING DOORS. FLOOR PLAN ON THIS SHEET IS FOR GENERAL LAYOUT INFORMATION ONLY. SEE SECTION 13127 OF THE SPECIFICATIONS FOR COMPLETE SHOP DRAWINGS AND DETAILS REGARDING CONTRACTOR DOME INSTALLATION RESPONSIBILITY.

B BUILDING DIMENSIONS ARE FROM CENTERLINE OF COLUMN.

KEYED NOTES

1 3'-0" X 6'-8" METAL PERSONNEL DOOR (PAINT DOOR AND FRAME).

2 FRAME (TYPICAL).

3 MODULAR RELOCATABLE STRUCTURE (DOME).

4 OVERHEAD COILING DOOR (16'-0" X 16'-0") (PAINT DOOR AND FRAME).

5 SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.

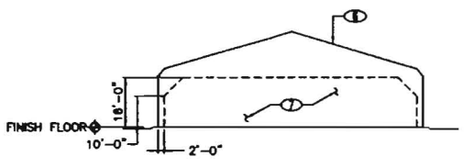
6 INSTALL GOVERNMENT FURNISHED (GFE) MODULAR RELOCATABLE STRUCTURE (DOME) ON EXISTING RING WALL FOUNDATION.

7 MINIMUM CLEAR ENVELOPE. DOME STRUCTURE, INCLUDING CABLE BRACES, FIRE PROTECTION SYSTEM, ETC MUST BE OUTSIDE THIS AREA.

8 18'-0" X 1'-6" X 1'-0" FOOTING AT OVERHEAD DOOR.

LEGEND

— - — CENTERLINE OF DOME AND/OR STRUCTURE



TYPICAL DOME SECTION B/A1

NTS

RECORD DRAWING

Date MARCH 1998

NO.	DATE	CLASS REVIEW	REVISIONS					
1	3/2/98		AS-BUILT WITH CHANGES					

LEEDSHILL-HERKENHOFF, INC.

ARCHITECTS ENGINEERS

Figure G-14a
Storage Domes 231
and 232

BLDG. 54-231 TA-54

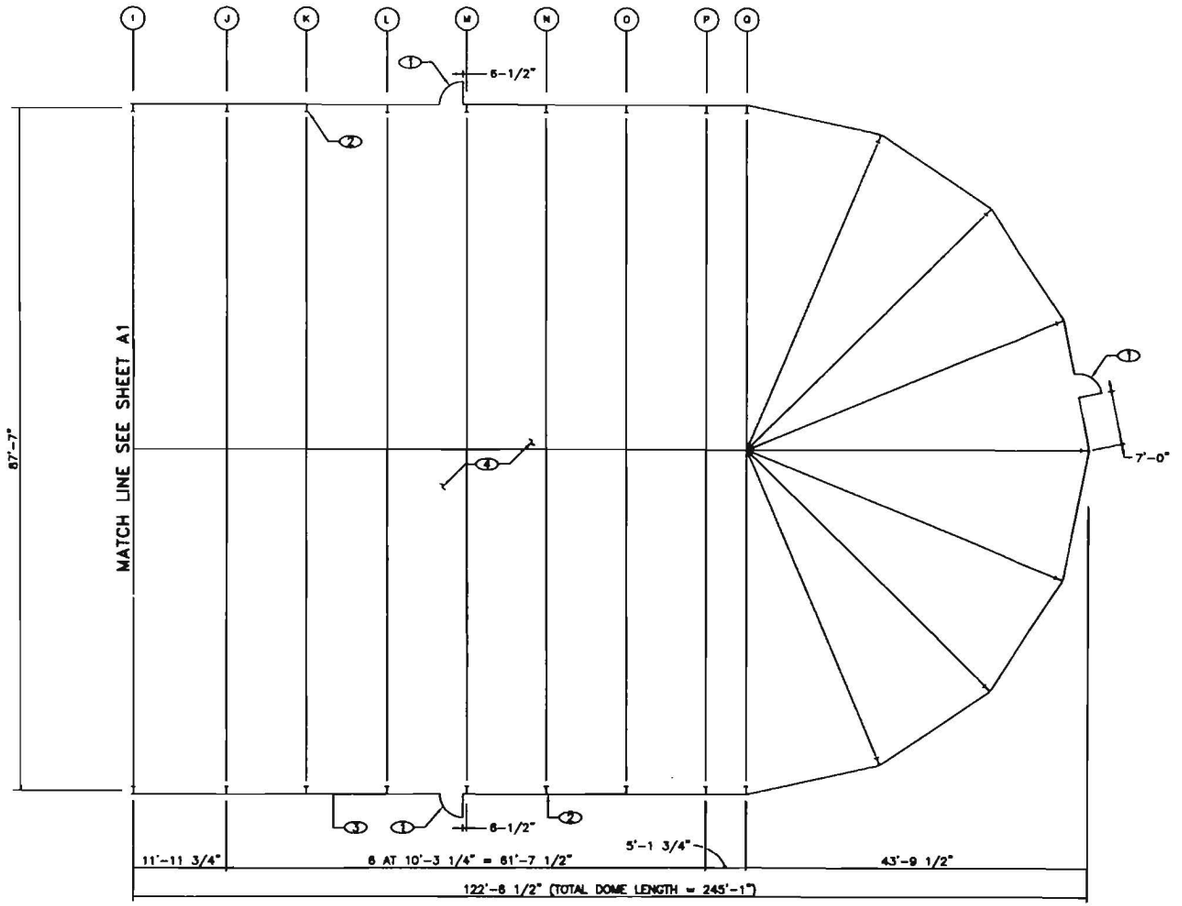
DRAWN P SCHMITTLE
DESIGN J JARRARD
CHECKED D KLEIN
DATE 08/21/98

SUBMITTED DAVID DOZIER
APPROVED FOR RELEASE JIM BELL

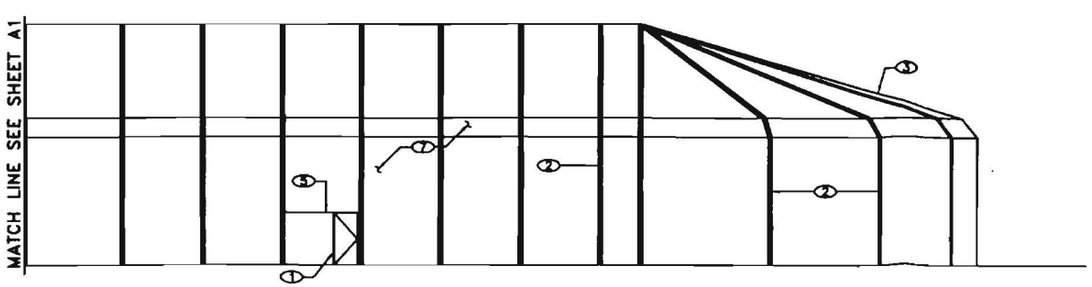
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET A1 4/13

PROJECT ID 13830
DRAWING NO. C49840-A
REV. 1



DOME FLOOR PLAN (EAST)



ELEVATION (EAST) A/A2

NOTES

A MODULAR RELOCATABLE STRUCTURE (DOME) WILL BE GFE FOR CONTRACTOR INSTALLATION. DOME MANUFACTURER WILL FURNISH UNASSEMBLED DOME COMPONENTS INCLUDING PERSONNEL DOORS WITH THRESHOLDS AND OVERHEAD COILING DOORS. FLOOR PLAN ON THIS SHEET IS FOR GENERAL LAYOUT INFORMATION ONLY. SEE SECTION 13127 OF THE SPECIFICATIONS FOR COMPLETE SHOP DRAWINGS AND DETAILS REGARDING CONTRACTOR DOME INSTALLATION RESPONSIBILITY.

B SPRINKLER RISER CLOSET NOT FURNISHED WITH GFE DOME. CONSTRUCT CLOSET ON SITE AS SHOWN ON SHEET A3.

C BUILDING DIMENSIONS ARE FROM CENTERLINE OF COLUMN.

D FOR TYPICAL DOME SECTION. SEE SHEET A1.

KEYED NOTES

1 3'-0" X 8'-8" METAL PERSONNEL DOOR (PAINT DOOR AND FRAME).

2 FRAME (TYPICAL).

3 MODULAR RELOCATABLE STRUCTURE (DOME).

4 INSTALL GOVERNMENT FURNISHED (GFE) MODULAR RELOCATABLE STRUCTURE (DOME) ON EXISTING RING WALL FOUNDATION.

5 SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS

LEGEND

——— CENTERLINE OF DOME AND/OR STRUCTURE

RECORD DRAWING
Date MARCH 1999

NO.	DATE	CLASS REVIEW	REVISIONS	DWN	MFG	CHKD	MGR	APP
1	3/2/98		AS-BUILT WITH CHANGES					

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS

Figure G-14b
Storage Domes 231
and 232

BLDG. 54-231 TA-54

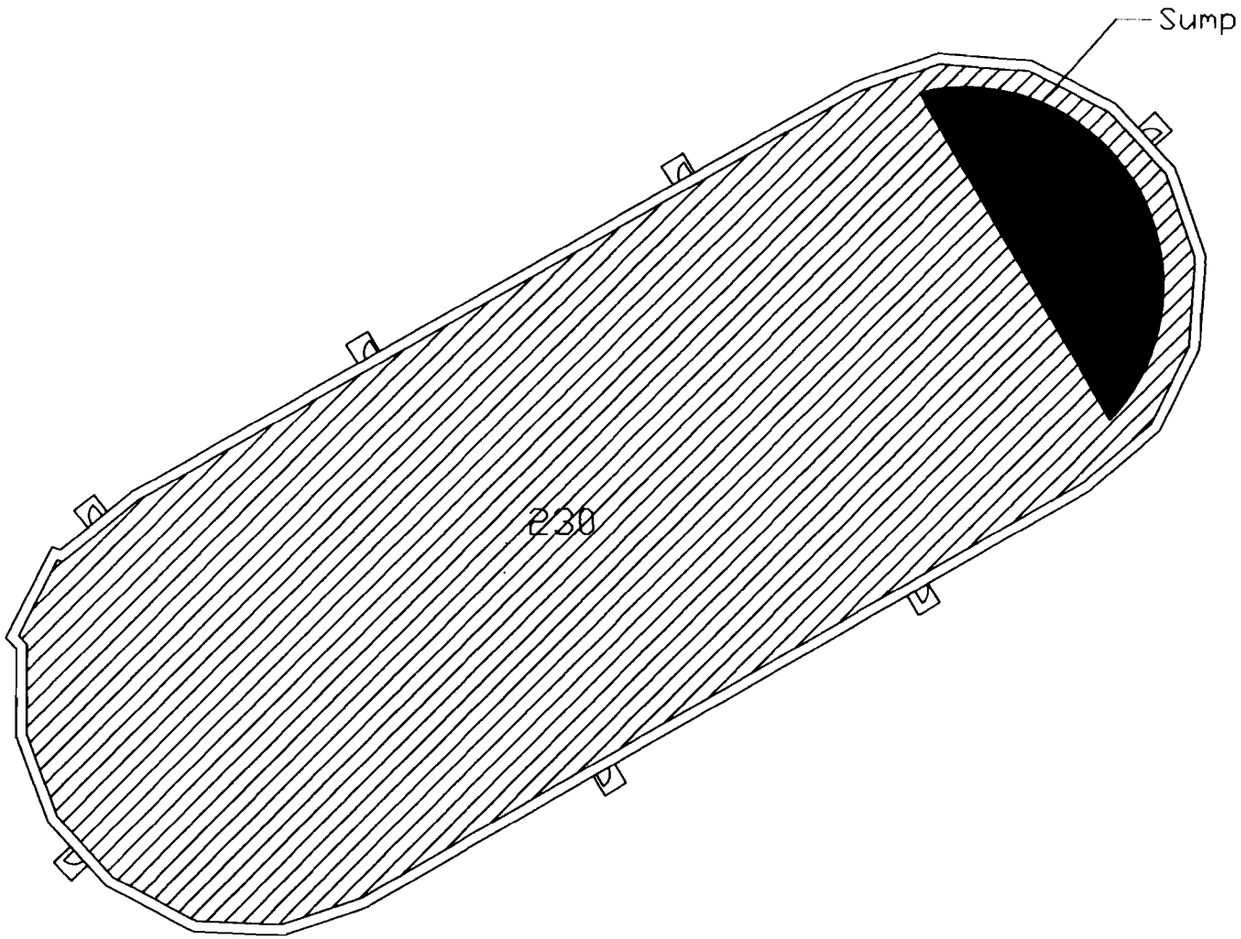
DRAWN P SCHUTTLE
DESIGN J JAMBARD
CHECKED D KLEIN
DATE 08/21/98

SUBMITTED DAVID DOZIER
APPROVED FOR RELEASE JIM BELL

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET A2 5/13

CLASSIFICATION
PROJECT ID
DRAWING NO.
REV.



LEGEND

Min. 3" Depth

Min. 1'-9" Deptt

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DRN	VER	CHKD	SUB	APP

Facility & Waste Operations
Waste Facility Management
TA-54 RMU-54

Figure 5-15
Storage Dome 230
Secondary Containment

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	08-17-02

BLDG TA-54

SUBMITTED R. Lechel

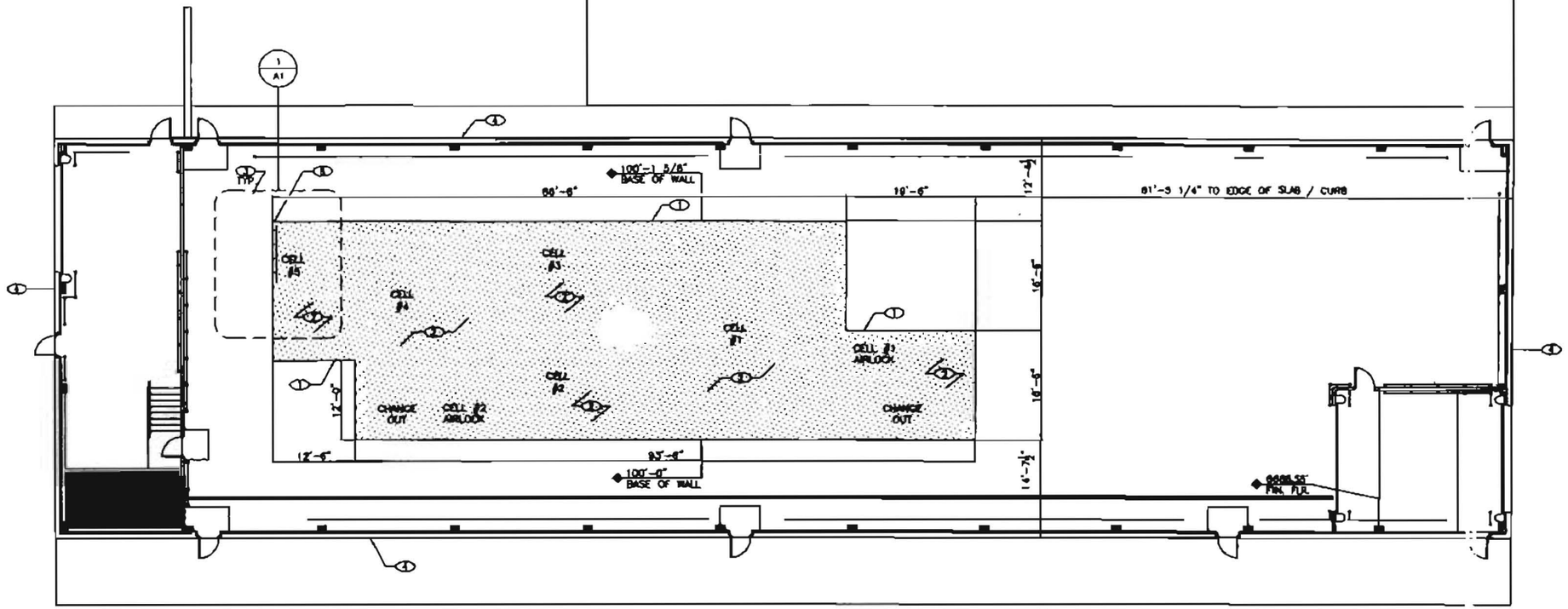
APPROVED FOR RELEASE D. Mclain

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET OF

CLASSIFICATION REVIEWER REVIEWER DATE

PROJECT ID DRAWING NO SK-54-G-12 REV 0



FLOOR PLAN

N

NOTES

A

B SEAL ALL PENETRATIONS IN SECONDARY CONFINEMENT STRUCTURE WITH FIRE-RESISTIVE SEALANT. SEE SPECIFICATION 07841.

C DIMENSIONS SHOWN FOR THE FLOOR COATING ARE TO EDGE OF SLAB / CURB. COORDINATE LOCATION WITH PRIMARY CONTAINMENT STRUCTURE.

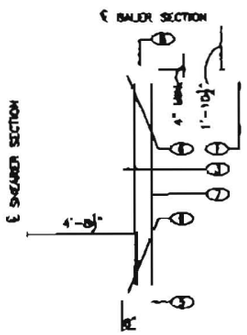
KEYED NOTES

1 PRIMARY CONTAINMENT STRUCTURE
2 SPECIAL FLOOR COATING AT PRIMARY CONTAINMENT STRUCTURE. SEE GENERAL NOTE C.
3 SHEARER / BALER (G.F.E.) – SEE STRUCTURAL FOR FOUNDATION REQUIREMENTS.
4 SECONDARY CONFINEMENT STRUCTURE.
5 STEEL TUBE FRAMING – SEE STRUCTURAL.
6 6-3/4" WIDE EXPANSION JOINT BOOT WITH GALVANIZED COVER.
7 WALL PANEL BELOW
8 ALIGN OUTSIDE EDGE OF STRUCTURE (FRAMING) WITH OUTSIDE EDGE OF EDGE OF SHEARER / BALER FLANGE.
9 HEPA FILTER FRAME OR STAINLESS-STEEL PASS THROUGH
10 5/8" TYPE "X" GYP. BD.
11 0.090" FRP PANEL
12 2" x 2" x 1/8" RETAINING ANGLE
13 FIRE

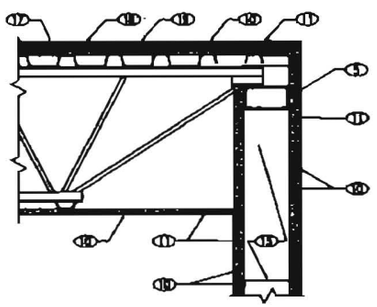
THIS SHEET HAS BEEN REDRAWN. SEE ORIGINAL DRAWING FOR SIGNATURES AND ENGINEER'S SEAL

KEYED NOTES (CONT.)

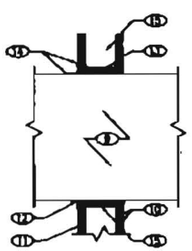
15 6" METAL STUD WALL FRAMING
16 OPEN-WEB JOIST – SEE STRUCTURAL
17 1-1/2" x 22 GA. STEEL ROOF DECK – SEE STRUCTURAL
18 ~~1" THICK CLASS A FIBER GLASS FIBER BOARD~~ FIBER BOARD CHANGE TO 1 ADDITIONAL LAYER 5/8" SHEETROCK (MOD. 13)
19 VINYL FILM VAPOR BARRIER ADHERED TO GYP. BD.



STRUCTURE LOCATION DETAIL (PLAN VIEW) 1/A1



FIRE-RATD ASS'Y DETAIL 2/A1



TYPICAL FRAMED OPENING. 3/A1

RECORD DRAWING
8/01

	8/01		RECORD DRAWING

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS

Figure G-16
TA-54-012

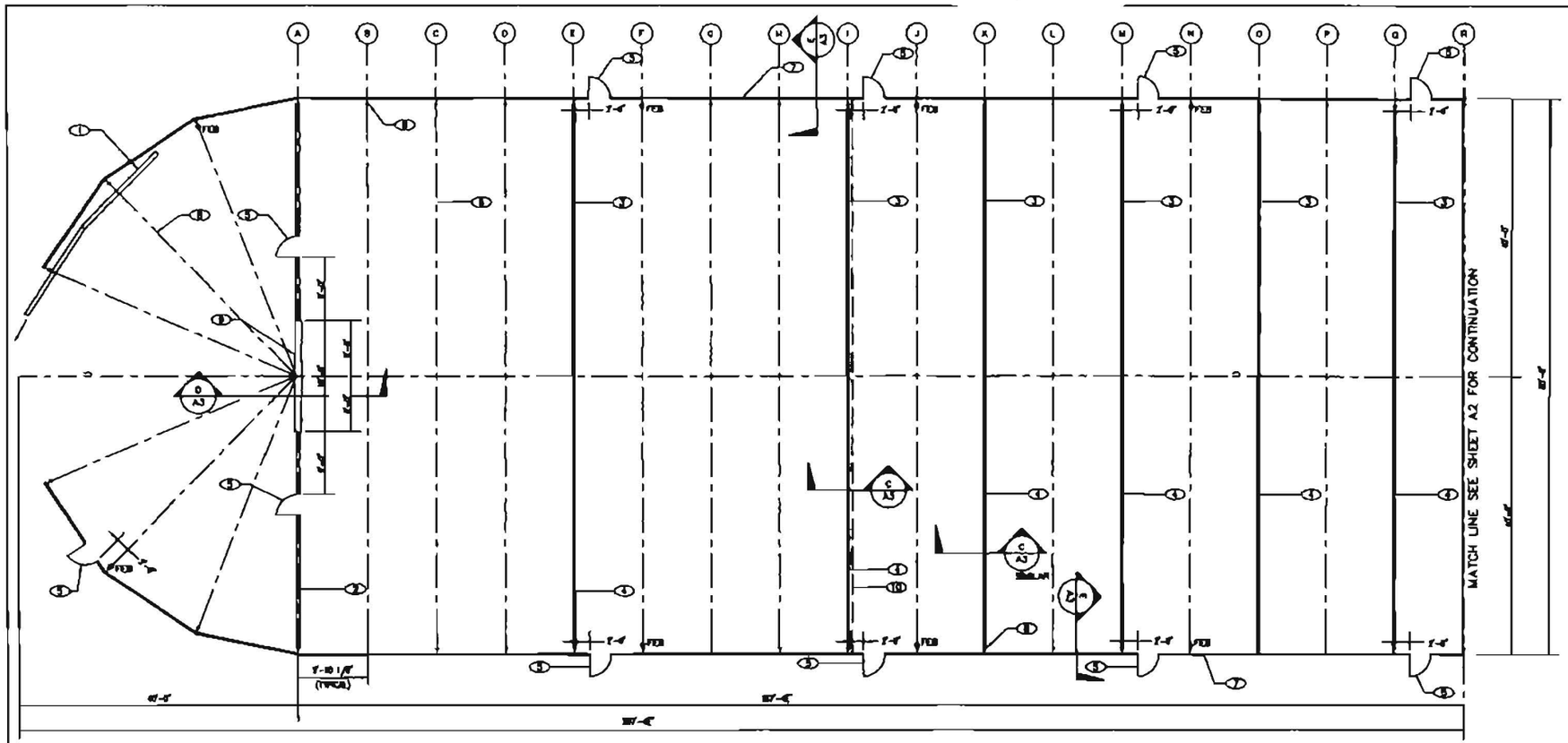
TA-54

T. APEAR
S. STEPHENS
O. E. STOENS
7/8/00

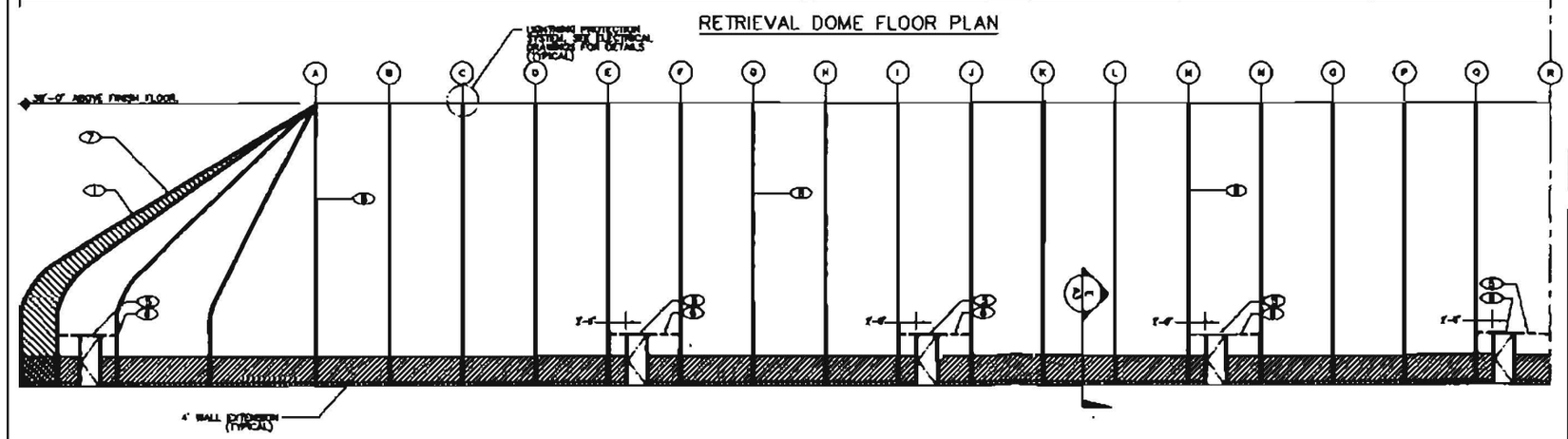
Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

A1 6/17

19303 C62204 2



RETRIEVAL DOME FLOOR PLAN



RETRIEVAL DOME ELEVATION A/A1

NOTES

A. DOMES ARE CONTRACTOR FURNISHED AND INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B. DOME(S) SHOWN ON THESE DRAWINGS ARE BASED ON DOMES MANUFACTURED BY SPRUNG INSTANT STRUCTURES. SEE SPECIFICATION SECTION 13127 FOR OTHER APPROVED DOME MANUFACTURERS AND ASSOCIATED CONTRACTOR RESPONSIBILITIES.

KEYED NOTES

1. 32'H x 32'W DOUBLE PANEL HORIZONTAL ROLLING DOOR.
2. MOVABLE DIVIDING FLAT INTERIOR WALL
3. UPPER DIVIDING WALL (PAD 1 & 4)
4. UPPER DIVIDING WALL (PAD 2)
5. 3'-0" x 1'-8" METAL PERSONNEL DOOR
6. ALUMINUM SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.
7. MODULAR RELOCATABLE STRUCTURE
8. ALUMINUM FRAME (TYPICAL)
9. 14'H x 14'W RAPID ROLL-UP DOOR
10. MOVABLE CURTAIN

LEGEND

- 4' WALL EXTENSION
- CENTERLINE OF BUILDING AND/OR FRAME
- (A) FRAME SYMBOL
- ELEVATION SYMBOL
- FEB FIRE EXTINGUISHER WITH BRACKET, MOUNTED AT 48" ABOVE FLOOR. (BY UNIVERSITY)

SEE COVER SHEET FOR ADDITIONAL RECORD DRAWING INFORMATION

THIS DRAWING SET WAS DEVELOPED FOR FOUR PHASES. BID ONLY WORK DESIGNATED AS PHASE I-R. WORK DESIGNATED AS BELONGING TO PHASE II-R, PHASE III-R OR PHASE IV-R IS FOR INFORMATION ONLY.

NO.	DATE	CLASS REVISION	REVISIONS
1	12/93		AS-BUILT WITHOUT CHANGES

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS

Figure G-17a
Storage Dome 226

BLDG. 54-226 TA-54

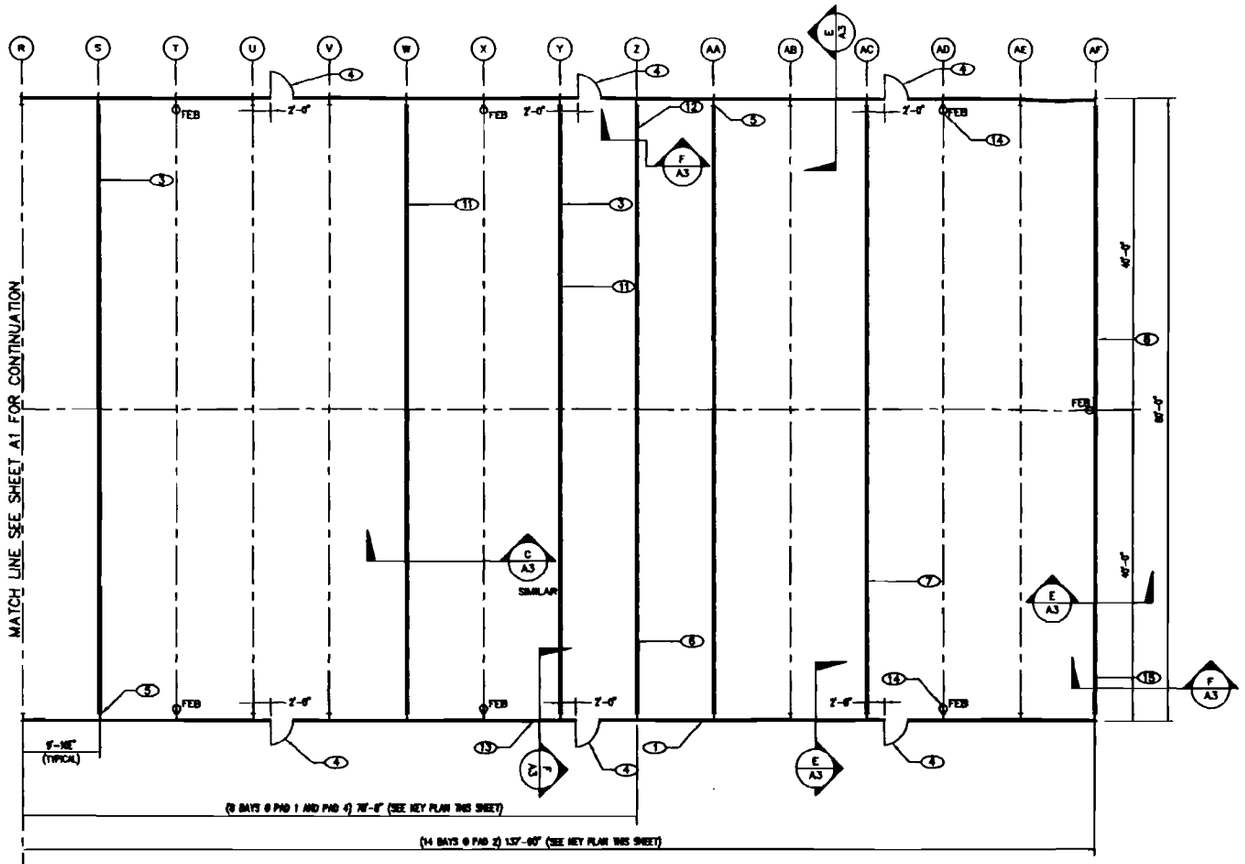
DRAWN F. PHILLIPS
DESIGN J. [illegible]
CHECKED B. JONES
APPROVED J. [illegible]
DATE 6/8/94

DAVID DUBBER | DAVID HOWELL | CORY [illegible]

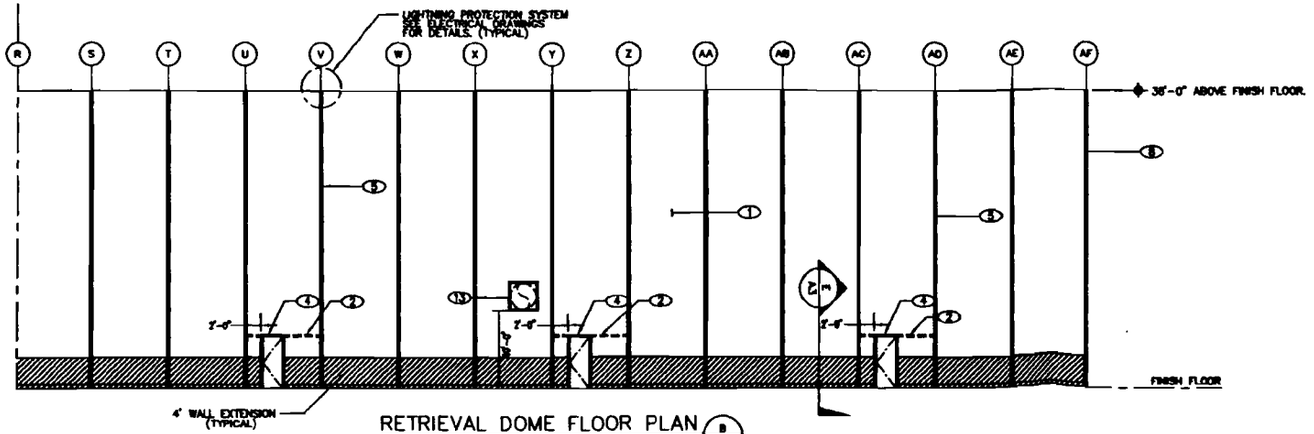
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET A1 | 38 of 66

PROJECT NO. 14211 | DRAWING NO. C40422 | REV. 1



RETRIEVAL DOME FLOOR PLAN



RETRIEVAL DOME FLOOR PLAN B/A2

LEGEND

- 4' WALL EXTENSION.
- CENTERLINE OF BUILDING AND/OR FRAME. (GFE)
- ELEVATION SYMBOL.
- (AA) FRAME SYMBOL.

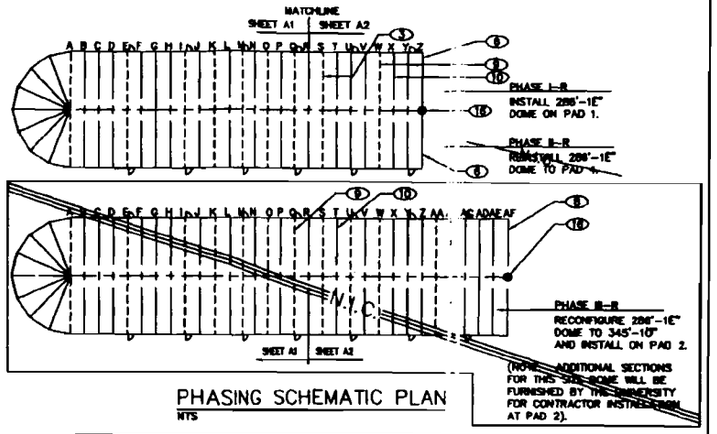
NOTES

A DOMES ARE CONTRACTOR FURNISHED AND INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B DOME(S) SHOWN ON THESE DRAWINGS ARE BASED ON DOMES MANUFACTURED BY SPRUNG INSTANT STRUCTURES. SEE SPECIFICATION SECTION 13127 FOR OTHER APPROVED DOME MANUFACTURERS AND ASSOCIATED CONTRACTOR RESPONSIBILITIES.

KEYED NOTES

1. MODULAR RELOCATABLE STRUCTURE
2. ALUMINUM SUPPORT FRAMING. TYPICAL AT ALL PERSONNEL DOORS.
3. UPPER DIVIDING WALL. (PAD 1 & 4)
4. 3'-0" x 6'-8" METAL PERSONNEL DOOR
5. ALUMINUM FRAME (TYPICAL)
6. FLAT END WALL (PAD 1 & 4)
7. UPPER DIVIDING WALL. (PAD 2)
8. FLAT END WALL (PAD 2)
9. UPPER DIVIDING WALL (DASHED)(TYPICAL)
10. COLUMN LINE. (TYPICAL)
11. UPPER DIVIDING WALL. (PAD 2)
12. FRAMED MECHANICAL DUCT OPENING. (PAD 1)
13. FRAMED MECHANICAL DUCT OPENING. (PAD 4)
14. FIRE EXTINGUISHER WITH BRACKET (PAD 2 ONLY)
15. FRAMED MECHANICAL DUCT OPENING. (PAD 2 ONLY)
16. CONTROL POINT. (SEE CIVIL DRAWINGS).



PHASING SCHEMATIC PLAN
NTS

SEE COVER SHEET FOR ADDITIONAL RECORD DRAWING INFORMATION

THIS DRAWING SET WAS DEVELOPED FOR FOUR PHASES. BID ONLY WORK DESIGNATED AS PHASE I-R. WORK DESIGNATED AS BELONGING TO PHASE II-R, PHASE III-R OR PHASE IV-R IS FOR INFORMATION ONLY.

NO.	DATE	CLASS REVIEW	REVISIONS	DWN	DES	CHKD	REL	ENG	PROJ	APP
1	12/86		AS-BUILT WITH CHANGES							

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN MARCOS

Figure G-17b
Storage Dome 226

BLDG. 54-226 TA-54

DRAWN	F PHILLIPS
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	J JARRARD
DATE	6/8/84

A/E STAMP

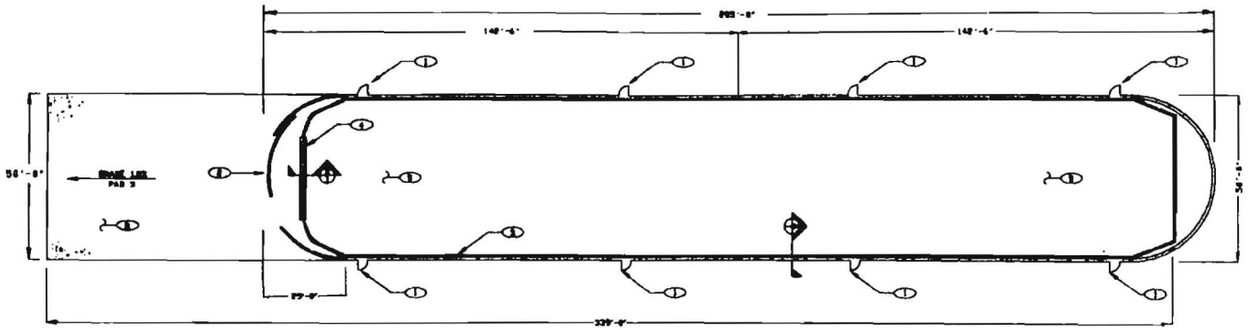
SUBMITTED: DAVID DOZIER
ENGINEER: DAVID PC[illegible]LL
APPROVED: CORY HIGGINS

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET A2 39 of 66

CLASSIFICATION REVIEWER DATE

PROJECT ID 14211
DRAWING NO. C49422
REV. 1



NOTE: ORIGINAL ASPHALTIC CONCRETE PAD WIDTH WAS EXTENDED APPROXIMATELY 5 FEET ON EITHER SIDE TO ACCOMMODATE WIDTH OF DOME

GRAPHIC SCALE

(IN FEET)

1 INCH = 80 FT.

KEY NOTES

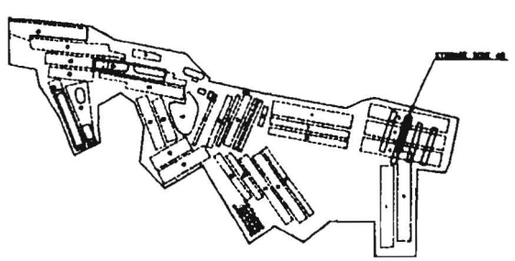
1. 3'-0" X '-0" PERSONNEL DOOR
2. DOUBLE ... VEL ROLLING DOOR
3. ASPHALT ... CONCRETE BERM
4. ASPHALT ... CONCRETE RAMP
5. ASPHALT ... CONCRETE PAVING
6. DOME WALL

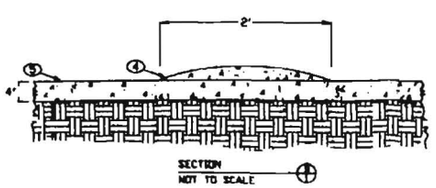
LEGEND

ASPHALTIC CONCRETE PAVING

EARTH (COMPACTED BACKFILL)

LOCATION MAP
SCALE: 1" = 800'





NOTE:
AVERAGE DISTANCE TO DOME WALL FROM BERM IS 1'-6"

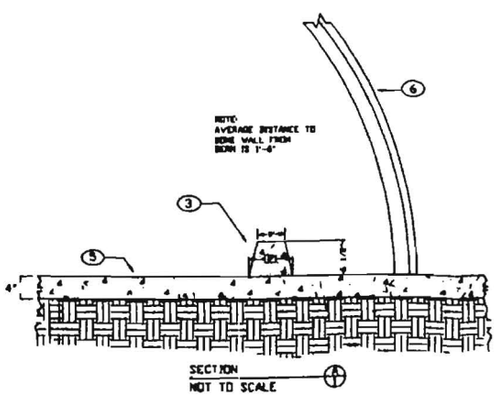


Figure 3-18
Storage Dome 48

JAMES J. HAUGEN
NEW MEXICO
10763
REGISTERED PROFESSIONAL ENGINEER

FACILITY DEVELOPMENT TEAM
CST-14

TECHNICAL AREA 54 (TA-54), AREA G
STORAGE DOME 48
TA-54-48
AS-BUILT FLOOR PLAN

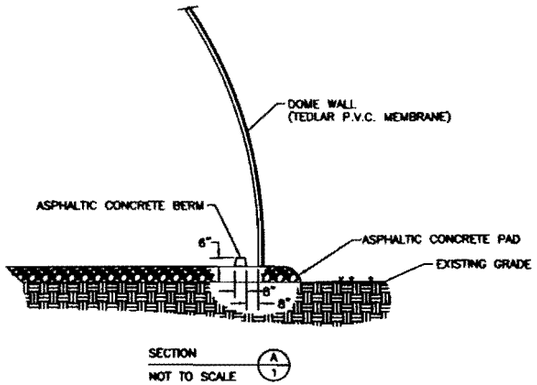
DRAWN BY	DATE	APPROVED
R. D'PEAR	03/27/95	J. HAUGEN

Los Alamos

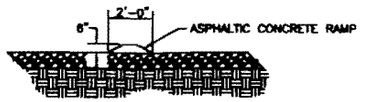
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET 1 OF 1

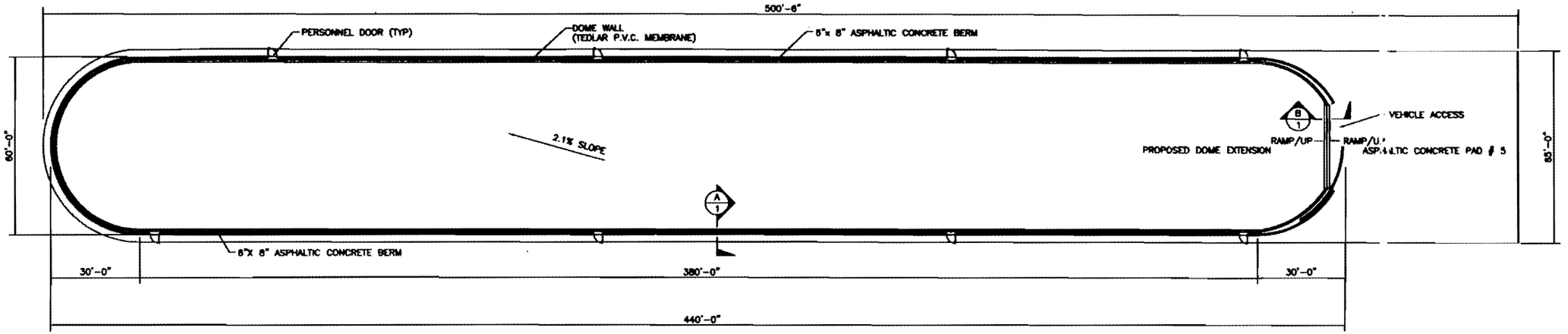
DRAWING NO.

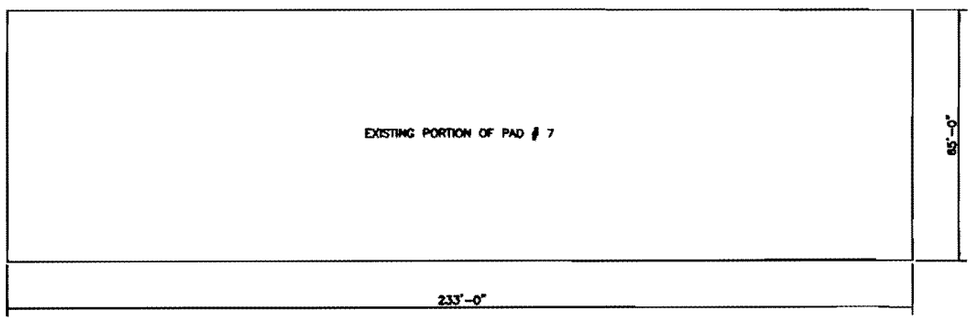


SECTION A/1
NOT TO SCALE



SECTION B/1
NOT TO SCALE





FLOOR PLAN

N

NO	DATE	CLASS REV	DESCRIPTION	ORIN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G--19
Storage Dorre 49

DRAWN	C. SANDRA
VERIFIED	C. SANDRA
CHECKED	
RELEASED	
DATE	03-03-05

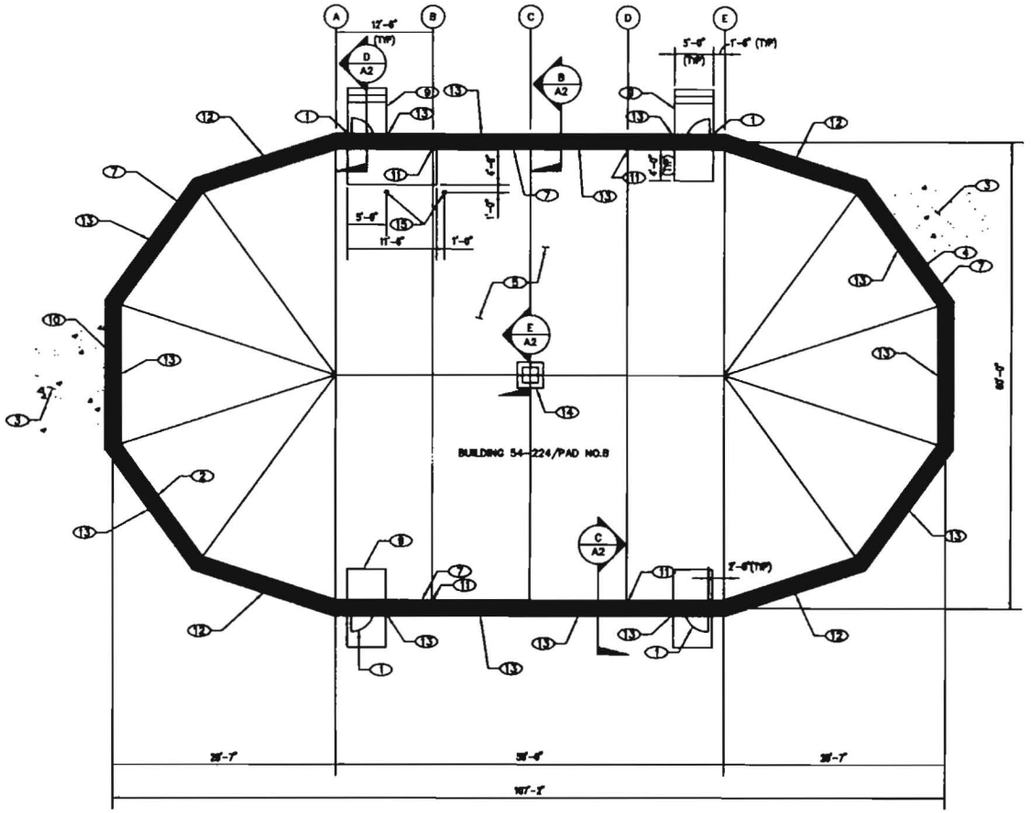
SUBMITTED | RECOMMENDED | APPROVED

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

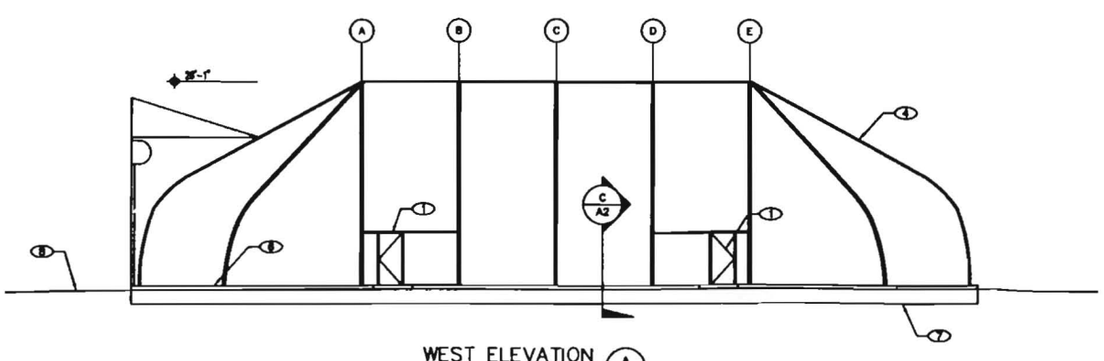
SHEET 1 OF 1

CLASSIFICATION | REVIEWER | DATE

PROJECT ID | DRAWING NO | REV



MODULAR RELOCATABLE STRUCTURE – FLOOR PLAN



WEST ELEVATION

KEYED NOTES

1. 3'-0" x 6'-8" PERSONNEL DOOR. (= EACH)
2. ROLLING SINGLE PANEL DOOR.
3. ASPHALTIC CONCRETE PAVING AROUND PERIMETER OF CONCRETE RINGWALL.
4. FRAME AND FABRIC COVER.
5. HDPE LINER ON ASPHALTIC CONCRETE PAVING.
6. TOP OF RINGWALL.
7. CONCRETE RINGWALL PERIMETER FOUNDATION.
8. FINISH GRADE.
9. CONCRETE LANDING.
10. 1" x 4" x DOOR WIDTH – STEEL PLATE THRESHOLD ANCHORED TO CONCRETE RINGWALL THROUGH HDPE LINER WITH 1"ø ROUND HEAD SLEEVE ANCHORS @ 12 INCHES ON CENTER WITH 10" MINIMUM EMBEDMENT (RED HEAD OR APPROVED EQUAL).
11. FIRE EXTINGUISHER. (GFE)
12. 8" EXPANSION JOINT, AT MIDPOINT BETWEEN FRAME ELEMENTS. SEE SHEET A2 DETAIL 2.
13. CONTRACTION JOINT, AT MIDPOINT BETWEEN FRAME ELEMENTS TYPICAL UNLESS OTHERWISE NOTED. SEE SHEET A2 DETAIL 1.
14. SUMP
15. BOLLARD, SEE SHEET C4A DETAIL 4.

ABBREVIATIONS

TYP	TYPICAL
DOME	MODULAR RELOCATABLE STRUCTURE
HDPE	HIGH DENSITY POLYETHELENE
GFE	GOVERNMENT FURNISHED EQUIPMENT
@12	CENTER TO CENTER SPACING OF CONRETE REINFORCEMENT, IN INCHES

LEGEND

- ELEVATION SYMBOL
- CENTERLINE OF DOME AND/OR FRAME
- CONCRETE
- CONCRETE RINGWALL
- ASPHALTIC PAVING
- EARTH (UNDISTURBED)
- ALUMINUM

REFERENCE "BUBBLE" DESCRIPTION

PLAN/ELEVATION/DETAIL REFERENCE NUMBERS

SHEET WHERE REFERENCE IS LOCATED

11/95		AS-BUILT WITH CHANGES	
11-03-94		CHANGED PAD DIMENSION	
10-17-94		REVISED DOME, RINGWALL, AND ADDED NOTES.	

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS

Figure G-20
Storage Dome 224

BLDG. 54-224 TA-54

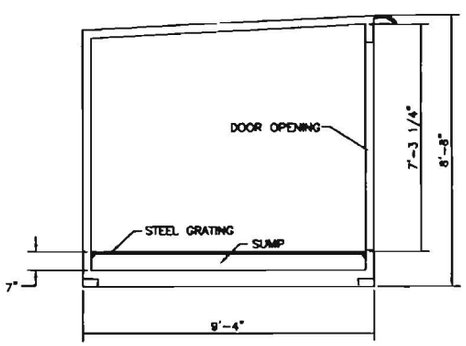
DRAWN	F PHILLIPS
DESIGN	D JONES
CHECKED	S HOFFMAN
RELEASED	D JONES
DATE	6/17/94

SUBMITTED: DAVID DIXSER
RECOMMENDED: DAVID PORS
APPROVED: CORY HOBBS

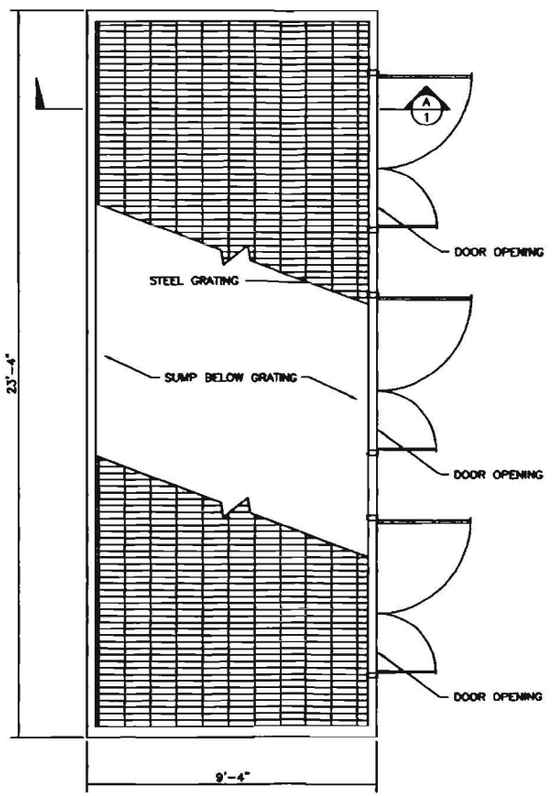
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET A1 9/22

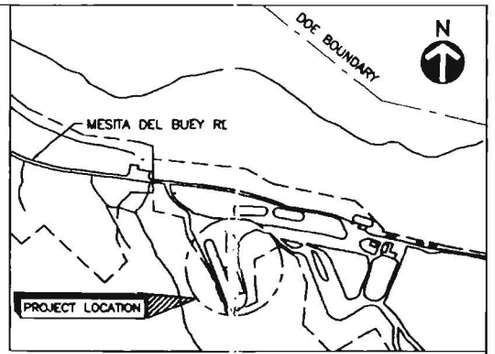
CLASSIFICATION
PROJECT ID
DRAWING NO.
REV.



CROSS SECTION A/1

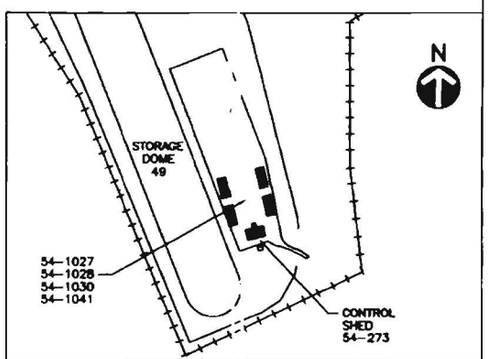


FLOOR PLAN



LOCATION MAP

SCALE: NONE



SITE PLAN

SCALE: NONE

NOTE

1. ALL STORAGE SHEDS TYPICAL TO FLOOR PLAN

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

Environmental Management
Solid Waste Operations

Figure G-2
TA-54-1027, -1028
-1030, and -1041
Secondary Containment

DRAWN	S.MADRID
VERIFIED	N/A
CHECKED	D.MEADOWS
DATE	07-10-98

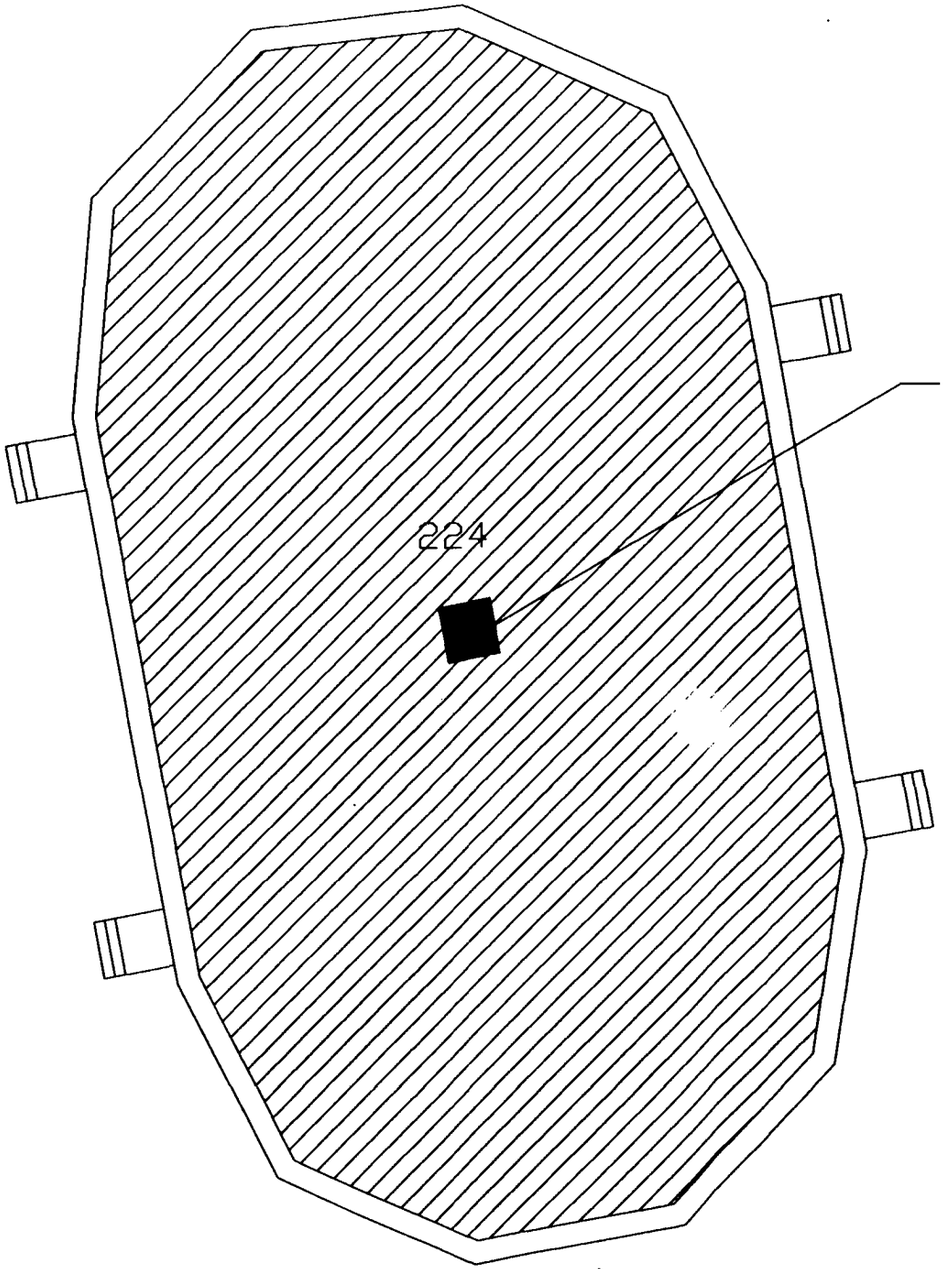
BLDG VARIES TA-54

SUBMITTED
SUBMITTED
APPROVED FOR RELEASE
B.DODGE

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET SK15 1 OF 1

CLASSIFICATION REVIEWER REVIEWER DATE
PROJECT ID DRAWING NO



LEGEND

Min. 6" Depth

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

Facility & Waste Operations
Waste Facility Management
TA-54 PMU-54

Figure G-22
Storage Dome 224
Secondary Containment

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

APPROVED FOR RELEASE
APPROVED D. Mclain

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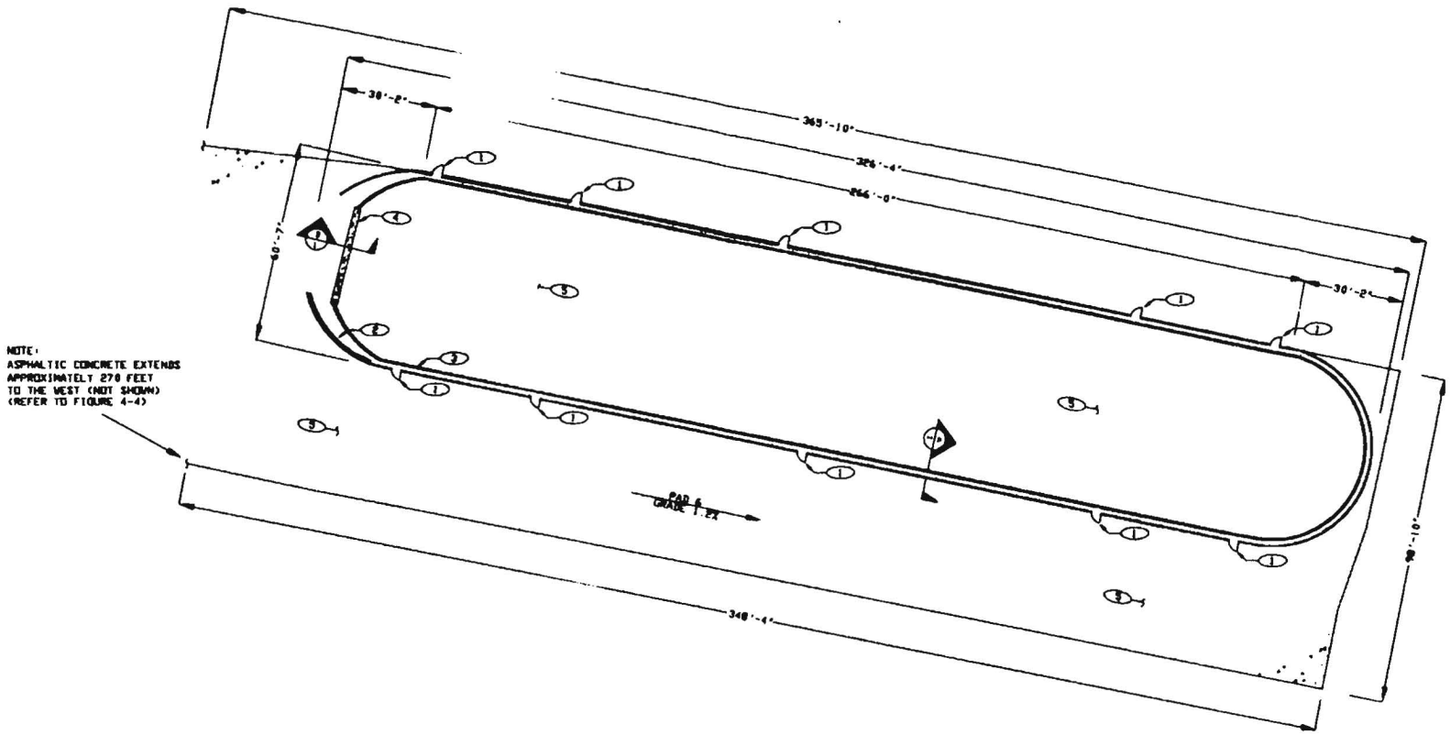
SHEET OF

CLASSIFICATION REVIEWER RELEASER DATE

PROJECT ID

DRAWING NO SK-54-G-11

REV 0



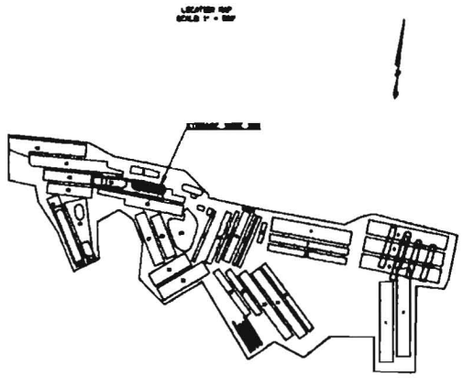
NOTE:
ASPHALTIC CONCRETE EXTENDS APPROXIMATELY 270 FEET TO THE WEST (NOT SHOWN) (REFER TO FIGURE 4-4)

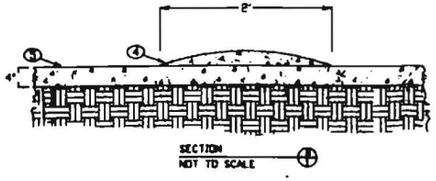
GRAPHIC SCALE

1 INCH = 50 FT.

KEY NOTES
1. 3'-0" X 6'-8" PERSONNEL DOOR
2. DOUBLE PANEL ROLLING DOOR
3. ASPHALTIC CONCRETE BERM
4. ASPHALTIC CONCRETE RAMP
5. ASPHALTIC CONCRETE PAVING
6. DOME WALL

LEGEND
ASPHALTIC CONCRETE PAVING
EARTH (COMPACTED BACKFILL)





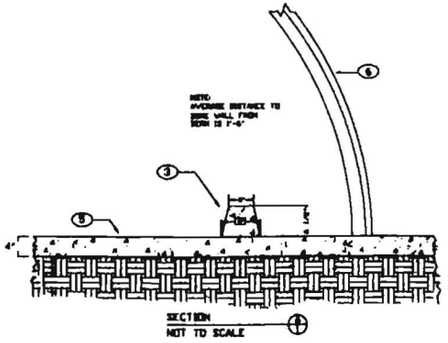


Figure G-23
Storage Dome 153

FACILITY DEVELOPMENT TEAM
CST-14

TECHNICAL AREA 54 (TA-54), AREA G
STORAGE DOME 153
TA-54-153
AS-BUILT FLOOR PLAN

DRAWN BY	DATE	APPROVED
R. O'REAR	03/27/95	J. HAUGEN

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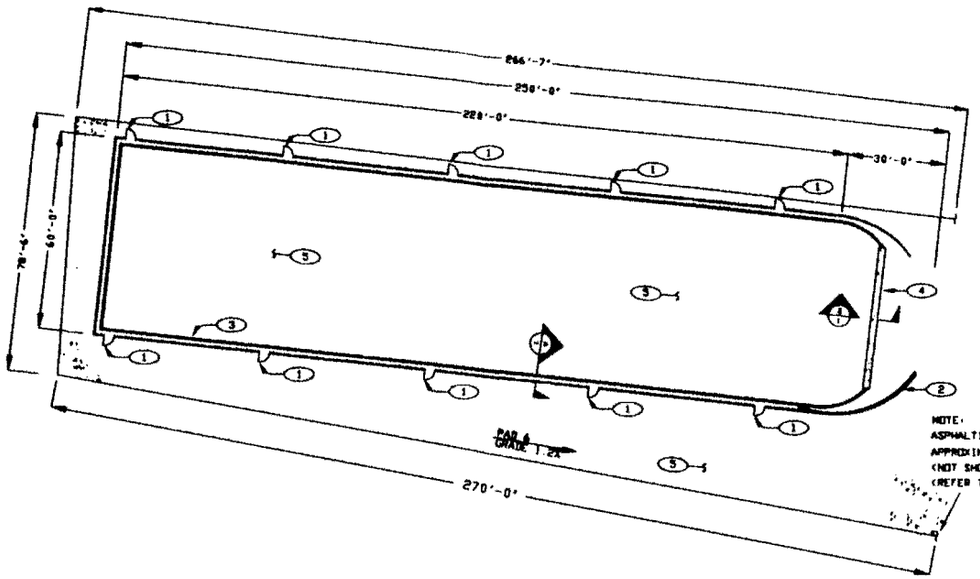
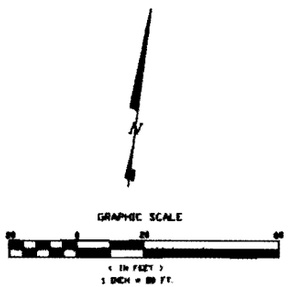
SHEET 1 OF 1

DRAWING NO.
CST-14G-DVG-628LR5



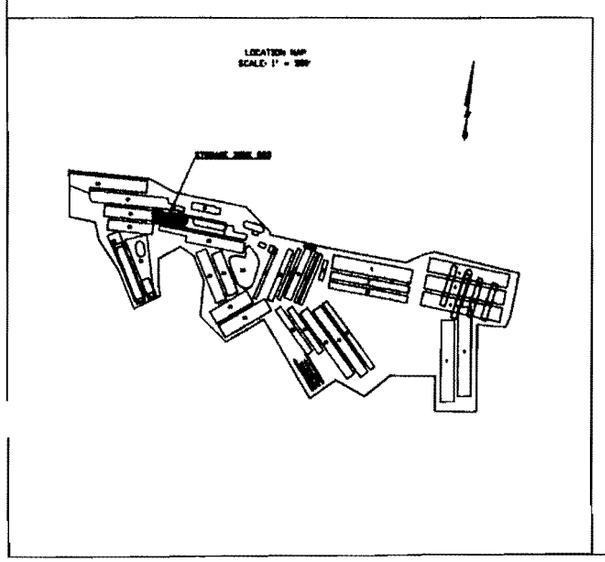


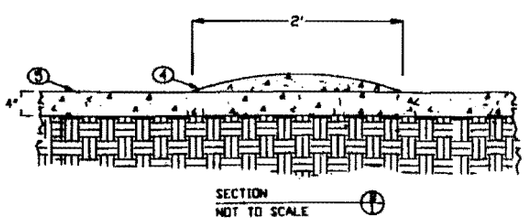
KEY NOTES

1. 3'-0" X 6'-8" PERSONNEL DOOR
2. DOUBLE PANEL ROLLING DOOR
3. ASPHALTIC CONCRETE BERM
4. ASPHALTIC CONCRETE RAMP
5. ASPHALTIC CONCRETE PAVING
6. DOME WALL

LEGEND

- ASPHALTIC CONCRETE PAVING
- EARTH (COMPACTED BACKFILL)





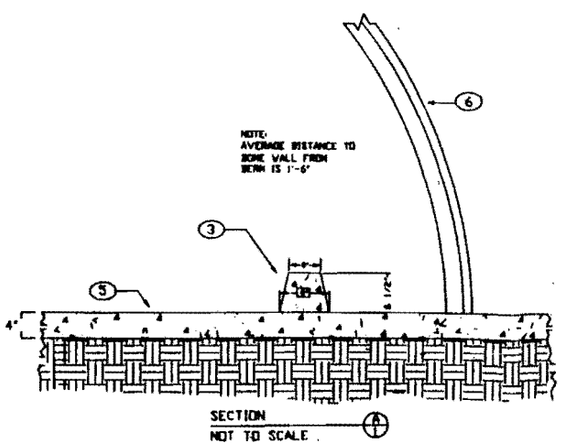


Figure G-24
Storage Dome 283

FACILITY DEVELOPMENT TEAM
CST-14

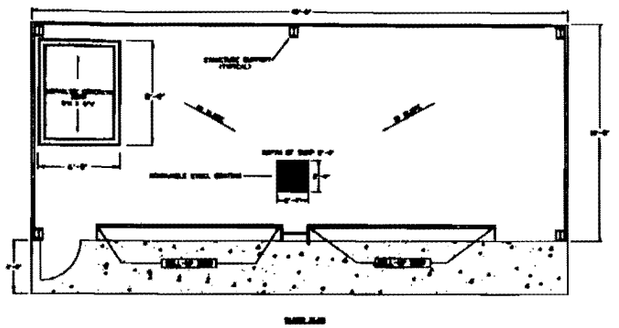
TECHNICAL AREA 54 (TA-54), AREA G
STORAGE DOME 283
TA-54-883
AS-BUILT FLOOR PLAN

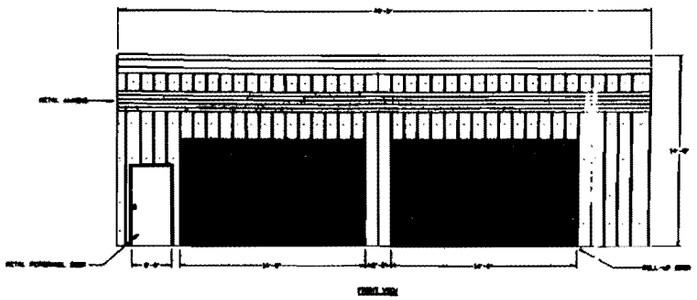
DRAWN BY	DATE	APPROVED
R. O'REAR	03/27/95	J. HAUGEN

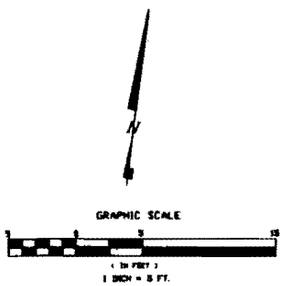
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

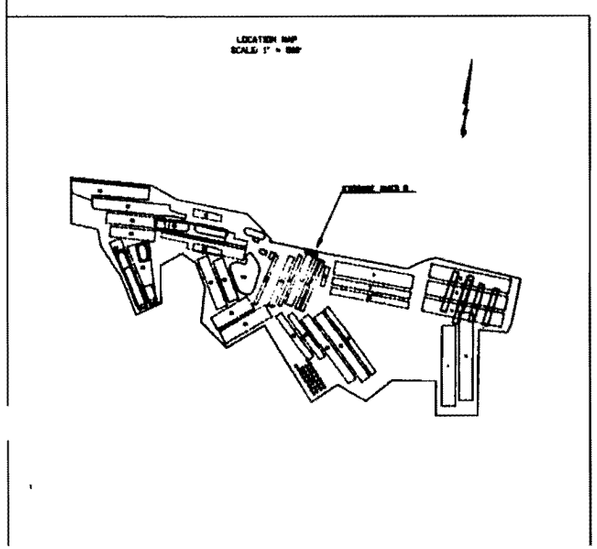
SHEET 1 OF 1

DRAWING NO.
CST-14G-DWG-629,05









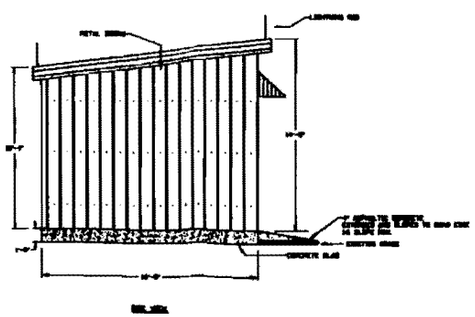


Figure G-25
Storage Shed 8

FACILITY DEVELOPMENT TEAM
CST-14

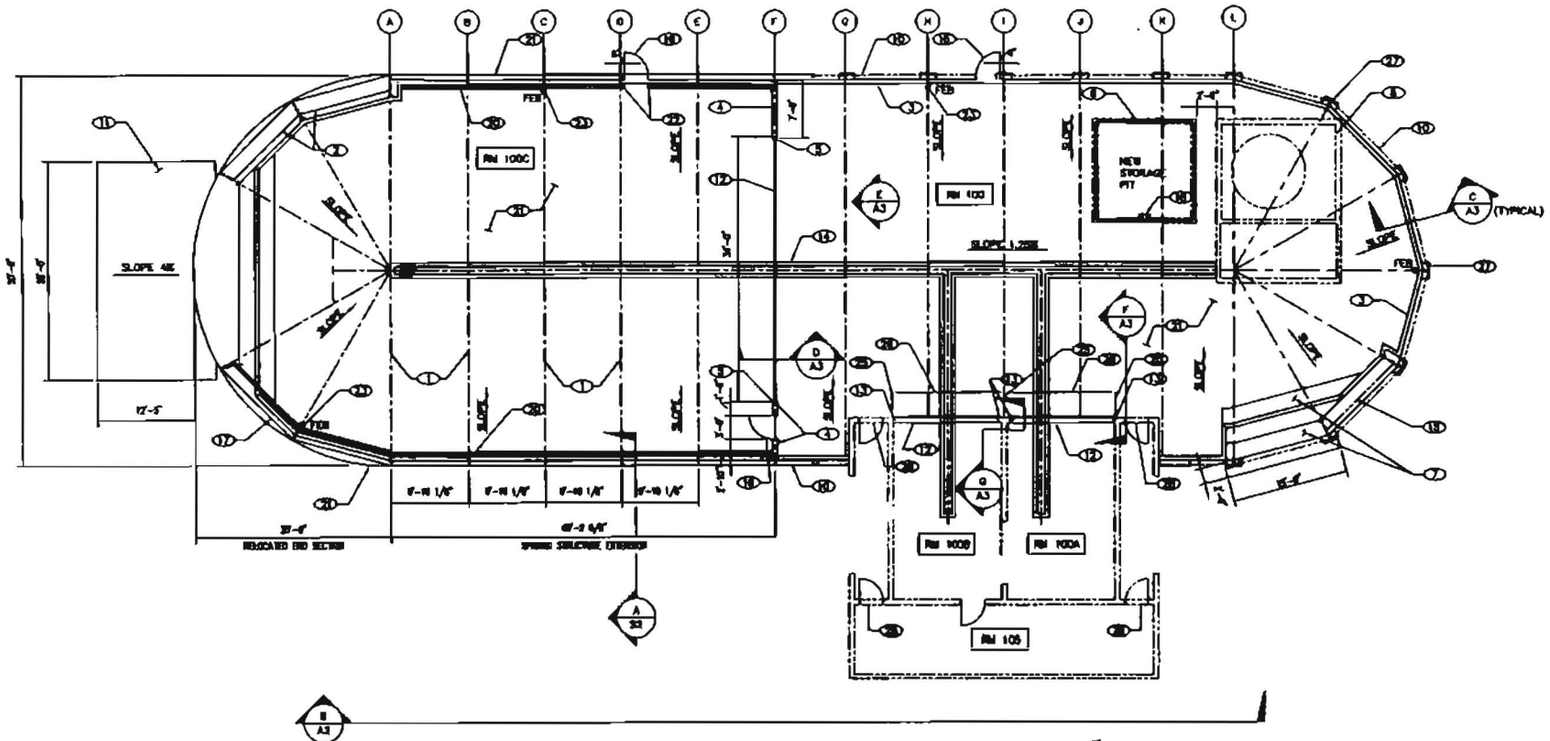
TECHNICAL AREA 54 (TA-54), AREA G
STORAGE SHED 8
TA-54-8
AS-BUILT FLOOR PLAN

DRAWN BY	DATE	APPROVED
R. O'REAR	03/27/95	J. HAUGEN

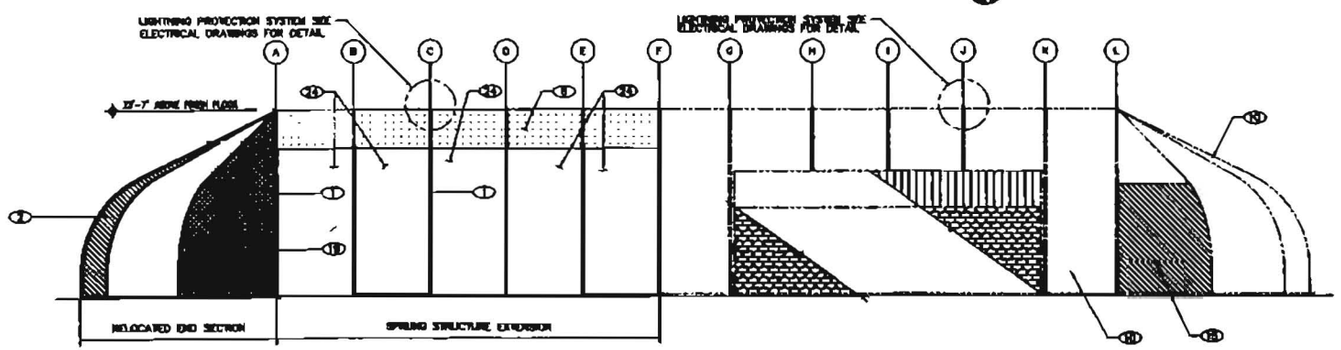
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET 1 OF 1

DRAWING NO.
CST-14G-DWG-630.RS



DRUM PREP FACILITY FLOOR PLAN



DRUM PREP FACILITY – SOUTH ELEVATION

NOTES

A DOME EXTENSION IS GOVERNMENT FURNISHED EQUIPMENT AND CONTRACTOR INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B SEE MECHANICAL DRAWINGS FOR PLUMBING AND PIPING LOCATIONS.

C ALL CONCRETE SURFACES TO BE SEALED WITH "PLASITE" SEALER. SEE SHEET S1.

D ITEMS SHOWN ON DRAWINGS AS "GFE" WILL BE GOVERNMENT FURNISHED AND CONTRACTOR INSTALLED EQUIPMENT. COORDINATE WITH THE CONTRACT ADMINISTRATOR THE LOCATION AND SCHEDULE OF EQUIPMENT DELIVERIES.

KEYED NOTES

1. ALUMINUM FRAME. (GFE)
2. DOUBLE PANEL END SLIDING DOOR. (GFE)
3. CONCRETE CURB (SEE STRUCTURAL DRAWINGS)
4. INTERIOR DIVIDING WALL. (GFE)
5. SUPPORT FOR PARTITION WALL. (GFE)
6. SKYLIGHT. (GFE)
7. NEW CONCRETE LANDING. SEE SHEET S2
8. EXISTING STORAGE PIT AND HANDRAIL TO REMAIN.
9. NEW STORAGE PIT WITH HANDRAIL. SEE SHEET S3
10. EXISTING DOME TO REMAIN.
11. NEW 6" CONCRETE DRIVEPAD. SEE SHEET S2
12. FLEXIBLE VINYL STRIP CURTAIN. SEE SHEET A1
13. EXISTING OVERHEAD COILING DOORS. PROVIDE MANUFACTURERS APPROVED STOP IN DOOR GUIDE TO PREVENT DOOR FROM CLOSING BELOW 10'-0" AFF.
14. NEW CONCRETE TRENCH DRAIN AND GRATING. (SEE STRUCTURAL DRAWINGS)
15. EXISTING SINGLE PANEL SLIDING DOOR TO REMAIN.
16. 3'-0" x 6'-8" PERSONNEL DOORS (GFE) INSTALL PER MANUFACTURERS RECOMMENDATION.
17. EXISTING RELOCATED END SECTION
18. FIXED ALUMINUM LADDER. SEE SHEET S3
19. INSTALL EXISTING FABRIC IN DOOR OPENING. FABRIC RELOCATED FROM NEW DOOR PANEL LOCATION.
20. PVC SKIRT. (GFE)
21. NEW CONCRETE FLOOR SLAB. SEE SHEET S2
22. TERMINATE PVC SKIRT AT DOOR FRAME.
23. FIRE EXTINGUISHER AND BRACKET (GFE). MOUNT ON ALUMINUM FRAME AT 42" ABOVE FINISH FLOOR
24. DOME SECTIONS TO MATCH EXISTING (GFE).
25. TS 3 x 2 x .25
26. C12 x 25 ABOVE.
27. NEW CONCRETE FOOTINGS. SEE SHEET S2
28. CAULK THRESHOLD OF THE FOUR EXISTING EXTERIOR PERSONNEL DOORS TO PREVENT MINOR EGRESS OF FIRE WATER FROM INTERIOR OF BUILDING TO OUTSIDE. (TO BE ABLE TO CONTAIN APPROXIMATELY 1/4 INCH OF WATER.)

NO.	DATE	CLASS REVISION	REVISIONS
A	4/89		AS-BUILT WITH CHANGES
B	3/27/89		FOR ASSESS NOTE 28

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS

Figure G-26
TA-54-33

BLDG. 54-33 TA-54

DRAWN F PHILLIPS
DESIGN J JARRARD
CHECKED G JONES
REVIEWED J JARRARD
DATE 4/1/84

DAVID DOSSER | DAVID FORELL | CORY MESSINA

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET A2 7/30

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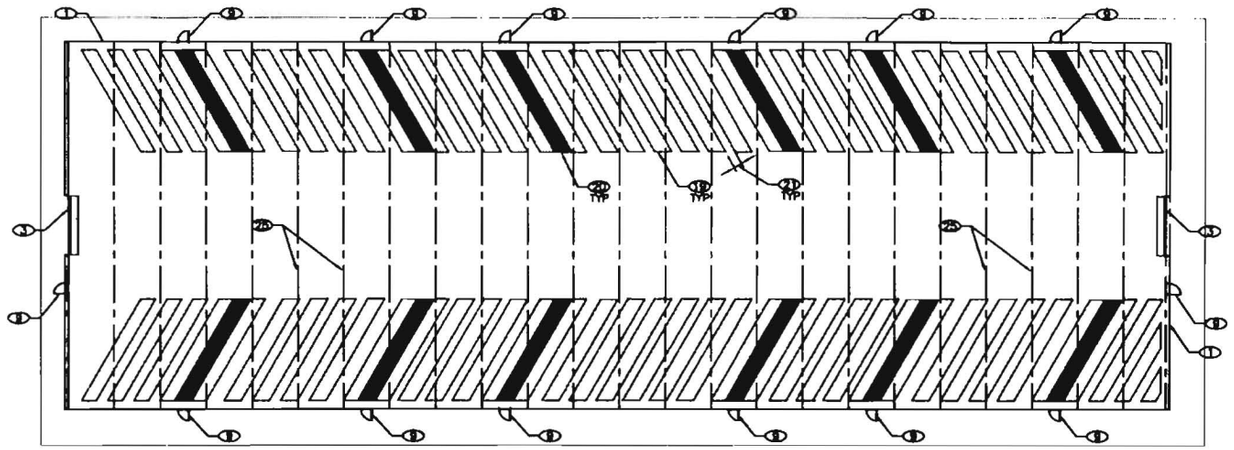
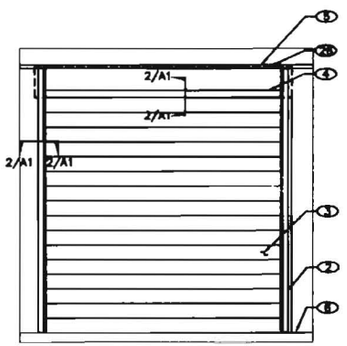


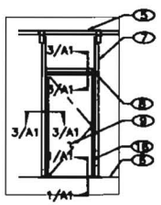
DOOR KEY PLAN

KEYED NOTES

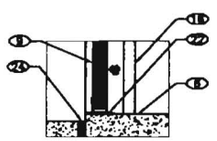
1 STORAGE DOME (SUPPLIED BY DOME MANUFACTURER)
2 OVERHEAD COILING DOOR SIDE TRIMMERS (SUPPLIED BY DOME MANUFACTURER)
3 16'-0" x 16'-0" OVERHEAD COILING DOOR
4 ANGLE (SUPPLIED BY DOME MANUFACTURER)
5 STRUCTURAL PVC TUBE (SUPPLIED BY DOME MANUFATURER)
6 FINISH FLOOR
7 ACCESS DOOR SIDE TRIMMER (SUPPLIED BY DOME MANUFACTURER)
8 ACCESS DOOR HEADER ANGLE (SUPPLIED BY DOME MANUFACTURER)
9 3'-0" x 7'-0" STEEL ACCESS DOOR (TYPICAL OF 8)
10 1-1/2" x 2-1/2" x 18 GA. SEALING ANGLE (SUPPLIED BY DOME MANUFACTURER)
11 PVC MEMBRANE (SUPPLIED BY DOME MANUFACTURER)
12 ALUMINUM STRIP (SUPPLIED BY DOME MANUFACTURER)
13 #10 x 3/4" TEK SCREW
14 3/8"ø x 1" BOLT
15 FLAT HEAD MACHINE BOLT
16 2" STEEL DOOR FRAME
17 BUTTERFLY SPACER
18 OVERHEAD COILING DOOR TRACK (JAMB DETAIL ONLY)
19 48" OR 60" WIDE STORAGE PALLET REA
20 48" MIN. WIDE AISLE WIDTH TO EXIT DOORS (HATCH INDICATES GRAPHIC REPRESENTATION ONLY)
21 28" MIN. AISLE WIDTH BETWEEN STORAGE PALLETS
22 ALUMINUM THRESHOLD
23 NOT USED
24 EXPANSION JOINT AT CONCRETE DOCK STOOPS
25 TYPICAL BAY SPACING (REFER TO DOME MANUFACTURER)
26 CORDED NEOPRENE WEATHERSTRIPPED HOOD BAFFLE



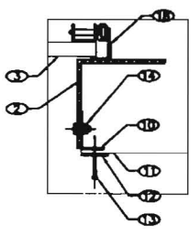
OVERHEAD COILING DOOR ELEVATION (A/A1)



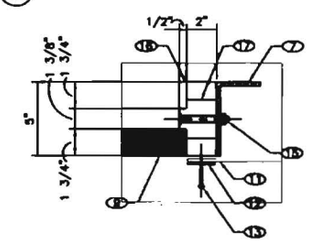
ACCESS DOOR ELEVATION (B/A1)



THRESHOLD DETAIL (1/A1)



JAMB/HEAD DETAIL (2/A1)



JAMB/HEAD DETAIL (3/A1)

REDRAWN FOR RECORD PURPOSES

NO.	DATE	CLOSE COMMENT						
1	8/98		AS-BUILT WITH CHANGES	PS	JW	PS	JW	
2	12/98		CCC DOME EXPANSION TO 300'					

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS

Figure G-27
Storage Dome 375

TA-54

DESIGNED J GALLEGOS
DRAWN J GALLEGOS
CHECKED D NUÑEZ
DATE 8/27/98

RECORD DRAWING
Date AUGUST 1999
This drawing has been verified based on the construction records of the general contractor. By the signature to the right, the engineer of record for the project is not responsible for the accuracy of any changes made to the drawing after the date of the signature or for any changes not shown on the drawing which may appear in the record document as a result thereof.

A/E STAMP

DESIGNED JIM WEEKS
PROJECT LEADER ABE HARRIS

Los Alamos Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET A1
9 OF 20

PROJECT ID 18645
DRAWING NO. C52062
REV. 2

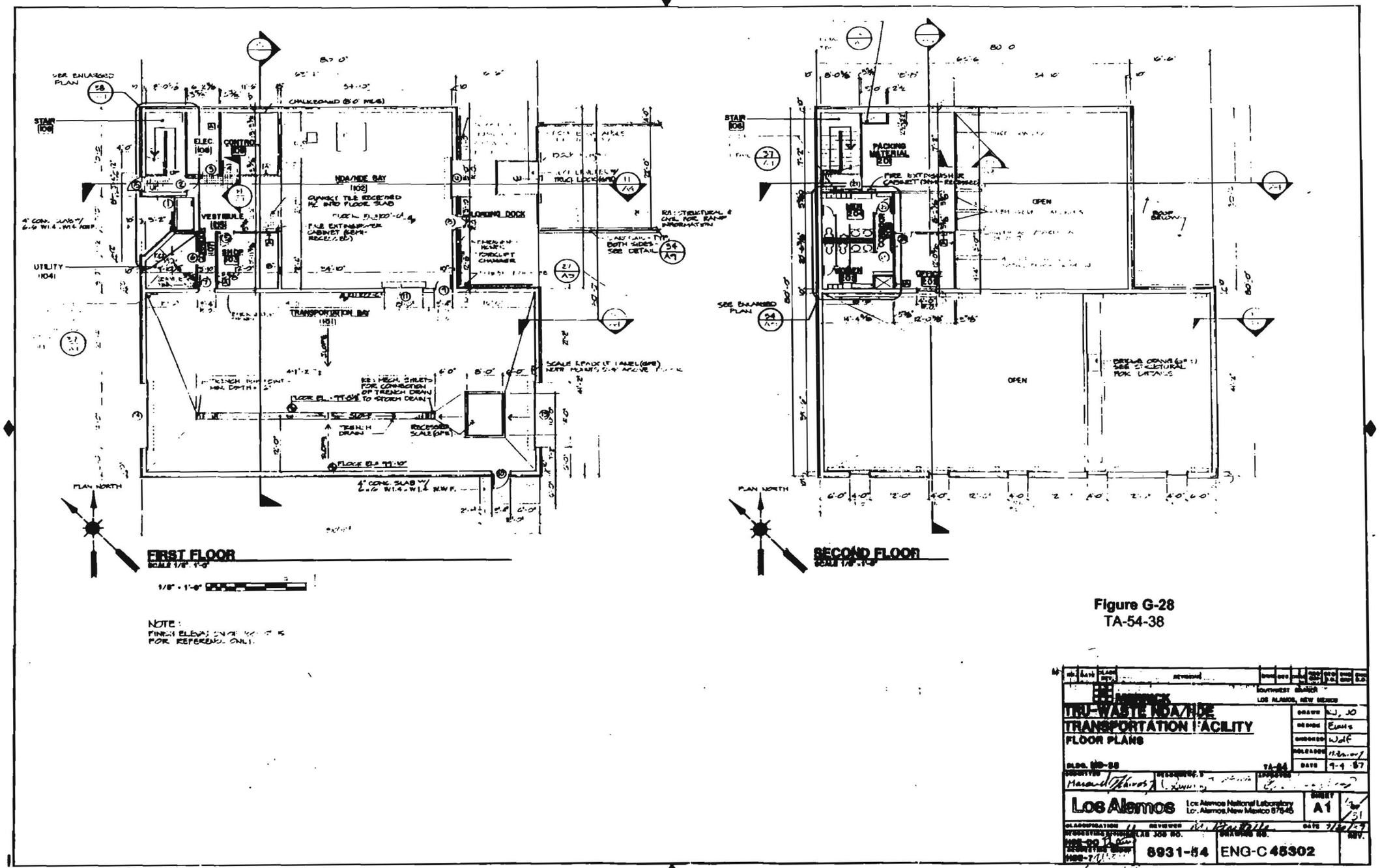


Figure G-28
TA-54-38

Supplement G-1

Engineering Details and Technical Specifications for Structures, Coatings, Liners, PermaCon®, Metal Pallets, and Secondary Containment Pallets at the Area L, Area G, and TA-54 West Container Storage Units

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specification for Storage Domes at Technical Area 54

The Construction, Exhibition, Hazardous Waste, Military, Prison and Warehouse Shelter Systems by *SPRUNG* Instant Structures

THE STRUCTURE

Designed and engineered on the principle of the "Membrane Stress Theory" the structure is the result of almost a decade of intensive research and development. The Sprung Instant Structure is constructed from extruded aluminum arches, integrally connected to an all-weather outer membrane of P.V.C. coated polyester scrim. This synthetic fabric is certified flame retardant.

APPLICATION

Sprung Instant Structures are the answer to any need for enclosed space, quickly and economically, especially where transportation is difficult and speed of installation is essential. Aesthetically pleasing, the structures are available in different colours and sizes, and are suited to both the city and country environments.

ENGINEERING

Sprung Structures may be designed to meet special requirements or to comply with local and special usage codes and standards. By design the structures shed snow, however they can be designed to meet any loading requirement. They also withstand high winds and hail. Standard pre-engineered drawings are available upon request.

FLEXIBILITY

The free-span structure can be erected quickly, and needs little or no surface preparation. The modular design allows built-up areas of unlimited length, easy extension of existing structures and quick dismantling and re-location.

TECHNICAL SPECIFICATIONS

Width:	Feet Meters	30 (9.14)	40 (12.19)	50 (15.24)	60 (18.29)	88.6 (27)	120 (36.58)
Module Length:	Feet Meters	9.84 (3)	9.84 (3)	9.84 (3)	9.84 (3)	9.84 (3)	15 (4.57)
Height:	Feet Meters	15.9 (4.8)	18.4 (5.6)	23.6 (7.2)	26.2 (8)	35.9 (10.9)	58 (17.7)
Weight:	lbs./sq. ft. kgs./m^2	1.5 (7.3)	1.5 (7.3)	1.5 (7.3)	1.5 (7.3)	2.5 (12.2)	3.6 (17.6)

Sprung Instant Structures Inc.

OFFICES IN: San Francisco, Ca. Fontana, Ca. Houston, Tx. Allentown, Pa. Atlanta, Ga.

Toll Free
1-800-528-9899

SPRUNG

MODULAR RELOCATABLE STRUCTURES
Available From Inventory

Doors: A personnel door is provided with each structure. Doors can be placed in virtually any panel to meet your requirements.

Additional doors, double personnel doors, single or double personnel doors complete with panic hardware, vehicle doors and oversize vehicle doors are also available as optional extras.

Drainage: Drainage should be provided around the pad to permit adequate dissipation of rain water.

Asphalt, concrete or gravel pads should be crowned to assist in water runoff.

Equipment: All hand tools required for erection will be provided. It will be the customer's responsibility to provide a crane or cherry picker for a short period of time to erect structures 50 feet (15.24 m) wide to 88.6 feet (27 m) wide.

Scaffolding must also be supplied by the customer.

Erection: Erection, with a normal sized crew, should proceed at the rate of 1200 to 1500 square feet (110 to 140 sq. m.) per day, weather permitting. When necessary, this figure can be increased significantly by increasing the work force or extending the work day past 8 hours, or a combination of both. Dismantling should proceed at double this rate.

An erection consultant will be provided to direct the erection of the structure by the customer's unskilled work force. The consultant's transportation at cost, and living expenses are the customer's responsibility. The consultant will also be provided on the same terms for the dismantling of leased structures.

Fabric: The fabric is a durable P.V.C. coated polyester scrim treated with inhibitors to prevent degeneration from the ultraviolet rays of the sun and it is fire retardant (i.e. self-extinguishing). Normal life expectancy is 10 to 12 years. We provide a five year pro-rata guarantee.

Footings: Reasonably flat and firm ground requires no preparation or foundation for structures up to 60 feet (18.29 m) in widt. Anchorage is obtained with two drift pins at each column base plate. Specific anchor systems are used for sand and muskeg. Structures 88.6 feet wide (27 m) should have concrete footings, if a concrete pad is not being installed. Alternative methods are available if ground conditions meet certain criteria.

Freight: Domestic sales are quoted "knocked down" F.O.B. Plant. International sales are quoted C+F Seaport, Country of Destination.

Return freight on all leases, is to the customer's account.

Labour: It is the customer's responsibility to provide a work force of 6-10 unskilled labourers for erection of single structures up to 88.6 feet in width.

Lease: Leases are available in North America for a minimum of one year, with the option to renew semi-annually, as often as required.

Patents: Patents are held in Canada, the United States and throughout the world.

Permits: It is the customer's responsibility to obtain all necessary building and/or development permits, licenses or clearances of any type for erection and use of the structure.

Purchase Option: Leases will have a purchase option exercisable anytime within 12 months from commencement, upon payment of the purchase price in full. Provided that lease payments have been made on time, a credit of 50% of paid lease amounts will be applied to the purchase.

Options to purchase will EXPIRE at the end of the first year of the lease.

Rental: Month to month rentals can be entered into subject to product availability.

Repairs: Fabric and components can be repaired or replaced in a minimum time frame without affecting the stability of the structure.

Taxes: All taxes and fees of any type are payable by the purchaser.

erms:

Sales: 50% with order. Balance due upon erection O.A.C.

Leases: 50% of lease payment plus all options with order. 50% of lease payment payable semi-annually in advance until lease cancelled by lessee. O.A.C.

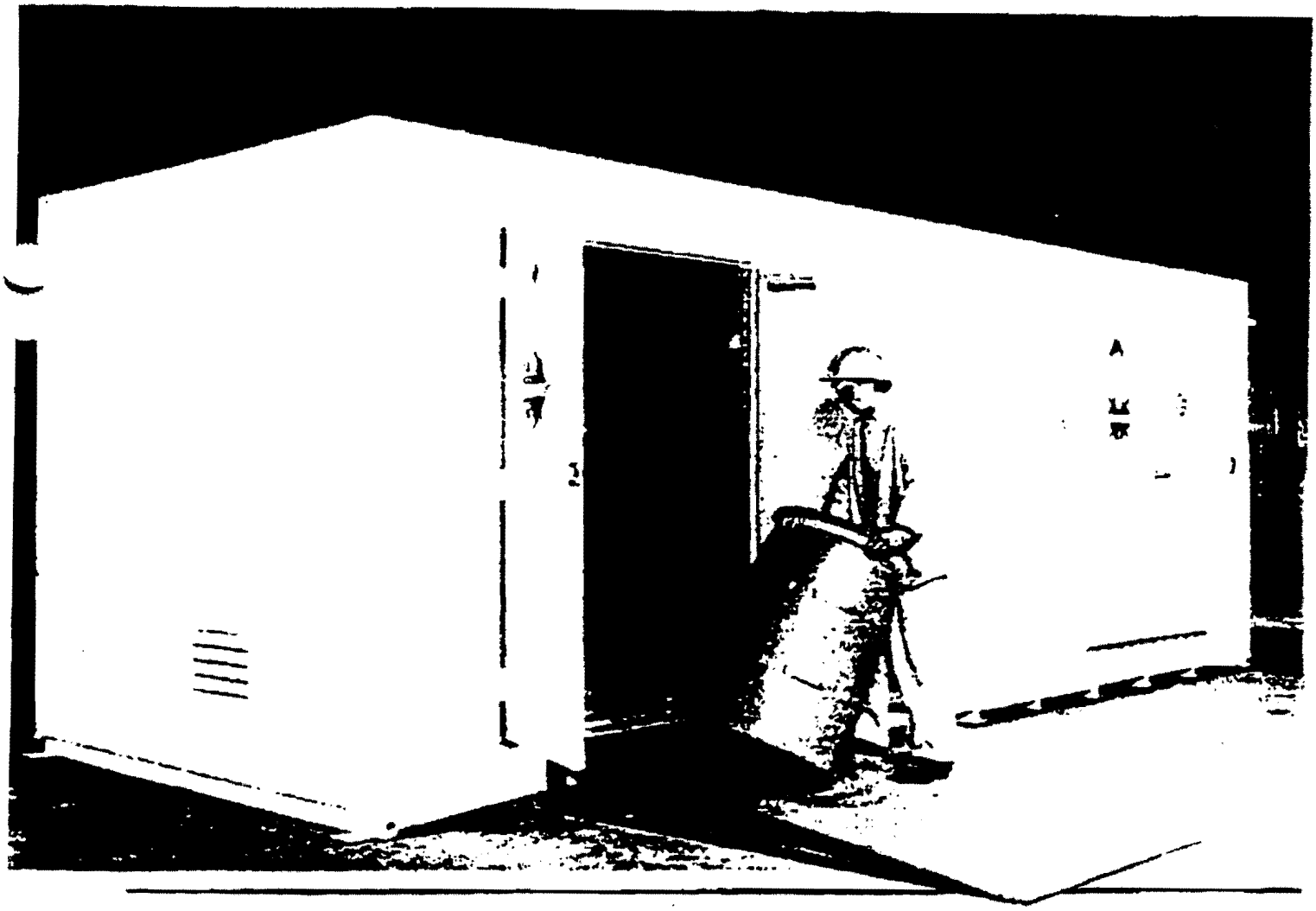
Rentals: 1st month and all extras with order. Additional months in advance, upon receipt of invoice O.A.C.

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specifications for Storage Sheds 68, 69, 70, 1027, 1028, 1030, and 1041 at Technical Area 54

Help Us Help You...

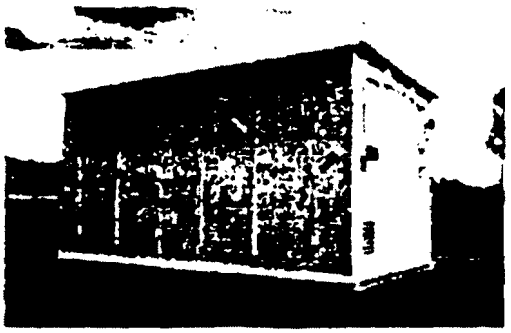
Select the Right Safety Storage™ Building



Achieve regulatory compliance for storage of hazardous materials

SAFETY STORAGE™

SAFETY STORAGE™



Steel and 2-Hour Fire-Rated Prefabricated Storage Buildings

Safety Storage™ prefabricated, weather-proof buildings offer a low cost solution to protect your facility from chemical hazards, provide secondary containment for soil and groundwater protection, minimize liability, meet fire safety needs, and safeguard personnel, while complying with federal, state, and local requirements.

These relocatable, turnkey buildings are available in a wide choice of building sizes and storage capacities, at a potential 60% savings over the cost of permanent structures. They are designed to Factory Mutual System standards and utilize UL listed components throughout.

Safety Storage buildings are designed to comply with all federal, state, and local regulations and can be pre-engineered to meet special structural, electrical, fire, and ventilation requirements.

Safety Storage is the nation's leading manufacturer of prefabricated chemical and hazardous material storage buildings. Custom engineering assistance and special application buildings are offered to meet specific requirements.

FEATURES

Steel Buildings

- Walls and sump walls construction of 10-gauge welded steel
- Roof/ceiling constructed of 12-gauge steel
- Double-doors

FireShield Buildings

- Two-hour fire-rated walls, roof/ceiling, and sump walls, in accordance with UL 263 and ASTM-E119 requirements.
- Air inlet vents equipped with 1½ hour UL Classified fire dampers
- UL Classified three-hour fire-rated double doors (60"x80") with UL listed frame and hardware. Active door equipped with automatic door closer, security lock, and interior safety release

All Buildings

- Chemical resistant coated surfaces
- Water sprinkler piping assembly
- Secondary containment sump, with fiberglass floor grating
- Open-channel construction for visual inspection and crane/forklift openings
- Security locks with inside safety release
- Static grounding system
- Forklift pockets for ease of relocation
- Hold-down brackets
- Hazard placards and labeling
- One-year limited warranty

OPTIONS

- UL listed interior and exterior lighting (Class I, Division 1)
- Heating and air conditioning systems (Class I, Division 1)
- Thermostatic control switches
- Electromechanical exhaust ventilation systems (Class I, Division 1)
- Liquid level detectors (Class I, Division 1)
- Dry chemical fire suppression system
- Interior separation wall(s), steel and 2-hour fire-rated
- Chemical resistant sump liner
- Explosion relief construction
- Safety eye/face wash units
- Sump overflow pipe fitting with cap
- Shelving
- Loading ramp(s)

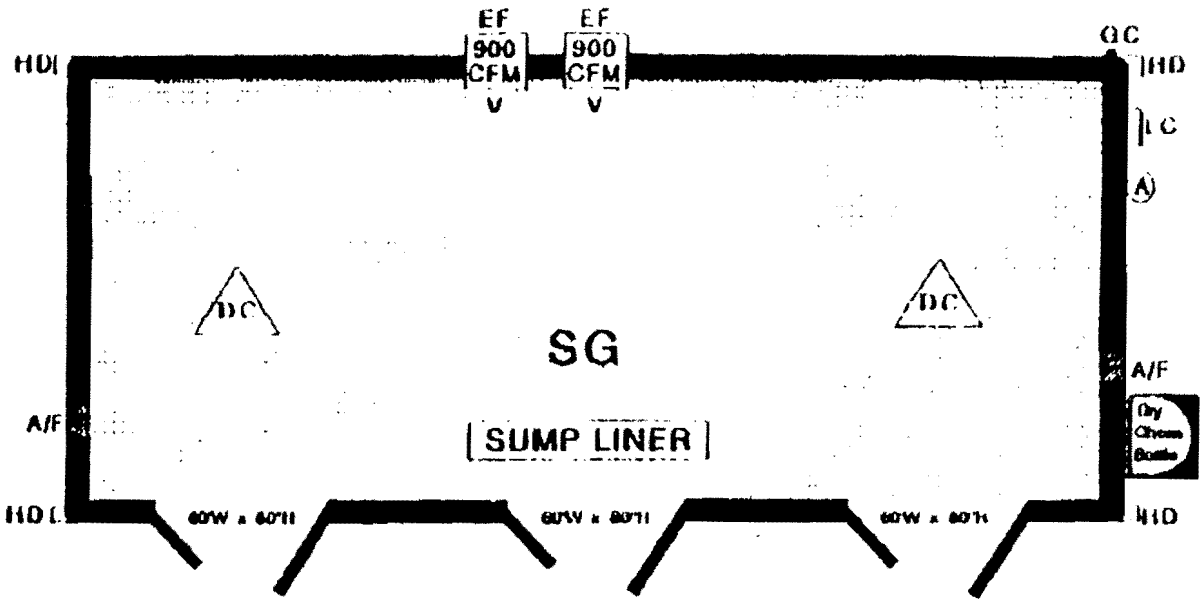
Model	Outside Dimensions			Inside Dimensions			Tare Weight (Lbs.)	Door Openings		Designed Storage Capacity			Sump Capacity (Gallons)
	Length	Width	Height	Length	Width	Height		Height	Width	Weight (Lbs.)	Sq. Ft.	Drums**	
32	33'3⅜"	11'5¼"	8'8"	32'7½"	10'8⅛"	7'3¼"	23,325	6'7⅜"	4'10⅜"	97,125	348	90	1460
24	25'3⅜"	11'5¼"	8'8"	24'7½"	10'8⅛"	7'3¼"	17,600	6'7⅜"	4'10⅜"	65,750	263	60	1100
22	23'3⅜"	9'3¾"	8'8"	22'7½"	8'9¼"	7'3¼"	16,750	6'7⅜"	4'10⅜"	49,500	198	50	830
15	15'11¾"	9'3¾"	8'8"	15'3½"	8'9¼"	7'3¼"	8,775	6'7⅜"	4'10⅜"	33,000	134	33	560
7	8'7⅜"	9'3¾"	8'8"	7'11½"	8'9¼"	7'3¼"	5,250	6'7⅜"	4'10⅜"	17,375	69	16	290
10	10'11"	6'5"	8'4"	10'4"	5'9¼"	7'	2,600	5'9½"	3'1"	14,875	59	14	220
32FS	33'3⅜"	11'5¼"	8'8"	32'	10'	7'1"	35,300	6'7⅜"	4'10⅜"	80,000	320	80	1340
24FS	25'3⅜"	11'5¼"	8'8"	24'	10'	7'1"	26,575	6'7⅜"	4'10⅜"	60,300	240	60	1000
22FS	23'3⅜"	9'3¾"	8'8"	21'11½"	8'1¼"	7'1"	24,025	6'7⅜"	4'10⅜"	44,500	178	44	750
15FS	15'11¾"	9'3¾"	8'8"	14'7½"	8'1¼"	7'1"	13,975	6'7⅜"	4'10⅜"	29,625	118	28	500
7FS	8'7⅜"	9'3¾"	8'8"	7'3½"	8'1¼"	7'1"	8,125	6'7⅜"	4'10⅜"	14,750	59	12	250
10FS	10'11"	6'5"	8'4"	9'8"	5'1¼"	6'10"	8,300	5'7¾"	4'10⅜"	11,000	44	8	150

*Includes hold-down brackets. **55 gallon drums.

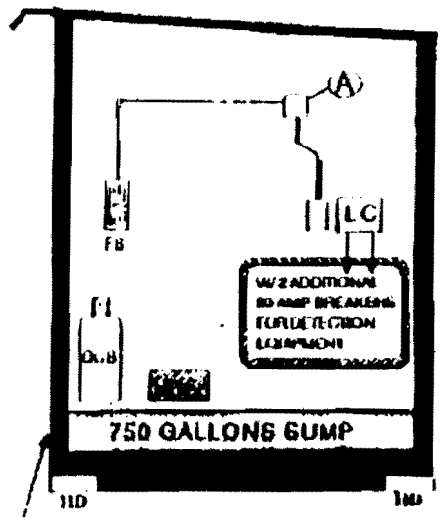
LOS ALAMOS NATIONAL LAB - "2-HOUR FIRE RATED" MODEL SSI-22FS

LOCKER "B" IIFS
SAFETY STORAGE MODEL 22FS
"LITHIUM HYDRIDE"

ONE VENT SYSTEM TO BE INVERTED SO "V" IS TOWARD CEILING



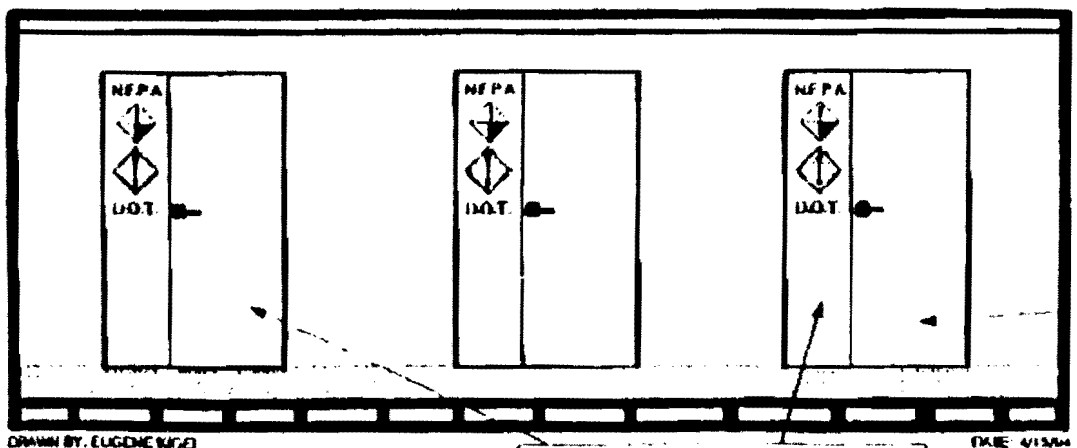
"2-HOUR" FIRE RATED
*Roof
*Sill
*Vertical Walls



SILL HEIGHT AT SUMP = "2 HOUR" FIRE RATED

23'4" LENGTH x 9'4" WIDTH x 8'8" HEIGHT

"LITHIUM HYDRIDE" STORAGE



DRAWN BY: EUGENE WIGO

"3-HOUR" FIRE - RATED DOORS

MEETS NATIONAL WHEELCHAIR ACCESS REQUIREMENTS 24" & 36" - 60"

LEGEND

A AUDIBLE ALARM FOR DRY CHEM
AF 1.5 HOUR FIRE RATED VENTS
CFM CUBIC FEET PER MINUTE
DC DRY CHEM SPRINKLER
DCB DRY CHEM BOTTLE INCLOSURE
EF EXPLOSION PROOF EXHAUST FAN EXIT
FS FAN SWITCH
FE FUSIBLE LINKS
GC GROUNDING CONNECTION (EXT)
HD HOLD-DOWN BRACKETS
LC LOAD CENTER W/ TWO 20 AMP BREAKERS
SG STEEL FLOOR GRATING
V VENT SCREEN FOR FUME REMOVAL
CLASS I, DIV 1, EXPLOSION PROOF

DRAWN BY: KARL N BOEHLE
12/27/94

Accepted for production

SAFETY STORAGE INC.
8306 Wilshire Boulevard • Suite 900
Beverly Hills, CA 90211-2344
Tel: (213) 939-5715 • Fax: (213) 939-1646

LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

MODEL: Safety Storage Inc., Model # 22-FS

APPROVAL from TESTING / ENGINEERING LABS: **Factory Mutual Laboratory APPROVED (SEE ATTACHED FM LETTER FOR VERIFICATION)**

DIMENSIONS: 23'3.75" Length x 9'3.75" Width x 8'8" Height

COMPLIANCE: The lockers comply with all present Federal, State, and Local building, electrical, mechanical and fire codes; hazardous materials / waste and Cal/OSHA regulations.

CONSTRUCTION: The Pre-Fabricated lockers are weather-proof, New prime steel Construction, continuously welded at all four (4) vertical seams and liquid tight. ASTM-graded steel.

RELOCATABLE: The lockers are designed around the premise that they will be relocatable (when empty). The bottom must have four-inch (4") "C" channels for forklift or crane strap access every two-feet the entire length. The "C" channels shall provide a uniform load spread in use or in relocation. The subfloor welds are liquid-tight.

RECESSED SPILL CONTAINMENT: Minimum 750 Gallons of "spill containment" capacity required.

SILL HEIGHT="2-HOUR FIRE RATED" CONSTRUCTION AT THE "RECESSED SPILL CURB AREA": The recessed sump sill height is a crucial element of the entire vertical wall surface area of all four (4) sidewalls and are constructed to the same **"2-Hour Fire Rated"** standards of Gypsum "sandwiched by steel" design used from sump up to and including the ceiling/roof **("UL" approved design)**. This Non-combustible construction is in accordance with ASTM-E119.

SUMP SILL HEIGHT: Minimum seven-Inch (7") recession in the spill containment sump sill height to meet and exceed all code requirements for spill curb heights etc. (including PCB requirements).

ROOF DESIGN: The entire Roof will be **"2-Hour Fire Rated"**. The roof Class-A Flame Spread classification, and I-60 wind uplift rating. This Non-combustible construction is in accordance with ASTM-E119. The manufacturer's product literature must state that the roof is capable of handling 40 psf snow loads plus equipment such as lights and sprinkler system.

SAFETY
STORAGE INC.
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Beverly Hills, CA 90211-2344
Tel: (213) 939-5715 • Fax: (213) 939-1646

LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

FLOORING: STEEL GRATING is standard. The Steelgrate has a minimum 500 psf uniform load bearing capacity. The steelgrate installation is designed for ease of access by chemical users for spill clean-up. The Steelgrate installation shall run front-to-back and in approximately four-foot (4') sections. Bowing is eliminated by the uniform load spreads designed throughout the flooring substratum section. The Flooring is of an "open-channel" design for visual inspection of the recessed sump and spill flow control.

SUBFLOOR: The horizontal subfloor shall be constructed of no less than 10-gauge steel. The 10-gauge steel is new, prime steel and welded at all seams. Tests must be done by the manufacturer that shows that the sump created by the sub-floor is liquid-tight as required by code.

*SEISMIC HOLD-DOWNS:*Each corner of each building has a 4" seismic hold-down bracket installed for end-user finish into the foundation. The hold-downs are calc'd for **"worst case" Zone-4 rating** if installed.

*GROUNDING:*Each building has three (3) interior bonding lugs, one (1) exterior grounding assembly and an eight-foot (8') copper/clad grounding rod shipped inside for end-user installation into the foundation upon delivery.

DOOR REQUIREMENTS: Two (2) Door Openings per Locker, consisting of one set of dual-doors at least sixty inches (60") wide and eighty inches (80") tall. The passive leaf of each set of dual-doors is equipped with UL-Listed Top and Bottom surface bolts. Each door opening includes weatherstripping. Each door frame and hardware (i.e. keyed lock system) is "UL-Listed" and approved. Each door opening has an inside safety latch for end-users staff to open the doors in the event of an emergency per the building codes. Each door opening exceeds building code requirements with **"3-Hour Fire Rated"** Dual-Doors that are approved and labeled by **Underwriters Laboratory UL-Labeled, "3-Hour FIRE RATED DOORS"**. The doors design shall meet Federal Legal requirements set by the "American Disabilities Act" requirements. Each set of Dual-doors will be customized with automatic door closures that work with fusible links on both sides of each set of dual-doors.

SAFETY
STORAGE INC.
8306 Wilshire Boulevard • Suite 900
Beverly Hills, CA 90211-2344
Tel: (213) 939-5715 • Fax: (213) 939-1546

LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

SECURITY:WELDED-ONLY The design and building construction is focused on the SECURITY of the end-users inventory and materials stored. The design shall be of four (4) Vertical Walls welded together and to the Roof and Sub-Floor. Security and integrity of design are primary to the end-users risk and liability reduction with the storage or dispensing of Hazardous Materials. Each dual-door opening will be secured by an exterior single-point dead bolt style key lock. The interior shall be provided with an emergency safety latch to open doors as required by building codes.

VISUAL INSPECTION: The lockers design and construction integrity shall be visually inspected by compliance agencies on a regular basis, so each manufacturer must design in the ability to inspect the secure containment of spills, the flow of spills inside the locker into a recessed sump, seismic load capacity, fire prevention and suppression methods, etc..

SIGNAGE: Each door opening must receive one (1) "D.O.T." all-metal placard on an aluminum rust-proof wall-holder and stainless steel clips which act as a flip-chart type chemical content clarifier sign to meet California "Right-to-Know" laws. Each door opening must receive one (1) pressure sensitive "NFPA" 704M hazardous rating sign for fire professionals .

AIR FLOW: Two (2) Air Inlet Vents with <u>UL-Classified "1.5 Hour Rated" fire dampers</u> are required per locker (see diagram). These air inlet vents shall be galvanized steel framed, curtain-type galvanized steel blades, and equipped with UL-Listed 165 degrees Fahrenheit fusible-links to close in the event of a fire and the source is in the interior or on the exterior. These vents are designed to provide "in coming make-up air" only <u>(no suction devices are to be placed near this equipment).</u>

DRUM STORAGE CAPACITY:@ Single-Level: FORTY-FOUR (44) Drum single-level storage capacity is required in a packed configuration design with single drum movement and no aisle space. (55-GALLON TYPE)

FINISHES:INTERIOR Finish is primed and painted with a chemically-resistant white epoxy. The interior finish has been tested against a minimum of fifty (50) common industrial chemicals and has stood-up to actual field use for nine (9) years now. *EXTERIOR Finish* is a glossy, heat reflective white colored aliphatic polyurethane (5-mil thick). The surface is also graffiti resistant.

PRESENTATION: Each building shall be shipped after inspection with a heavy-duty industrial"SHRINK-WRAP" to protect the building in route to the end-users site. The buildings are delivered free of diesel exhaust markings, road grime, mud, etc..

SAFETY
STORAGE INC.
8306 Wilshire Boulevard · Suite 900
Beverly Hills, CA 90211-2344
Tel: (213) 939-6718 • Fax: (213) 939-6145

LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

WARRANTY: 12 month on components / 10 year structural

MANUALS: A "Manual" explaining the grounding, off-loading, seismic hold-downs, suggested pad creation, fire suppression, and electrical systems shall be sent upon placement of order.

FIRE-RATING: Locker shall be "2-Hour Fire Rated" from sump up to and including the ceiling/roof ("UL" approved design). GYPSUM is the Fire-Retardant utilized to achieve the "2-Hour rating".The VERTICAL WALLS Construction are from the "UL" book of universally accepted DESIGNS (e.g. U-263 design which uses Gypsum, Steel studs, and a sandwich wall design). This Non-combustible construction is in accordance with ASTM-E119.

FIRE SUPPRESSION SYSTEM DESIGN: The Fire Suppression System shall be an AUTOMATIC" Dry Chemical Fire Suppression System which includes two (2) dump heads with plastic cap covers that blow-off Minimum 1,920 cubic feet of dump upon activation, an audible alarm, activation points both automatic via fusible-links or by manual pull station. Exterior Enclosure of the bottle holding the dry chemical and its "system brains".

ELECTRICAL SYSTEM: The interior electrical components shall all be explosion-proof (wiring, seals, and conduits). One (1) exterior breaker box shall be located on the right side wall and will hold all required breakers. One breaker is for the normal service wired 120 volt / 20 amp for the lights, forced air ventilation system, etc..

FUME REMOVAL: INTERIOR MOUNTING / DUCTING: One (1) Electrically Powered, explosion-proof, forced air, mechanical, ventilation system for fume removal. The system is designed with interior ducting to draw fumes up and out to the exterior for removal from within twelve-inches (12") above the flooring surface meeting code requirements (per locker). The system is designed and installed to run with direct control on the exterior from a fan switch for on / off determination. Each system providing 19-57 air changes per hour (Class I, Division 1). System has a minimum 900 cfm motored fume removal rated motor (Class I, Division 1) with a non-sparking aluminum fan blade. One (1) exterior mounted on / off Fan switch is included.

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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

LOS ALAMOS NATIONAL LAB RESPONSIBILITIES (upon purchase):

1) **FOUNDATION:** The installation site foundation must be completed and well cured prior to shipment of the building. Typical curing time for new concrete foundations can run 14-21 days.

2) **OFF-LOADING:** END-USERS will be responsible for having a 15-ton capacity crane and experienced crane operator with spreader bar and associated cabling at the site prior to delivery for off-loading.

3) **ELECTRICAL:** Power must be brought to the breaker box located on the right side wall of the locker by the end-user. All interior electrical wiring must be completed prior to shipment. Power for the normal electrical features are on the 120 volt / 20 amp breaker. Two (2) additional 20 amp breakers shall be included to detection equipment to be provided by Los Alamos National Lab.

4) **ARMING DRY CHEM SYSTEM:** The END-USER will need to "arm" the dry chemical fire suppression system after delivery to prevent accidental discharge during transportation and off-load. Any special "dump tests" required by local authorities are the sole-responsibility of the chemical user entity and staff.

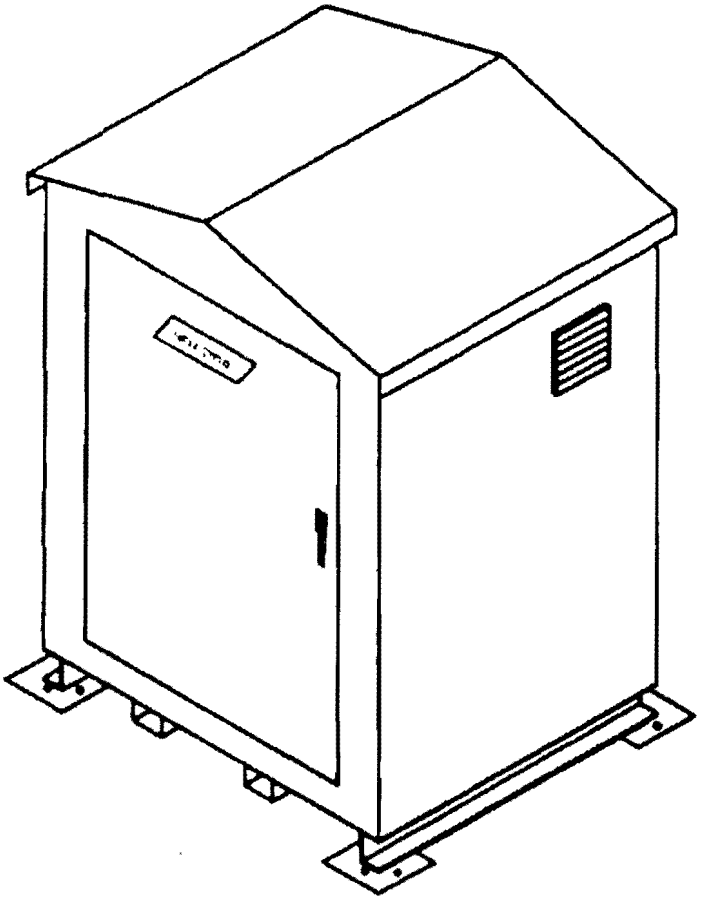
5) **GROUNDING:** The eight-foot (8') grounding rod shipped inside the building must be installed into the foundation and completed to the exterior bonding lug after delivery by END-USER staff.

6) **SEISMIC FINISH WORK:** The enduser site staff is responsible to "TIE-DOWN" the locker to the foundation to achieve the "SEISMIC ZONE-4" Rating.

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specifications for Storage Sheds 144, 145, 146, and 177 at Technical Area 54

MODEL C



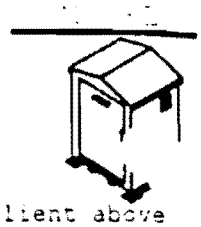
INTERIOR DIMENSION	EXTERIOR DIMENSION	STORAGE CAPACITY	SECONDARY CONTAINMENT	DOOR CONFIGURATION NO.	RATING	DIMENSION	APPROXIMATE SHIPPING WT
6'0" X 5'0" X 7'0"	6'6" X 5'6" X 9'0"	6/55 Gal. Drums	120 Gallons	1 set	None	4'6" X 6'3" Opening	1800 LBS.

Standard Equipment:
Two Part Chemical Resistant Epoxy Paint Interior & Exterior. Polyurethane Top Coat on Exterior
Six air changes per hour natural ventilation Exterior Ground Connection. Corrosion Resistant Epoxy Coated
Steel Grate Flooring. Forklift Pockets, Stainless Steel Hinges Industrial Grade 3 pt. Locking Mechanism
Seismic Tie-Down Pads

Construction:
10, 12 & 14 Gauge HRS

Dimensions Noted Above are - Length X Width X Height

Specifications for Portable
Hazardous Waste Storage Building
Manufactured by Ideal Environmental Products
CHEM-STOR Model C



The portable hazardous materials storage container is designed to bring the client above compliance levels for hazardous material and waste storage. The container provides secondary spill containment, and security for hazardous materials storage in accordance with federal, state and local regulations. The material, design and workmanship are specified in the following outline.

Product Qualification:
The product has a history of production, sales and service for more than nine years.

Design:
A) Dimensions - Exterior dimensions approximately five feet wide by six feet long by nine feet tall. (5'-0"W x 6'-0"L x 9'-0"H)
The building design exceeds the recommendations of:

The Uniform Building Code	NFPA 30	Factory Mutual
The Uniform Fire Code	OSHA	

B) Spill Containment - Internal spill containment is a major design feature of the storage container. When filled with 55 gallon drums stored upright and unstacked, the container will contain a minimum of the total leakage from one-quarter (25%) of the drums.
C) Floor - The floor of the container is constructed of 10 gauge steel and incorporates a false floor system to prevent the release of hazardous liquids and solids if they are discharged from a primary container.
D) Walls & Roof - The walls and roof are fabricated using 12 and 14 Gauge HRS.
E) Doors - The container has one door opening which is 4'-6" wide by 6'-3" high located on the front of the container. The door is equipped with an industrial grade 3 pt lock and interior safety release.
F) Ventilation - The container is equipped with vents which are sized to allow for a minimum of 6 air changes per hour.
G) Grounding - The container is equipped with one exterior static grounding connection.
H) Seismic Tie Down - The container is equipped with provisions for securing the building to the ground per seismic Zone 4 regulations.

Workmanship:
A) Steel Fabrication - The steel used to fabricate the container is free from kinks, and sharp bends. The manufacturing process does not reduce the strength of the steel to a value less than intended by the design. Each manufacturing process is done neatly and accurately, and all bends are made by controlled means to insure uniformity of size and shape.
B) Welding - The welding procedures employed are in accordance with the filler metal specifications of the American Welding Society and in cooperation with the ASTM. All welds are of sufficient size and shape to develop the full design strength of the parts connected by the welds. These welds transmit the imposed stresses without permanent deformation or failure when subject to proof of storage loads.
C) Painting - After a thorough cleaning process the exterior and interior of the container are painted with a self-priming chemical resistant epoxy paint. All exterior surfaces are then painted with a durable polyurethane paint.

Structural Design:

Wind Load	110 MPH
Floor Load	250 PSF
Snow Load	40 PSF
Seismic Load	Zone 4

Units equipped with explosion relief venting:

Internal Pressure	100 PSF

SEPARATION OF NON-COMPATIBLE MATERIALS
TABLE NO 51.110-A

MATERIAL SEPARATION

	MINIMUM SEPARATION FROM						
	TOXICS	ACIDS	BASES	FLAM-MABLES	OXI-DIZERS	WATER REACTIVE	PYRO-PHORIC
TOXICS		1 HR	1 HR	1 HR	1 HR	1 HR	1 HR
ACIDS	1 HR		S	S 2	S	S	S 2
BASES	1 HR	S		S	S	S	S
FLAMMABLES	1 HR	S 2	S		S	*	S
OXIDIZERS	1 HR	S	S	S		S	S 2
WATER REACTIVE	1 HR	S	S	*	S		S
PYROPHORIC	1 HR	S 2	S	S	S 2	S	

1. FOR SEPARATION OF HAZARDOUS PRODUCTION MATERIAL GASES FROM HAZARDOUS PRODUCTION LIQUIDS AND SOLIDS, SEE SECTION 51.110 (B) 3

2. SEPARATION BY NOT LESS THAN 20 FEET MAY BE USED AS AN ALTERNATIVE TO A NONCOMBUSTIBLE PARTITION.

NOTES:

S = NONCOMBUSTIBLE PARTITION. THE PARTITION SHALL EXTEND NOT LESS THAN 18 INCHES ABOVE AND TO FRONT AND REAR OF STORED MATERIAL

1 HR = ONE-HOUR NONCOMBUSTIBLE FIRE-RESISTIVE OCCUPANCY SEPARATION EXCEPT WHEN APPROVED GAS CABINETS ARE USED.

* = NOT ALLOWED: A SEPARATE STORAGE ROOM IS REQUIRED

ACIDS	CAUSTICS	SOLVENTS	OXIDIZERS

STORAGE AS_SMENT

NUMBER & TYPE	GENERIC NAME	HAZARDOUS CLASSIFICATION	STORAGE PERIOD CYCLE TIME
BOXES, PAILS, TUBS BOTTLES, DRUMS BARRELS, PALLETS	FUEL, SULFURIC ACID, WASTE OIL PAINT, PROPANE	FLAMMABLE SOLIDS CORROSIVES, OXI- DIZERS, TOXICS FLAMMABLE LIQUID GASES, ORGANIC PEROXIDES	CONTINUOUS INTERMITTENT 30 DAYS, 90 DAYS INDEFINITE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

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[illegible] APPLIED TO CHEM-STOR LOCKERS

- GENERAL INFORMATION
CODES: Whether or not specific codes, regulations or ordinances apply to the use of Chem-Stor lockers depends on several factors, principally, the type, quantity and physical state of materials to be stored; whether or not dispensing is to take place, the location of the locker at the specific site and of course the interpretations of local code-enforcing authorities.
References used for this commentary include Uniform Fire Code, UFC 1988 Ed.; Uniform Building Code, UBC 1988 Ed.; Santa Clara County, Model Ordinance for Hazardous Materials Storage; Flammable and Combustible Liquids Code, NFPA 30, 1987 Ed.; California Code of Regulations, Title 22 T-22 , Div. 4, Chapter 30, Minimum Standards for Management of Hazardous Waste; Guide for Venting of Deflagrations, NFPA 68, 1988 Ed.; and NFPA Annotated OSHA Regulations, Volume 1 published 1990.
COMMENTS: Chem-Stor lockers are designed specifically for hazardous materials storage, providing sound environmental protection against contamination due to spills or leaks while at the same time providing a high level of security and protection from the elements. The lockers are suitable for storing usable as well as waste materials.
Requirements for separation or isolation as well as the fire-hazard nature of many materials makes safe storage difficult. Chem-Stor lockers offer an easy, safe, and very practical solution to many hazardous materials storage problems. Each locker contains the basic features necessary for a hazardous materials storage facility; spill control, explosion relief (optional on some models), natural ventilation of storage spaces, shelving construction and structural design for heavy storage. In addition, each locker is small enough and strong enough to be picked up with a fork lift for relocation.

- STRUCTURAL APPLICATION AND PERMITS
CODES: The UBC defines a structure as "...an edifice or building of any kind or any piece of work artificially built up or composed of parts joined together in some definite manner." UBC Section 301 regarding building permits required, exempts one-story detached accessory buildings used as tool or storage sheds from permit requirements provided the projected roof are does not exceed 120 sq. ft. The UFC and local Hazardous Materials Storage Ordinances require permits to be obtained to storing hazardous materials.
COMMENTS: Chem-Stor lockers may or may not require a building permit to install. Regardless of permit requirements, however, local jurisdictions may require structural calculations and a site plan. Ideal Environmental will provide structural calculations upon request. Information regarding construction materials and loading is included in the specifications. Regardless of the UBC permit requirements, Chem-Stor lockers must not be installed or used in a manner or location which constitutes a violation of Building or Fire Codes. Hazardous materials storage permits issued under the UFC or local Ordinance generally specify types and quantities of hazardous materials permitted to be stored as well as approved locations and monitoring and

[illegible] Chem-Stor lockers simplify [illegible] present and a complete storage facility with known quantities [illegible] can be relocated from one approved location to another.
Pads or foundations are not necessary for Chem-Stor lockers [illegible] load distribution design. Some jurisdictions however require anchorage against seismic activity. Upon customer request, IDEAL ENVIRONMENTAL will provide information regarding anchoring methods.

- SPILL CONTROL AND SECONDARY CONTAINMENT

CODES: The UFC, UBC and Model Ordinance, as well as many state and local laws throughout the country, require that hazardous materials, whether stored in a usable state or as a waste, must be stored in an approved storage facility providing spill control so that spills or leakage is prevented from creating fire and health hazards and contaminating the surrounding environment. The model ordinance requires spill control in the form of "secondary containment." The secondary containment construction must be such that it will not be structurally weakened through contact with leaked or spilled material for a period of time equal to the maximum time needed to clean up the leakage or spilled hazardous material. The secondary containment must have capacity to contain 150% of the volume of the largest primary container stored (110% if only one container) or 10% of the aggregate volume of all primary containers stored, whichever is greater. If the storage facility is open to rainfall, the secondary containment must additionally have capacity to accomodate the volume of a 24-hour rainfall based on a 25-year storm history.
UFC, Art. 80 requires that, "..rooms, buildings or areas used for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off the spillage and fire protection water". The spill control must, at minimum, be liquid-tight recessed (4") floors or liquid-tight sills (4") connected to a drainage system to direct the spillage and fire protection water to an approved location. When "secondary containment" is specifically required the spill control and drainage system must be designed as secondary containment OR the building, room or area shall be designed to provide secondary containment through the use of liquid-tight floors or sills. Secondary containment shall have capacity equal to the volume of the largest single container stored plus flow from the automatic fire extinguishing system for a period of 20 minutes.
UFC, Art. 80 specifically requires a liquid-tight floor and secondary containment for the storage of : liquid and solid oxidizers, organic peroxides, pyrophoric materials, unstable (reactive) materials, water reactive materials, highly toxic solids and liquids, radioactive materials, corrosives, other health hazard type materials.
UFC, Art. 79; and NFPA 30 (which includes OSHA requirements in this instance) have similar requirements for containing spills of flammable or combustible liquids in "storage rooms," "inside storage rooms," attached buildings and "cut-off rooms." Methods include liquid-tight sills floors depressed 4" below surrounding floors or grated trenching to direct spills to a safe area. These regulations also require that run-off water from fire suppression be controlled and impounded in a safe location. The UFC and NFPA 30 also requires outside storage areas

[illegible]
so as to [illegible]
T-22, Chapter [illegible], Section [illegible], pertaining to [illegible] Waste, requires that "storage [illegible] minimize the possibility of spills and escape from the area [illegible]"
COMMENTS: Chem-Stor lockers are designed specifically [illegible] Model Hazardous Materials Storage Ordinances and UFC requirements. [illegible] lockers are designed with containment adequate for [illegible] volume based on [illegible] gallon drums as primary containers.
Chem-Stor locker secondary containment is static-tested [illegible] tightness using water at the factory before application of any finish material. After the containment has proven to be liquid-tight, all surfaces are coated with a chemical resistant epoxy to protect the steel construction from corrosion.
Where local jurisdictions require automatic fire sprinklers and will not accept "approved" alternate systems, provisions for fire flow run-off to a safe location will have to be developed by the user.

- MONITORING
CODES: The Model Ordinances and UFC have similar monitoring requirements for leakage or spills. Both require that. "Monitoring methods shall include at least one system for detecting leakage from the primary container. A monitoring system capable of detecting that the hazardous material stored in the primary containment has entered the secondary containment shall be provided. Visual inspections of the primary containment is the preferred method, however, other means of monitoring may be required..." (Most enforcement authorities will require a monitoring plan wherein the frequency and method of inspection to detect leakage must be specified.)
COMMENTS: Chem-Stor lockers are designed with a 50" minimum, wide door for easy visual inspection of primary containers and a Chemical Resistant Steel Grate Floor or Corrosion Resistant Fiberglass Grate Floor installed in lift out floor panels for quick, easy access and inspection of the secondary containment.

-SECURITY
CODES: UFC, Art. 79 and Art. 80, NFPA 30, OSHA, the Model Ordinance, and T-22 all require security for hazardous materials storage; NFPA 30 and UFC Art. 79, "Storage areas shall be protected against tampering or trespassers..."; Model Ordinance, "Access to storage facilities shall be secured by means of fences and/or locks. The storage facilities shall be securely locked when unattended;" T-22, "Storage of hazardous waste shall be in a secure enclosure, including but not limited to, a building, room or fenced area which shall prevent unauthorized persons from gaining access to the waste..."; UFC, Art. 80, "The storage of hazardous materials shall be safeguarded with such protective facilities as public safety requires."
COMMENTS: Chem-Stor lockers' steel construction, versatile hardware and security bars on the roof hatch provide excellent security against unauthorized entry. The lockers also provide a simple way to isolate materials which may require special security measures while not restricting access to general storage areas.

[illegible] materials [illegible] and associated [illegible]. UFC, Art. [illegible] requirements [illegible] principally to inside storage, mixing and handling rooms. The general intent is to prevent accumulation of flammable vapors and to that end, six air changes per hour are required; NFPA 30 on the same subject does not specify air changes per hour for gravity ventilation but requires mechanical ventilation at 150 cfm if Class I liquids are dispensed. OSHA requires six air changes per hour by either gravity or mechanical exhaust ventilation. In all instances where flammable or combustible liquids are stored and ventilation is required, ventilation must occur within 12" of the floor. Where gases are stored, required ventilation must be designed to provide air outlets near the ceiling or roof and make up air inlets near the floor. Air changes per hour are not specified for gas storage, OSHA requires that openings must be at least 1 sq. ft. for each 1,000 cu. ft. of room volume. An additional information source; Factory Mutual System's "Industrial Loss Prevention Handbook" recommends ventilation in work areas where flammable vapors might be present at 1 sq. ft. of vent opening for each 500 sq. ft. of floor area. UFC Art. 80 generally requires mechanical ventilation for indoor storage areas and storage buildings at 1 cu. ft./m for each 1 sq. ft. of floor area. Exceptions may be made where natural ventilation can be shown to be adequate for the materials stored.

COMMENTS: Chem-Stor lockers standard features provide natural ventilation openings on at least two sides within 12" of the floor, in the doors and at the roof. The internal volume of the standard locker is nominally 450 cu. ft. Assuming an empty locker, 6 air changes per hour (2700 cu. ft.) would require a very slight air movement (less that 1/2mph) through a 1 sq. ft. opening. Where mechanical ventilation is required, the optional forced air system is recommended. This system pushes outside air into the locker to provide ventilation up to 20 air changes per hour.

- DEFLAGRATION VENTING

CODES: The UBC, UFC, NFPA 30 and OSHA all contain some requirement for "explosion venting" where flammable liquids, dusts or gases are stored or handled. UBC, Chapter 9, says, in part that, "when required by the UFC, explosion venting shall be provided to vent the gases resulting from deflagrations of dusts, gases or mists in rooms, buildings or other enclosures. The venting shall be in exterior walls or roof only and shall be designed to prevent serious structural damage and production of lethal projectiles. The venting shall consist of any one or a combination of: walls of lightweight material, lightly fastened hatch covers, lightly fastened outward opening swinging doors or lightly fastened walls or roof. Venting shall discharge vertically or to an unoccupied yard at least 50' in width on the same lot."

UFC, Art. 80 specifically requires "explosion venting" be provided in indoor areas and buildings used for the storage of: highly toxic or flammable gases stored outside of gas cabinets or exhausted enclosures; flammable solids; solid or liquid oxidizers Class 1, 2 or 3; organic peroxides Class II, III, IV or V; unstable (reactive) materials.

UFC, Art. 79 for "inside use, dispensing and mixing rooms" requires

"adequate explosion" vent [illegible] design.
NFPA 30, for container and portable tank storage requires exp[illegible] venting only where dispensing is done, and in areas where Class [illegible] unstable liquids are processed. Explosion venting is to be through [illegible] of more of the following methods a) open air construction; b) lightweight walls and roof; c) lightweight wall panels and roof panels; (d) windows of explosion venting type." NFPA 30 references NFPA 68 "Guide for Venting of Deflagrations." OSHA 1910.106 [illegible] repeats the NFPA 30 requirements but makes no reference to NFPA 68.
NFPA 68 in its "Basic Recommendations for Venting" section says, "Since venting of deflagrations is a complex subject of many variables on which information in limited only general guidelines are provided." In very general terms the required vent area will depend on the size and strength of the enclosure to be vented, the acceptable level of resulting damage, the maximum anticipated rate of pressure rise, the anticipated maximum pressure developed by the fuel mixture and the design of the venting devices. Formulas are provided for calculating required vent areas when the required information is know or can be calculated.
COMMENTS: Chem-Stor standard lockers are designed to comply with the intent of the codes by providing deflagration relief in the form of an 11.6 sq. ft. roof cap constructed of 16 gauge metal securely hinged and tethered. Internal volume of the standard locker is nominally 450 cu. ft.: this places the vent area to locker volume ratio at 1 sq. ft. of vent for each 37.8 cu. ft. of volume. For comparison purposes OSHA 1910.103 (3) (ii) (c) and NFPA 50A require explosion venting for "gaseous hydrogen systems in separate buildings" at the rate of 1 sq ft. for each 30 cu. ft. of room volume.
The most common method of deflagration venting is the so-called weak roof of wall panel design; however, Chem-Stor's hinged cap design provides more functional certainty because it can be easily maintained and manually exercised from time to time and it is not as likely to become a projectile as would weakly attached or light weight panels.

- FIRE PROTECTION
CODES: Portable fire extinguishers suitable for the type hazard will in all cases be required. Most jurisdictions reference NFPA 10 or UFC Standard 10-1 for the selection and installation of portable fire extinguishers.
UBC 3802(f) and UFC 10.308(f) require automatic fire extinguishing systems in buildings containing Group H Division 1, 2, 3 and [illegible] occupancies (storing/handling hazardous materials in excess of the exempt quantities listed in UBC Table 9-A and 9-B).
NFPA 30 and OSHA when referring to "inside storage rooms" do not specifically require quantities permitted when such protection is not provided.
It should be noted that all the referenced regulations except UFC require "automatic systems" which could be sprinklers, water spray, CO2, dry chemical, halon, or other approved systems.
UFC, Art. 79 however specifically calls for automatic fire sprinkler systems in "liquid storage rooms" and "inside liquid storage rooms."

[illegible] Ann. [illegible] generally calls for automatic fire [illegible] does permit approved alternate automatic fire extinguishing [illegible]
COMMENTS: The code requirements are obviously intended to protect [illegible] areas within the same building which may be exposed to high fire hazard storage, use, handling, mixing, etc. and also takes into consideration fire fighting access to these hazards.
Whether the Chem-Stor locker is considered to be a building or simply enclosed outside storage and where the locker is placed on site is probably the key as to whether or not automatic fire protection is required. For example, if the locker is placed against or inside a sprinklered building, sprinklers will surely be required. In one jurisdiction, if the locker is within 10' of any building it must have a sprinkler.
Most jurisdictions will accept alternative or equivalent protection depending on the specific situation. For that reason, Chem-Stor provides an optional factory-installed u.l. listed dry chemical system.

- FIRE-RESISTIVE CONSTRUCTION
CODES: When the UBC requires fire-resistive construction the reference is to a time rating assigned as a result of having withstood fire exposure as established by a standard test procedure. The requirements for fire-resistive construction are generally based on: the size, use and type of construction of the building; the exposure of one use to another in the same building; the exposure of other buildings on the same property; exposure potential relative to property lines; or the protection of specific situations within buildings, e.g., vertical shafts and exitways (stairs and corridors).
Noncombustible construction simply means the materials will not ignite and burn or will not contribute, within a limited criteria, fuel to a fire. The terms fire-resistive and noncombustible are not interchangeable.
COMMENTS: The standard Chem-Stor lockers are of completely noncombustible construction. Fire-resistive exterior walls rated up to two hours can be easily provided on one or more sides to accommodate locations where distances to property lines or buildings dictate or where storage in two or more lockers side by side require fire separation walls. Locker interiors can be easily divided by either fire-resistive or noncombustible partitions to accommodate requirements for separation or segregation of materials. Chem-Stor, also offers a complete line of Fire Rated units which are built in accordance with Underwriters Laboratories listing #425.

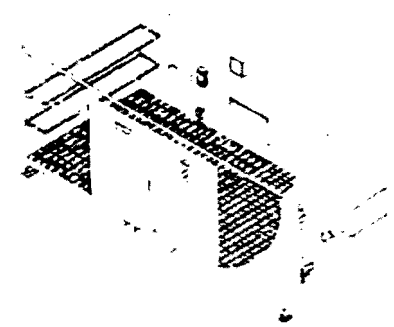

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TABLE NO. 9A - EXEMPT AMOUNTS OF HAZARDOUS MATERIALS, LIQUIDS AND CHEMICALS PRESENTING A PHYSICAL HAZARD BASIC QUANTITIES PER CONTROL AREA [1]

When two units are given, values within parentheses are in cubic feet (Cu.Ft.) of pounds (Lbs.)

CONDITION		STORAGE [2]			USE [2] - CLOSED SYSTEMS			USE [2] - OPEN SYSTEMS		
MATERIAL	CLASS	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)
1.1 Combustible liquid [3]	II	—	120 [4,5]	—	—	120 [4,5]	—	—	30 [4]	—
	III-A	—	330 [4,5]	—	—	330 [4,5]	—	—	80 [4]	—
	III-B	—	13,200 [6]	—	—	13,200 [6]	—	—	3300 [4]	—
1.2 Combustible dust lbs./1000 cu. ft.		1 [7]	—	—	1 [7]	—	—	1 [7]	—	—
1.3 Combustible fiber (loose)		(100)	—	—	(100)	—	—	(20)	—	—
(baled)		(1,000)	—	—	(1,000)	—	—	(200)	—	—
1.4 Cryogenic, flammable or oxidizing			45	—	—	45	—	—	10	—
2.1 Explosives		1 [5,8,9]	(1) [5,8,9]	—	1/4 [5]	(1/4) [6]	—	1/4 [5]	(1/4) [6]	—
3.1 Flammable Solid		125 [4,5]	—	—	25 [4]	—	—	25 [4]	—	—
3.2 Flammable gas (gaseous)		—	—	750 [4,5]	—	—	750 [4,5]	—	—	—
(liquefied)		—	15 [4,5]	—	—	15 [4,5]	—	—	—	—
3.3 Flammable liquid [3]	I-A	—	30 [4,5]	—	—	30 [4]	—	—	10 [4]	—
	I-B	—	60 [4,5]	—	—	60 [4]	—	—	15 [4]	—
	I-C	—	90 [4,5]	—	—	90 [4]	—	—	20 [4]	—
Combination 1A, 1B, 1C		—	120 [4,5,10]	—	—	120 [4,10]	—	—	30 [4,10]	—
4.1 Organic Peroxide unclassified detonatable		1 [5,8]	(1) [5,8]	—	1/4 [5]	(1/4) [6]	—	1/4 [5]	(1/4) [6]	—
4.2 Organic Peroxide	I	5 [4,5]	(5) [4,5]	—	(1) [4]	(1) [4]	—	1 [4]	1 [4]	—
	II	50 [4,5]	(50) [4,5]	—	50 [4]	(50) [4]	—	10 [4]	(10) [4]	—
	III	125 [4,5]	(125) [4,5]	—	125 [4]	(125) [4]	—	25 [4]	(25) [4]	—
	IV	500	(500)	—	500 [4]	(500)	—	100	(100)	—
	V	N.L.	N.L.	—	N.L.	N.L.	—	N.L.	N.L.	—
4.3 Oxidizer	4	1 [5,8]	(1) [5,8]	—	1/4 [5]	(1/4) [6]	—	1/4 [5]	(1/4) [6]	—
	3	10 [4,5]	(10) [4,5]	—	2 [4]	(2) [4]	—	2 [4]	(2) [4]	—
	2	250 [4,5]	(250) [4,5]	—	250 [4]	(250) [4]	—	50 [4]	(50) [4]	—
	1	1000 [4,5]	(1000) [4,5]	—	1000 [4]	(1000) [4]	—	200 [4]	(200) [4]	—
4.4 Oxidizer - Gas (gaseous)		—	—	1500 [4,5]	—	—	1500 [4,5]	—	—	—
(liquefied)		—	15 [4,5]	—	—	15 [4,5]	—	—	—	—
5.1 Pyrophoric		4 [5,8]	(4) [5,8]	50 [5,8]	1 [8]	(1) [8]	10 [5,8]	0	0	0
6.1 Unstable (reactive)	4	1 [5,8]	(1) [5,8]	10 [5,8]	1/4 [8]	(1/4) [8]	2 [5,8]	1/4 [8]	(1/4) [6]	0
	3	5 [4,5]	(5) [4,5]	50 [4,5]	1 [4]	(1) [4]	10 [4,5]	1 [4]	(1) [4]	0
	2	50 [4,5]	(50) [4,5]	250 [4,5]	50 [4]	(50) [4]	250 [4,5]	10 [4]	(10) [4]	0
	1	125 [4,5]	(125) [4,5]	750 [4,5]	125 [4]	(125) [4]	750 [4,5]	25 [4]	(25) [4]	0
7.1 Water (reactive)	3	5 [4,5]	(5) [4,5]	—	5 [4]	(5) [4]	—	1 [4]	(1) [4]	—
	2	50 [4,5]	(50) [4,5]	—	50 [4]	(50) [4]	—	10 [4]	(10) [4]	—
	1	125 [5,8]	(125) [5,8]	—	125 [8]	(125) [5,8]	—	25 [4]	(25) [4]	—

N.L. = Not Limited

1 Control area is a space bounded by not less than a one-hour fire-resistive occupancy separation within which the exempted amounts of hazardous materials may be stored dispensed, handled or used. The number of control areas within a building used for retail and wholesale stores shall not exceed two. The number of control areas in buildings with other uses shall not exceed four.

2 The aggregate quantity in use and storage shall not exceed the quantity listed for storage.

3 The quantities of alcoholic beverages in retail sales uses are unlimited provided the liquids are packaged in individual containers not exceeding four liters. The quantities of medicines, foodstuffs and cosmetics containing not more than 50 percent of volume of water- miscible liquids and with the remainder of the solutions not being flammable in retail sales or storage occupancies are unlimited when packaged in individual containers not exceeding four liters.

4 Quantities may be increased 100 percent in sprinklered buildings. When Footnote 5 also applies, the increase for both footnotes may be applied.

5 Quantities may be increased 100 percent when stored in approved storage cabinets or safety cans as specified in the Fire Code. When Footnote 4 also applies, the increase for both footnotes may be applied.

6 The quantities permitted in a sprinklered building are not limited.

7 A dust explosion potential is considered to exist if 1 pound or more of combustible dust per 1,000 cubic feet of volume is normally in suspension or could be put into suspension in all or a portion of an enclosure or inside pieces of equipment. This also includes combustible dust which accumulates on horizontal surfaces inside buildings or equipment and which could be put into suspension by an accident, sudden force or small explosion.

8 Permitted in sprinklered buildings only. None is allowed in unsprinklered buildings.

9 One pound of black sporting powder and 20 pounds of smokeless powder are permitted in sprinklered or unsprinklered buildings.

10 Containing not more than the exempt amounts of Class I-A, Class I-B or Class I-C flammable liquids.

Manufacturer's Information on Epoxy Filler-Sealer and Protective Coating

PLASITE ®

TECHNICAL BULLETIN

9028
May 1989
(Replaces Jan. 1984)

PLASITE 9028M1 & 9028M2 MASONRY & CONCRETE FILLER-SEALER

TYPE: PLASITE 9028M1—A 100% solids epoxy blended with a properly graded combination of silica fillers and inerts to provide excellent bulking, film strength and working properties.
PLASITE 9028M2—A 100% solids epoxy blended with an inert flaking pigment providing excellent workability and ease of application.
CURING AGENT: Combined Amine.
INTENDED USE: As a filler-sealer for all types of concrete finishes, as well as a repair or grout material. Topcoating with PLASITE Series 700, 4000, 7000 and 9000 coatings should be used to increase chemical resistance and to meet the requirements of the environment. Tank linings, floors, ceilings and walls are common applications.

PLASITE 9028M1 is a general purpose filler-sealer that will fill holes up to ¼" in depth. For larger holes or concrete repair, an addition of a properly graded silica sand may be used to obtain the proper consistency.

PLASITE 9028M2 has less body than PLASITE 9028M1 and will fill holes up to approximately ⅛" in depth and for general thin film surfacing for specifications calling for flush surface up to 40 mils. It is ideal for horizontal surfaces as it is self-leveling and needs no finishing.

FOR INDUSTRIAL USE ONLY!

CHEMICAL RESISTANCE: Good all-around chemical resistance but not as resistant as the PLASITE topcoats. Refer to our laboratory for exposures where topcoats may not be required.
TEMPERATURE RESISTANCE: Dry temperature basis is 300°F continuous or 400°F for short periods of time. Immersion temperatures are based on the topcoat.
SURFACE PREPARATION: Requires hard, dense, clean, uncontaminated prime masonry surface, free of glaze and laitance. For further information refer to SURFACE PREPARATION on Page 2.
APPLICATION: PLASITE 9028M1 may be applied to surface by spray, brush, roller or trowel and requires finishing by squeegee or plastic finishing blade. PLASITE 9028M2 may be applied to surface by spray, brush or roller and requires less finishing than PLASITE 9028M1. For first filling and sealing operation, both materials require working with squeegee to fill voids.
COLORS: PLASITE 9028M1 - Light Green PLASITE 9028M2 - Medium Gray.
COVERAGE: 1604 Mil Ft.²/Gallon theoretical.
COVERAGE & COATS: Severe spillage or immersion service will require two (2) coats. The first coat will normally provide a flush surface; the second coat (applied in the same manner) will fill small leftover voids and assure a completely sealed surface. Field experience indicates a coverage rate of 60 to 80 ft.²/gallon for this 2 coat system.
For less severe service, the second coat may not be required. Coverage rate for a single coat application is approximately 80 to 120 ft.²/gallon.
NOTE: When bulking is required for grouting and plugging large holes, a clean wash silica sand may be used with an approximate U.S. Sieve Size (percent retained on screen): 3% - #40; 31% - #50; 43% - #70; 19% - #100. Bulking factor of specified filler is approximately 80% based on dry volume measure of sand. Example—one gallon of coating plus one-half gallon of recommended filler will yield 1.4 gallons with a coverage of 2245 mil ft.² (1.4x1604) or 1.4 x 232 = 325 Cu. In.
DRYING TIME: Where low temperatures of 50 to 60°F are involved with low humidity the drying time may be 16 hours. At 70°F and relative humidity of 40 to 60%, the drying time may be from 8 to 10 hours. Under conditions of high temperatures and high humidity the drying time may be as low as two hours.
INITIAL SET: 8 to 10 hours at 70°F.
CURING TIME: 5 to 7 days at 70°F or force cure on the same schedule as for topcoat.
OVERCOATING TIME: PLASITE 9028 systems may be overcoated within one hour at 70°F by high solids epoxies in the range of 80 to 100% volume. For a lower solids coating in the range of 40 to 80% by volume the overcoating time is 8 to 10 hours. Lower solids materials, and any coating that is used as topcoat that has not been tried, should be checked for bleed-through if earlier overcoating is required.

PHYSICAL SPECIFICATIONS

PIGMENTS: 9028M1—Inert Fillers Including Silica
9028M2—Inert Fillers Combined with Special Flake Pigments
SOLIDS: 100%
POT LIFE: Approx. 6 hrs. at 70°F
SHELF LIFE: 24 Months at 70°F
SHIPPING WT.: 9028M1—14½ lbs. 9028M2—15½ lbs.

ABRASIVE RESISTANCE: Average loss per 1000 cycles. Taber CS-17 Wheel, 1000 Gram Weight:
9028M1..... 64 milligrams
9028M2.....105 milligrams
THERMAL SHOCK: Unaffected 5 Cycles -70°F to +200°F on concrete substrate.

WISCONSIN PROTECTIVE COATINGS CORP.
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Green Bay, WI 54308-8147
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Represented by:

THINNERS

Thinning of the PLASITE 9028 Series is not usually required. Should it be desirable to reduce application air pressure requirements and improve flow-out or workability, the addition of 5% to 10% PLASITE 20 thinner may be used.

SURFACE PREPARATION (For Immersion Service)

1. Inspect for structural failures, cracks, protrusions and fins. Grind surface flush and grind cracks to "V" configuration. Chip all loose concrete to width of ¼" minimum.
2. Repair all large holes, cracks, voids and other imperfections with PLASITE 9028M1 or 9028M2 filler-sealer with addition of specified sand, as required, to provide proper stiffness used as the grout. Mixtures of specified sand up to equal parts of sand to resin may be used. See note in COVERAGE section.
3. Concrete surface must have minimum 30 days cure, be clean, hard, dense and free of laitance, form oil and release agents. Blow holes, pits and cavities must be open in order that they may be properly filled and sealed. To provide the foregoing requirements, it is necessary to prepare the surface using one or more of the methods listed in order of preference.
   a. Whip blast with a fine grade of sand reducing the normal nozzle pressures. Pressure and distance of nozzle from surface depends on characteristic of concrete. CAUTION: Do not overblast as it will result in high consumption of material and labor.
   b. Water blasting at a pressure of approximately 3000 psi may be used to produce similar results.

NOTE: Surface preparation for exposures other than immersion service will require less surface preparation and will depend on environment, condition of concrete surface and other factors. In general, the foregoing Paragraphs 1, 2 and 3 will be a requirement. Satisfactory surface preparation, sanding, grinding, brushing, pressure washing, etching and other methods must be determined on a job-to-job basis. Contact our Sales Engineers or Laboratory for specific information.

EQUIPMENT

Due to heavy viscosity of the material, a fine atomization cannot be obtained. Spray equipment is utilized to apply material to surface prior to working into voids with a squeegee or flexible plastic blade. Suggested application equipment:

SPRAY EQUIPMENT:

Grayco—Pump Feed—225 President Heavy Material Air Spray Unit (10:1 ratio); 204-000 Spray Gun; 330 Fluid Tip; 329 Air Cap (slotted type). For 9028M1 only may use 167-331 Fluid Tip; 160-663 Air Cap.

Speeflo—Pump Feed—914-552 Heavy Duty Coatings Pump with Hopper; Heavy Fluid Gun; 701-628 Fluid Tip; 701-618 Air Cap.

Binks No. 98-930 Unit - Pump Feed - Specify a 45 x ¼" E Air Cap and Fluid Nozzle to fit 7E-2 Gun.

NOTE: For Pump Feed equipment, a ½" to ¾" ID fluid hose is recommended depending on length.

Normal solvent flushing of airless pumps may not remove the 9028 material adequately. It is suggested that cleaning by disassembly of the lower unit be performed after each application.

Binks—Pressure Pot Feed—18 Gun; 59ASS Fluid Tip; 251 Air Cap; 59SS Needle and Heavy Duty Spring.

NOTE: For Pressure Pot Feed equipment, PLASITE 20 thinner may be added, as required (not over 20%).

BRUSH: A high quality stiff brush should be used.

ROLLER: Use short nap (½" or less) fiber, resistant to ketone solvents.

READ THIS NOTICE!
SAFETY AND MISCELLANEOUS EQUIPMENT

1. It is recommended that the operator wear clean coveralls, rubber-soled shoes, gloves and maintain a high degree of personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE THINNER FOR THIS COATING, WHEN ADDED, IS FLAMMABLE AND CARE IS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks, and open flame and use necessary safety equipment (such as, air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and clothing and the breathing of vapor or spray mist. When working in tanks, rooms, and other enclosed spaces, adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

MIXING

The PLASITE 9028 Series are shipped in one and five gallon containers. An appropriate amount of curing agent is shipped with each unit. Thoroughly mix resin and pigment (Part 1), add curing agent (Part 2) and continue mixing until fully blended. Always use a mechanical mixer to assure optimum workability. A 15-minute sweat-in period shall be allowed prior to application.

APPLICATION PROCEDURE (For Immersion Service)

1. Apply first coat by spray or hand method and thoroughly work into surface with squeegee or flexible plastic blade to provide a flush uniform surface.
2. Apply second coat in same manner as first coat. This coat may be applied immediately after the first coat or whenever first coat is hard.
3. Damp concrete surfaces may be filled and sealed with PLASITE 9028M1 or 9028M2.
4. Visually inspect all surfaces and repair any voids.

This bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult your local sales representative or PLASITE Technical Service Department for further information.

METRIC COMPARISONS

1 mil = .001" = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. × 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

We guarantee our product to be free of defects in material and workmanship and to be in accordance with our company quality control standards. All data, statements and recommendations made herein are based upon information we believe to be reliable, but are made without any representation or guarantee or warranty of accuracy and are made with reservation of all patent rights. Our products are sold on the condition that the user himself will evaluate them, as well as our recommendations, to determine their suitability for his own purpose before adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations. Liability under any condition shall be limited to replacement of material only. No liability is assumed or implied, for injury to personnel, labor costs, product loss or any other expenses incidental to the structure or operation of the plant and equipment where the coating is applied.

PLASITE®

TECHNICAL BULLETIN

7122
February 1987
(Replaces Jan. 1985)

PLASITE 7122 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.

INTENDED USE: As a tank lining and for industrial maintenance. May be applied to metal, concrete and wood (Refer to ZONE OF USAGE below.)

FOR INDUSTRIAL USE ONLY!

GOVERNMENT AGENCY ACCEPTANCE: Meets the requirements of the U. S. Food and Drug Administration, 21 CFR 175.300 (NOTE: The color "Green" is not suitable for food service. Special colors may not meet FDA requirements; consult PLASITE Technical Service Department).

PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Department of Agriculture for use in direct food contact areas.

PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Environmental Protection Agency for surfaces which contact potable water.

CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.

TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods. Continuous immersion temperatures depend on particular reagent.

SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.

APPLICATION: PLASITE 7122H is formulated for standard production spray equipment. 7122B is formulated for brush and roller application and should be force cured for immersion service. Refer to page 4 for details on APPLICATION PROCEDURE.

COLORS: Green; Light gray; Medium gray; Black; White; Light blue; Tile red. Special colors are available, but may not be suitable for food service. Consult PLASITE Technical Service Department.

FILM THICKNESS PER COAT: A 6 to 7 mil film is produced in one multi-pass spray coat. A 2 to 4 mil film may be produced by one flow on brush coat.

COVERAGE: 898 mil ft²/gallon ± 4% theoretical. For estimating purposes, 30 ft²/gallon will produce a 12 to 15 mil DFT film (20% loss included). Two multi-pass spray coats will produce the 12 to 15 mil DFT film recommended for immersion service.

DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.

CURING TIME: 5 days at 90°F or 7 days at 70°F. Refer to Page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.

SOLIDS: 67% by weight; 56% ± 4% by volume, depending on color and pigmentation.

POT LIFE: Approximately 24 hours at 70°F.

SHELF LIFE: 24 months at 70°F. Material in stock should be turned upside down every 3 months.

SPRAY VISCOSITY: 28 ± 7 seconds - Ford Cup #4 depending on color.

SHIPPING WT.: Approximately 12 lbs./gallon.

ELECTRICAL RESISTANCE: 5.5 × 10¹³ ohm-cm Volume Resistivity - ASTM D-257-66.

***ABRASIVE RESISTANCE:** 47 milligrams average loss 1000 cycles TABER CS-17 Wheel - 1000 Gr. Wt., lt. gray color.

***HARDNESS:** Konig Pendulum Hardness of 136 seconds. (Glass Standard = 250 seconds); ASTM METHOD D4366-84.

THERMAL SHOCK: Unaffected 5 cycles -70°F to +200°F

GLOSS: 86 at 60°.

***NOTE:** Above tests were conducted on film cured at 150°F.

VOLATILE ORGANIC COMPOUNDS CONTENT

Color	COATING AS SUPPLIED (ASTM METHOD D2369) Lbs./Gal.	Grams/Liter	THINNED 10% BY VOLUME WITH PLASITE 71 THINNER *Lbs./Gal.	*Grams Liter
Lt. Gray	3.09 ±2%	370 ±2%	3.43 ±2%	410 ±2%

NOTE: VOC content varies between colors. Contact PLASITE Technical Service Department for VOC of specific colors.

*Determined theoretically by using ASTM Method test results.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.

B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces are subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.

C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, (primer and topcoat) of 7 to 10 mils required.

D ZONE: Process plant exterior subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, (primer and topcoat) of 6 to 8 mils required.

R 8/89

WISCONSIN PROTECTIVE COATINGS CORP.
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Represented by:

CHEMICAL RESISTANCE

The following list of laboratory tests is an indication of the range of chemical resistance. These tests consist of mild steel test panels coated to a film thickness of 12 to 15 mils. The panels are one-half immersed in the solution at temperatures of 70° to 100°F for a period of six months with no effect on the coating.

ACIDS	ALKALIES	SOLVENTS	MISCELLANEOUS
25% Sulfuric*	50% Sodium Hydroxide	Alcohol	Calcium Chloride
50% Oxalic*	Magnesium Hydroxide	Ethyl, Iso-Propyl,	Latex Rubber
30% Phosphoric*	10% Potassium Hydroxide	Butyl, Decyl	Linseed Oil
25% Boric*	Calcium Hydroxide	Gasoline	Brine
50% Citric*	50% Sodium Carbonate	Kerosene	Ferric Chloride*
	Tri-Sodium Phosphate	Iso-Propyl Acetate	Ammonium Nitrate
		Naptha	Sour Crude Oil — 150°F

***NOTE:** Although the chemical tests indicated may show that PLASITE 7122 is unaffected by immersion as listed, it is not meant to imply an express guarantee in actual service. The service is dependent upon proper application and actual operating conditions and it is generally recommended that users confirm adaptability of the product for a specific use by their own tests.

PLASITE 7122 is classified as a relatively thin film coating and should not be used for total and continuous immersion in certain chemicals such as those acids referred to under CHEMICAL RESISTANCE which have extremely high corrosion rate to mild steel and other substrates. Use in such chemical exposure should be confined to fumes and spills.

THINNERS

The following thinners are recommended:

PLASITE 71 THINNER — is a medium fast thinner to be used under most conditions.

PLASITE 69 THINNER — recommended for airless or conventional spray. A special blend of fast evaporating solvents and containing no hydrocarbons.

It will always be necessary to thin the coating. The applicator must make exact thinner adjustments based on his equipment and air and surface temperatures. The following thinning guidelines are approximate:

Normal application temperatures and conditions will require the addition of approximately 10% thinner by volume with approximately 5% additional thinner added for each 5° of increased temperature.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

PRIMERS

Primers of the inhibitive type must be used when steel surfaces are not blasted to white metal and when finish coatings are below 8 mils in thickness. These primers may be applied by either brush or spray application:

PLASITE 7100 ANTI-CORROSIVE PRIMER described in Bulletin 7100-AC is an epoxy-phenolic catalyzed primer of heavy duty type applicable for B, C and D Zones.

PLASITE 7103 HEAVY DUTY PRIMER described in Bulletin 7103 is an epoxy metal primer with superior bond and water resistance, as well as chemical resistance, for B, C and D Zones.

NOTE: The primers listed above are NOT recommended for food or potable water service, or any service where FDA compliance is required.

CURING

1. Normally polymerization and curing will take place in 5 days at 90°F or 7 days at 70°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied, a minimum substrate temperature of 70°F is required for proper polymerization. Force curing is required for the PLASITE 7122B (brush formulation) when used in immersion service. 7122 should be force cured for all taste sensitive immersion service.
2. Force curing at elevated temperature does increase resistance to certain exposures; therefore, when exposure is severe, force curing is recommended to obtain maximum resistance.
3. Listed below are a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70° to 100°F be allowed. After the air dry period has elapsed, the temperature should be raised by approximately 30°F each 30 minutes until the desired force curing temperatures are reached.

METAL TEMPERATURE °F	°C	CURING TIME	METAL TEMPERATURE °F	°C	CURING TIME
130	54.4	18 Hours	170	76.6	3½ Hours
140	60.0	10 Hours	180	82.2	2½ Hours
150	65.5	6 Hours	190	87.7	2 Hours
160	71.1	4½ Hours	200	93.3	1¾ Hours

4. Final cure may be checked by exposing coated surface to MIBK for ten minutes. If no dissolving and only minor softening of film occurs, the curing can be considered complete. The film should reharden after exposure if cured.

PLASITE®

TECHNICAL BULLETIN

7122
February 1987
(Replaces Jan. 1983)

PLASITE 7122 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy-phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.

INTENDED USE: As a tank lining and for industrial maintenance. May be applied to metal, concrete and wood. (Refer to ZONE OF USAGE below.)

FOR INDUSTRIAL USE ONLY!

GOVERNMENT AGENCY ACCEPTANCE: Meets the requirements of the U. S. Food and Drug Administration, 21 CFR 175.300. (NOTE: The color "Green" is not suitable for food service. Special colors may not meet FDA requirements; consult PLASITE Technical Service Department).

PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Department of Agriculture for use in direct food contact areas.

PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Environmental Protection Agency for surfaces which contact potable water.

CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.

TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods. Continuous immersion temperatures depend on particular reagent.

SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.

APPLICATION: PLASITE 7122H is formulated for standard production spray equipment. 7122B is formulated for brush and roller application and should be force cured for immersion service. Refer to page 4 for details on APPLICATION PROCEDURE.

COLORS: Green; Light gray; Medium gray; Black; White; Light blue; Tile red. Special colors are available, but may not be suitable for food service. Consult PLASITE Technical Service Department.

FILM THICKNESS PER COAT: A 6 to 7 mil film is produced in one multi-pass spray coat. A 2 to 4 mil film may be produced by one flow coat brush coat.

COVERAGE: 898 mil ft²/gallon ± 4% theoretical. For estimating purposes, 50 ft²/gallon will produce a 12 to 15 mil DFT film (20% loss included). Two multi-pass spray coats will produce the 12 to 15 mil DFT film recommended for immersion service.

DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.

CURING TIME: 5 days at 90°F or 7 days at 70°F. Refer to Page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.

SOLIDS: 67% by weight; 56% ± 4% by volume, depending on color and pigmentation.

POT LIFE: Approximately 24 hours at 70°F.

SHELF LIFE: 24 months at 70°F. Material in stock should be turned upside down every 3 months.

SPRAY VISCOSITY: 28 ± 7 seconds - Ford Cup #4 depending on color.

SHIPPING WT.: Approximately 12 lbs./gallon.

ELECTRICAL RESISTANCE: 5.5 × 10¹³ ohm-cm Volume Resistivity - ASTM D-257-66.

***ABRASIVE RESISTANCE:** 47 milligrams average loss 1000 cycles TABER CS-17 Wheel - 1000 Gr. Wt., lt. gray color.

***HARDNESS:** Konig Pendulum Hardness of 136 seconds (Glass Standard = 250 seconds); ASTM METHOD D4366-84.

THERMAL SHOCK: Unaffected 5 cycles -70°F to + 200°F.

GLOSS: 86 at 60°.

***NOTE:** Above tests were conducted on film cured at 150°F.

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Lt. Gray	3.09 ±2%	370 ±2%	3.43 ±2%	410 ±2%

NOTE: VOC content varies between colors. Contact PLASITE Technical Service Department for VOC of specific colors.
*Determined theoretically by using ASTM Method test results.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.

B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces are subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.

C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, (primer and topcoat) of 7 to 10 mils required.

D ZONE: Process plant exterior subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, (primer and topcoat) of 6 to 8 mils required.

R 8/89

WISCONSIN PROTECTIVE COATINGS CORP.
614 Elizabeth Street
P.O. Box 8147
Green Bay, WI 54308-8147
414-437-6561

Represented by:

CHEMICAL RESISTANCE

The following list of laboratory tests is an indication of the range of chemical resistance. These tests consist of mild steel test panels [illegible] film thickness of 12 to 15 mils. The panels are one-half immersed in the solution at temperatures of 70° to 120°F for a period of six months with no effect on the coating.

ACIDS	ALKALIES	SOLVENTS	MISCELLANEOUS
10% Sulfuric*	50% Sodium Hydroxide	Alcohol	Calcium Chloride
50% Oxalic*	Magnesium Hydroxide	Ethyl, Iso-Propyl,	Latex Rubber
30% Phosphoric*	10% Potassium Hydroxide	Butyl, Decyl	Linseed Oil
25% Boric*	Calcium Hydroxide	Gasoline	Brine
50% Citric*	30% Sodium Carbonate	Kerosene	Ferric Chloride*
	Tri-Sodium Phosphate	Iso-Propyl Acetate	Ammonium Nitrate
		Naptha	Sour-Crude Oil — 150°F

***NOTE:** Although the chemical tests indicated may show that PLASITE 7122 is unaffected by immersion as listed, it is not meant to imply an express guarantee in actual service. The service is dependent upon proper application and actual operating conditions and it is generally recommended that users confirm adaptability of the product for a specific use by their own tests.

PLASITE 7122 is classified as a relatively thin film coating and should not be used for total and continuous immersion in certain chemicals such as those acids referred to under CHEMICAL RESISTANCE which have extremely high corrosion rate to mild steel and other substrates. Use in such chemical exposure should be confined to fumes and spills.

THINNERS

The following thinners are recommended:

PLASITE 71 THINNER — is a medium fast thinner to be used under most conditions.

PLASITE 69 THINNER — recommended for airless or conventional spray. A special blend of fast evaporating solvents and containing no hydrocarbons.

It will always be necessary to thin the coating. The applicator must make exact thinner adjustments based on his equipment and air and surface temperatures. The following thinning guidelines are approximate:

Normal application temperatures and conditions will require the addition of approximately 10% thinner by volume with approximately 5% additional thinner added for each 5° of increased temperature.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

PRIMERS

Primers of the inhibitive type must be used when steel surfaces are not blasted to white metal and when finish coatings are below 8 mils in thickness. These primers may be applied by either brush or spray application:

PLASITE 7100 ANTI-CORROSIVE PRIMER described in Bulletin 7100-AC is an epoxy-phenolic catalyzed primer of heavy duty type applicable for B, C and D Zones.

PLASITE 7103 HEAVY DUTY PRIMER described in Bulletin 7103 is an epoxy metal primer with superior bond and water resistance, as well as chemical resistance, for B, C and D Zones.

NOTE: The primers listed above are NOT recommended for food or potable water service, or any service where FDA compliance is required.

CURING

1. Normally polymerization and curing will take place in 5 days at 90°F or 7 days at 70°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied, a minimum substrate temperature of 70°F is required for proper polymerization. Force curing is required for the PLASITE 7122B (brush formulation) when used in immersion service. 7122 should be force cured for all taste sensitive immersion service.
2. Force curing at elevated temperature does increase resistance to certain exposures; therefore, when exposure is severe, force curing is recommended to obtain maximum resistance.
3. Listed below are a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70° to 100°F be allowed. After the air dry period has elapsed, the temperature should be raised by approximately 30°F each 30 minutes until the desired force curing temperatures are reached.

METAL TEMPERATURE °F	°C	CURING TIME	METAL TEMPERATURE °F	°C	CURING TIME
130	54.4	18 Hours	170	76.6	3½ Hours
140	60.0	10 Hours	180	82.2	2½ Hours
150	65.5	6 Hours	190	87.7	2 Hours
160	71.1	4½ Hours	200	93.3	1¼ Hours

4. Final cure may be checked by exposing coated surface to MIBK for ten minutes. If no dissolving and only minor softening of film occurs, the curing can be considered complete. The film should reharden after exposure if cured.

SURFACE PREPARATION

STEEL

High Temperature & Immersion Service (A & B Zones are described under ZONE OF USAGE.)

1. All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag shall be corrected prior to abrasive blasting. Skip welds shall be welded solid.
2. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease etc. may be used. Pre-baking of old tanks is recommended.
3. The surface shall be blasted to an SSPC-SP5 or NACE No. 1 white metal surface using a Venturi blast nozzle supplied with 80 to 100 psi. An anchor pattern or "tooth" in the metal shall correspond to approximately 20 to 25% of the total film thickness of the coating.
4. Contaminated grit shall not be used for the finish work.
5. The blasting media used shall be a natural abrasive, or steel grit, or slag grit (similar or equal to BLACK BEAUTY®. These abrasives shall be sharp with a hard-cutting surface, properly graded, dry and of best quality. The media shall be of proper size to obtain the specified anchor pattern and shall be free of objectionable contaminants.
6. The anchor pattern shall be sharp and no evidence of a polished surface is allowed.
7. Remove all traces of grit and dust with a vacuum cleaner or by brushing. Care must be taken to avoid contaminating the surface with fingerprints or from detrimental material on the workers' clothes.
8. The surface temperature shall be maintained at a minimum of 5° above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared.

Service in Corrosive Atmosphere (B, C and D Zones as described under ZONE OF USAGE.)

1. Degrease surface as described in Item 2 under A & B Zones.
2. Remove all loose mill scale, rust scale and old paint scale by one of the following methods:
   a. Near white metal blast cleaning — (B Zone) SSPC-SP10 or NACE No. 2.
   b. Commercial blast cleaning — (C Zones) SSPC-SP6 or NACE No. 3.
   c. Brush-off blast cleaning — (C & D Zones) SSPC-SP7 or NACE No. 4.
   d. Power tool cleaning — (D Zone) SSPC-SP3.

When utilized, inhibitive primer should be applied as soon as possible after surface preparation.

D Zone application surface preparation as in above Paragraph 2 (d) must result in a relatively rough surface. If the steel is new and this type of surface preparation does not leave a reasonably rough surface on the steel, then the heavy film system is not recommended.

NOTE: The above specification numbers are from Steel Structure Painting Council Surface Preparation Specifications, 4400 Fifth Ave., Pittsburgh, PA 15213 and National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218.

CONCRETE

A ZONE: All concrete surfaces require whip blasting for immersion service. Fully cured concrete must be blasted to provide a hard, firm and clean surface for coating. All concrete surfaces must be filled and sealed with PLASITE 9028M1 or PLASITE 9028M2 applied in accordance with PLASITE Bulletin 9028. All surface imperfections, "bug holes," etc. must be completely repaired before application of PLASITE 7122.

PLASITE 9028M1 and 9028M2 are NOT recommended for food or potable water service. (When coating system requires food or potable water service, or any service where FDA acceptance is required, refer to PLASITE Bulletin 9029 Concrete Filler-Sealer.)

B ZONE: Severity of expected service will dictate minimum concrete surface preparation. Severe service (strong fumes, spillage, etc.) will probably require A Zone surface preparation and PLASITE 9028M1 or PLASITE 9028M2 filling and sealing before application of PLASITE 7122.

GALVANIZED SURFACE

The surface shall be clean and grease free and properly etched with a standard solution such as GALVAPREP® 5 (as produced by Parker & Amchem) or a phosphating solution. After the surface is properly etched, it should be thoroughly rinsed with water and thoroughly dried prior to the coating application. No inhibitive primer is required providing the galvanized surface is continuous.

ALUMINUM

Surface shall be clean and grease free with a blast produced anchor pattern or "tooth" as described earlier under "STEEL". In addition, the blasted surface shall be given a chemical treatment such as:

ALODINE® 1200S available from
Parker & Amchem
32100 Stephenson Highway
Madison Heights, MI 48071
(800) 521-1355

OR

IRIDITE® 14-2 produced by
Allied-Kelite Division of
Witco Corporation
2701 Lake Street
Melrose Park, IL 60160
(800) 323-9784

For immersion, blasting with sharp grit followed by the chemical surface treatment is required.

NOTE: On metallic surfaces prepared only by chemical etching, the total coating film thickness applied should be restricted to only half the film normally applied to blasted surfaces. This reduced film thickness should be considered during selection of the coating for the service and the type of surface preparation performed.

WOOD, TRANSITE, AND SIMILAR SURFACES

Normally these materials need no surface treatment provided they are free of grease, oil and dirt and they are dry. It is generally recommended that the first coat be diluted one part of recommended PLASITE Thinner to one part of material and brush applied.

EQUIPMENT

SPRAY APPLICATION

1. All spray equipment should be thoroughly cleaned and the hose, in particular, should be free of old paint film and other contaminants.
2. Use standard production-type spray guns:

GUN	FLUID	AIR
DeVilbiss JGA-502	E	704
Binks #18	66-SS	63-PB
Graco PS00	04	02

3. When airless spray equipment is used the recommended liquid pressure is 1500 to 1800 psi with the tip size from .013" to .021". Thinning requirements are more than for conventional spray.

BRUSH APPLICATION

Use a high quality brush.

READ THIS NOTICE!
SAFETY AND MISCELLANEOUS EQUIPMENT

1. For tank lining work, it is recommended that the applicator provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE SOLVENT IN THIS COATING IS FLAMMABLE AND CARE AS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks and open flame and use necessary safety equipment, such as air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms and other enclosed spaces adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

MIXING

The catalyst is in a separate container and measured for the coating unit supplied. Thoroughly mix the pigments. After the pigment and liquid is thoroughly mixed, add the measured liquid catalyst slowly and mix completely with the coating. The coating should stand approximately 30 minutes after the catalyst has been thoroughly mixed.

APPLICATION PROCEDURE

SPRAY GUN

1. Air supply shall be uncontaminated. Adjust air pressure to approximately 50 lbs. at the gun and provide 10 to 15 lbs. of pot pressure. Adjust spray gun first by opening liquid valve and then adjusting air valve to give an 8" to 12" wide spray pattern with best possible atomization.
2. Apply a "mist" bonding pass.
3. Allow to dry approximately one minute but not long enough to allow film to completely dry.
4. Apply crisscross multi-passes, moving gun at fairly rapid rate, maintaining a wet appearing film. Observe the coating surface and, when it appears to be flowing together, you will have an average 4 to 5 mils wet film. By allowing the solvents to flash-off for a few minutes, several more fast multi-passes may be applied until you have a film thickness of approximately 5 to 7 mils (approximately 10 to 12 wet mils).
5. Overcoat Time will vary both with temperature and ventilation. Will require from 8 to 12 hours at 70°F for enclosed spaces. Less time required for exteriors. Remove all overspray by dry brushing or scraping if required.
6. By repeating Step No. 4 a homogeneous film of 12 to 15 mils is obtained.
7. Equipment must be thoroughly cleaned immediately after use with PLASITE thinner to prevent the setting of the coating.

NOTE: Prior to spray application all irregular steel areas, including weld seams should be brush coated with 7122 thinned a minimum of 30% by volume.

BRUSH APPLICATION

1. Apply a very light crisscross brush coat.
2. Allow to dry for approximately 5 minutes.
3. Apply a heavy coat using crisscross brush pattern. "Flow" the coating on rather than try to "brush out."
4. Allow to dry tack free.
5. Repeat Steps 3 and 4 until sufficient film thickness is obtained. Normally a film thickness of 2½ to 3 mils can be obtained per coat by this method.

INSPECTION

Refer to PLASITE Bulletin PA-3, Section 3, for inspection requirements.

PLASITE 7122 SPECIAL FORMULATIONS

7122 HAR: Formulated for added abrasion resistance. Refer to Technical Bulletin 7122 HAR.
7122 TFE: Formulated with fluorocarbon pigments for excellent release and mass flow properties. Same chemical resistance, coverage and application as for standard 7122.

This Bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult with your local sales representative or PLASITE Technical Service Department for further information.

METRIC COMPARISONS

1 mil = .001" = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. x 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

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7122-4

We guarantee our product to be free of defects in material and workmanship and to be in accordance with our company quality control standards. All data, statements and recommendations made herein are based upon information we believe to be reliable but are made without any representation or guarantee or warranty of accuracy and are made with respect to patent rights. Our products are sold on the condition that the user himself will evaluate them as well as our recommendations, to determine their suitability for his own purposes prior to adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of applicable laws or regulations. Liability under any condition shall be limited to replacement of material only. No liability is assumed or implied, for injury to personnel, property damage, product loss or any other expenses incidental to the structure or operation of the plant and equipment where this coating is applied.

High-Density Polyethylene Liner Information

SLT

HyperFlex®
Premium Grade HDPE Lining Material

SLT HyperFlex is uniquely produced from a specially formulated virgin HDPE geomembrane resin. **HyperFlex** has outstanding chemical resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. HyperFlex contains approximately 97.5% polymer and 2.5% carbon black, anti-oxidants and heat stabilizers, and contains no additives, fillers or extenders. **HyperFlex** has excellent resistance to UV radiation and is suitable for exposed conditions.

SMOOTH HDPE

PROPERTY	TEST METHOD	NOMINAL VALUES					
Thickness, mils	ASTM D751/1593/374	30	40	60	80	100	120
Density (g/cc)	ASTM D792/1505	0.944	0.944	0.944	0.944	0.944	0.944
Melt Flow Index (g/10 minutes)	ASTM D1238-E	≤1.0	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0
Tensile Properties Either Direction	ASTM D638 Type IV Dumbell, 2 ipm						
Tensile Strength at Break (lbs/in. width)	Gauge length per	150	200	300	400	500	600
Tensile Strength at Yield (lbs/in. width)	N.S.F. Std. 54	72	96	144	192	240	288
Elongation at Break (percent)		700	800	800	800	800	800
Elongation at Yield (percent)		15	15	15	15	15	15
Tear Resistance Initiation (lbs)	ASTM D1004	25	33	50	66	83	100
Low Temperature Brittleness °F	ASTM D746 B	<-120	<-120	<-120	<-120	<-120	<-120
Dimensional Stability Each Direction (percent)	ASTM D1204 100°C 1 hr.	± 1	± 1	± 1	± 1	± 1	± 1
Volatile Loss (max. percent)	ASTM D1203 Meth. A	0.10	0.10	0.10	0.10	0.10	0.10
Ozone Resistance	ASTM D1149 7 days 100 ppm 104°F	No Cracks	No Cracks	No Cracks	No Cracks	No Cracks	No Cracks
Environmental Stress Crack Resistance (hrs)	ASTM D1693 Cond. B	>2000	>2000	>2000	>2000	>2000	>1500
Puncture Resistance (lbs)	FTMS 101C Method 2065	45	60	90	120	150	180
Water Absorption (percent weight change)	ASTM D570	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Coef. Linear Thermal Expansion 10⁻⁶/°C	ASTM D696	1.2	1.2	1.2	1.2	1.2	1.2
Moisture Vapor Transmission (g/m²day)	ASTM E96	<0.002	<0.001	<0.001	<0.0009	<0.00085	<0.0008
Oxidative Induction Time (minutes) Pure O_2 at 1 Atmosphere	ASTM D3895 200°C	100	100	100	100	100	100
Tensile Impact Strength (ft-lbs/in²)	ASTM D1822	381	381	381	381	381	381
Carbon Black Content (percent)	ASTM D1603	2.5	2.5	2.5	2.5	2.5	2.5
Carbon Black Dispersion	ASTM D3015	A1	A1	A1	A1	A1	A1

SLT HyperFlex is available in 24-foot widths and up to 8,000 lb. rolls. Special length rolls available upon request.

This data is provided for informational purposes only and is not intended as a warranty or guarantee. SLT assumes no liability in connection with the use of this data.

For environmental lining solutions...the world comes to SLT.®

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SLT

SLT North America Inc

FrictionFlex® Textured HyperFlex® Lining Material

SLT's FrictionFlex patented texturing process provides the industry's leading textured liners. Uniquely produced from a specially formulated virgin HDPE geomembrane resin, **FrictionFlex** has outstanding chemical resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. **HyperFlex**, textured with the **FrictionFlex** process, contains approximately 97.5% polymer and 2.5% carbon black, antioxidants and heat stabilizers, and contains no additives, fillers or extenders. SLT textured liners have excellent resistance to UV radiation and are suitable for exposed conditions.

PROPERTY	TEST METHOD	NOMINAL VALUES			
Thickness, mils	ASTM D751/374/1593	40	60	80	100
Density (g/cc)	ASTM D792/1505	0.944	0.944	0.944	0.944
Melt Flow Index (g/10 minutes)	ASTM D1238-E	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0
Tensile Properties Either Direction	ASTM D638 Type IV Dumbell, 2 ipm				
Tensile Strength at Break (lbs/in. width)	Gauge length per	200	300	400	500
Tensile Strength at Yield (lbs/in. width)	N.S.F. Std. 54	96	144	192	240
Elongation at Break (percent)		600	600	600	600
Elongation at Yield (percent)		15	15	15	15
Tear Resistance Initiation (lbs)	ASTM D1004 Die C	33	50	66	83
Low Temperature Brittleness	ASTM D746 B	<-120°F	<-120°F	<-120°F	<-120°F
Dimensional Stability Each Direction (percent)	ASTM D1204 248°F 1 hr.	± 1	± 1	± 1	± 1
Volatile Loss (max. percent)	ASTM D1203 Meth. A	0.10	0.10	0.10	0.10
Ozone Resistance	ASTM D1149 7 days 100 pphm 104°F	No Cracks	No Cracks	No Cracks	No Cracks
Environmental Stress Crack Resistance (hrs)	ASTM D1693 Cond. C	>2000	> 2000	> 2000	> 2000
Puncture Resistance (lbs)	FTMS 101C Method 2065	60	90	120	160
Water Absorption (percent weight change)	ASTM D570	<0.01	<0.01	<0.01	<0.01
Coef. Linear Thermal Expansion 10⁻⁴/°C	ASTM D696	1.2	1.2	1.2	1.2
Moisture Vapor Transmission (g/m²day)	ASTM E96	<0.001	<0.001	<0.0009	<0.00085
Oxidative Induction Time (minutes) Pure O_2 at 1 Atmosphere	ASTM D3895 200°C	100	100	100	100
Tensile Impact Strength (ft-lbs/in²)	ASTM D1822	381	381	381	381
Carbon Black Content (percent)	ASTM D1603	2.5	2.5	2.5	2.5
Carbon Black Dispersion	ASTM D3015	A1	A1	A1	A1

SLT FrictionFlex is available in 24-foot widths and up to 8,000 lb. rolls. Special length rolls and other material thicknesses are available upon request.

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For environmental lining solutions...the world comes to SLT.®

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10-95, SLT

SLT

SLT PolyLock®
Cast-in-Place Component for Embedded Concrete Sealing

SLT PolyLock is an extruded high-density polyethylene profile designed for use as a cast-in-place mechanical anchor for HDPE lining terminations with concrete. In addition to providing a superior juncture, the elimination of anchor bolts, batten strip and gasket materials, PolyLock generally offers a more cost effective assembly. The PolyLock design provides a wide face for lining attachment, ease of installation and rounded corners to reduce stress crack initiation.

Dimensions:	Available in 10-foot lengths Width: 6" Anchor Finger Length: 1-1/2"
Chemical Resistance:	Excellent
Tensile Strength:	> 4,000 lbs/in²
Low Temperature Brittleness:	< -70°F
Resistance to Creep:	Excellent
Puncture Resistance:	Excellent



SLT PolyLock Concrete Embedment Profile

For environmental lining solutions...the world comes to SLT.®

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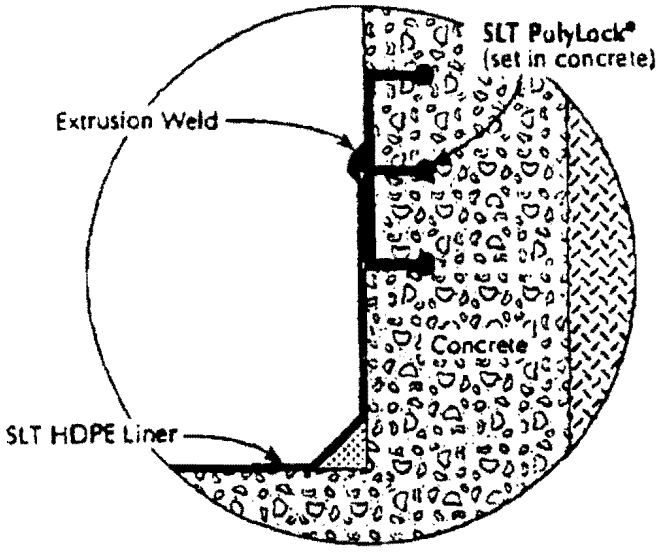
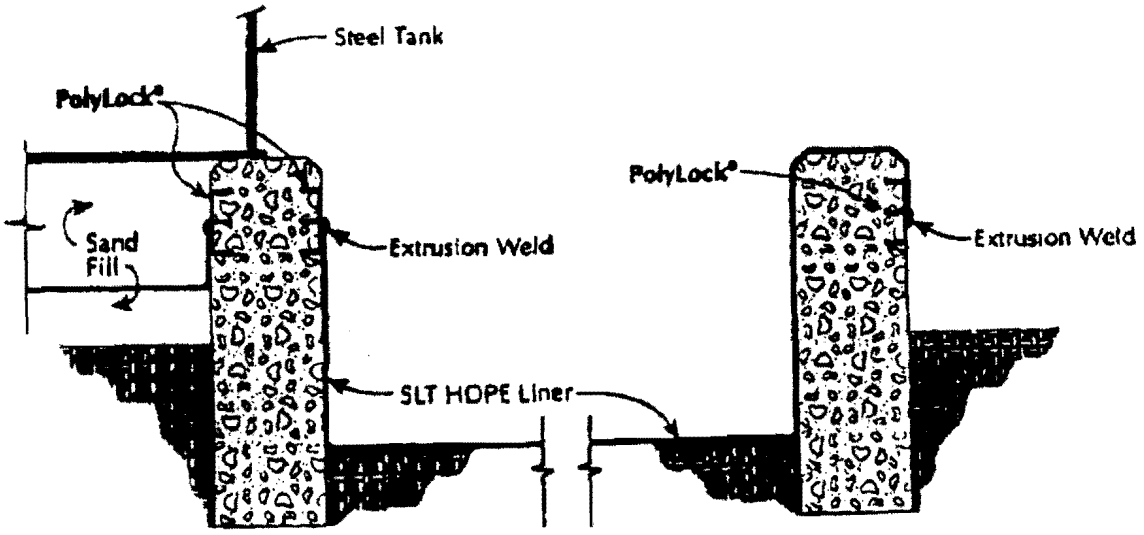
SLT PolyLock®

SLT PolyLock extruded profile is one of a family of geosynthetic products offered by SLT. PolyLock offers a mechanically stable, cost effective attachment to concrete and masonry. The HDPE resin used to manufacture PolyLock exhibits excellent chemical resistance and superior creep resistance. PolyLock can be installed in horizontal or vertical positions for a wide variety of attachments and applications.

SLT is the pioneer in the development and installation of HDPE liners for environmental protection applications. Continuing its tradition of technological leadership, SLT was the first company to develop a concrete embedment for membrane attachment; the first to manufacture the PolyLock extruded profile; and the first to install PolyLock. PolyLock is the first cast-in-place mechanical anchor system for HDPE lining termination with concrete. You can get the original PolyLock technology only from SLT.

Other special products, including extrusions, fabrications and formed items, are available through SLT for specialty applications.





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POLY-FLEX
POLYETHYLENE GEOMEMBRANES

Quality Control & Quality Assurance

7.1.2
Properties Met By Poly•Flex Geomembrane Rolls

Property	Test Method	Typical Value* 20 mil (0.5mm)	30 mil (0.75mm)	40 mil (1.0mm)	60 mil (1.5mm)	80 mil (2.0mm)	100 mil (2.5mm)
Thickness, mils, minimum		18	27	36	54	72	90
Density (g/cc), minimum		0.94	0.94	0.94	0.94	0.94	0.94
Melt Index (g/10 min., maximum)		0.4	0.4	0.4	0.4	0.4	0.4
Carbon Black content (%)		2-3	2-3	2-3	2-3	2-3	2-3
Carbon Black Dispersion		A-1, A-2, B-1	A-1, A-2, B-1	A-1	A-2, B-1	A-1, A-2, B-1	A-1	A-2, B-1	A-1	A-2, B-1
Tensile Properties							
1. Tensile Strength at Yield (pounds/inch width)		50	75	100	150	200	250
2. Tensile Strength at Break (pounds/inch width)		85	125	165	250	330	400
3. Elongation at Yield (%)		13	13	13	13	13	13
4. Elongation at Break (%)		750	750	750	750	750	750
5. Modulus of Elasticity (1% secant; pounds/square inch)		90,000	90,000	90,000	90,000	90,000	90,000
Tear Strength (lbs.)		15	23	31	47	63	79
Puncture Resistance (lbs.)		100	140	180	260	340	420
		40	53	65	90	120	155
Hydrostatic Resistance (lbs./square inch)		165	245	330	495	660	800
Low Temperature Brittleness (°F)		<-94°	<-94°	<-94°	<-94°	<-94°	<-94°
Dimensional Stability (% change max.)		± 1	± 1	± 1	± 1	± 1	± 1
Volatile Loss (%)		0.1	0.1	0.1	0.1	0.1	0.1
Resistance to Soil Burial (% change max. in orig. value)							
A. Tensile Strength at Yield & Break		10	10	10	10	10	10
B. Elongation at Yield & Break		10	10	10	10	10	10
Ozone Resistance		no cracks	no cracks	no cracks	no cracks	no cracks	no cracks
Environmental Stress Crack (hours)		>2000	>2000	>2000	>2000	>2000	>2000
Water Absorption (% change max in original weight)		0.1	0.1	0.1	0.1	0.1	0.1
Coefficient of Linear Thermal Expansion (cm/cm °c) x 10^{-5}		1.2	1.2	1.2	1.2	1.2	1.2
Moisture Vapor Transmission Rate (g/100 in² · day)		0.040	0.030	0.025	0.020	0.018	0.017
Roll Dimensions							
1. Width (feet):		22.5	22.5	22.5	22.5	22.5	22.5
2. Length (feet):		1000	800	600	400	300	250
3. Area (square feet):		22,500	18,000	13,500	9000	6750	5625
4. Weight (pounds), approx.:		2250	2700	2700	2700	2700	2800

* All values, except when specified as minimum or maximum, represent average lot property values.

P.06

Trevira® Spunbond nonwoven engineering products are highly needled fabrics with excellent tensile properties, high filtration potential and outstanding permeability.

Trevira® Spunbond Type 11 products are 100% continuous filament polyester nonwoven needlepunched engineering fabrics. They deliver a combination of advantages unmatched by any other spunbonded geotextiles. They're resistant to freeze-thaw, soil chemicals and ultraviolet light exposure.

Trevira® Spunbond nonwoven engineering fabrics offer excellent performance where the requirement is tensile reinforcement, planar flow, filtration, or separation. They are ideal for roadways, railbeds, drainage systems, lining systems, retaining walls. And much more.

TYPICAL PHYSICAL PROPERTIES OF TREVIRA® TYPE 11 PRODUCTS

Fabric Property	Unit	Test Method	011/120	011/140	011/200	011/250	011/280	011/300	011/400	011/450	011/500
Fabric Weight	oz/yd²	ASTM D-5261	3.5	4.2	6.0	7.5	8.5	10.5	12.4	13.5	16.5
Fabric Thickness, t	mils	ASTM D-5199	80	70	90	110	120	140	165	170	210
Grab Strength (MD/CD)[a]	lbs	ASTM D-4632	120/105	150/125	230/180	300/235	320/260	420/350	475/400	540/450	650/570
Grab Elongation (MD/CD)[a]	%	ASTM D-4632	75/85	75/85	75/85	75/80	75/80	75/80	75/80	80/80	85/85
Trapezoid Tear Strength (MD/CD)[a]	lbs	ASTM D-4533	50/40	55/50	80/75	105/85	110/100	140/125	170/145	180/185	225/200
Puncture Resistance	lbs	ASTM D-4833	55	85	95	115	125	155	170	185	225
Mullen Burst Strength	psi	ASTM D-3786	185	225	330	400	435	580	600	700	855
Water Flow Rate	gpm/ft²	ASTM D-4491	195	190	170	150	130	120	105	100	80
Permittivity, Ψ	sec⁻¹	ASTM D-4491	2.61	2.54	2.27	2.01	1.75	1.6	1.47	1.34	1.07
Permeability, k = Ψt	cm/sec	ASTM D-4491	.40	.45	.52	.58	.53	.57	.62	.58	.57
AOS	Sieve Size mm	ASTM D-4751	70-100 .210-.149	70-100 210-.149	70-100 210-.149	70-100 .210-.149	70-120 210-.125	100-120 149-.125	100-140 149-.106	120-140 125-.106	140-170 106-.088
Standard Roll Widths[b]	ft		12.5 and 15.0								
Standard Roll Lengths[b]	ft		400	400	300	300	300	300	300	300	300

[a] MD = Machine Direction, CD = Cross Machine Direction.

[b] Other widths and length rolls are available upon request.

MINIMUM[1] PHYSICAL PROPERTIES OF TREVIRA® TYPE 11 PRODUCTS

Fabric Property	Unit	Test Method	011/120	011/140	011/200	011/250	011/280	011/300	011/400	011/450	011/500
Fabric Weight	oz/yd²	ASTM D-5261	3.3	4.0	5.7	7.1	8.0	10.0	12.0	13.0	16.0
Fabric Thickness, t	mils	ASTM D-5199	50	55	75	95	105	125	145	150	185
Grab Strength	lbs	ASTM D-4632	90	110	160	210	230	305	350	390	500
Grab Elongation	%	ASTM D-4632	80	80	80	60	80	80	80	65	70
Trapezoid Tear Strength	lbs	ASTM D-4533	30	40	60	75	80	100	120	130	150
Puncture Resistance	lbs	ASTM D-4833	45	50	80	95	100	130	150	155	195
Mullen Burst Strength	psi	ASTM D-3786	170	190	285	360	360	510	550	640	780
Water Flow Rate	gpm/ft²	ASTM D-4491	155	150	130	110	90	80	65	60	40
Permittivity, Ψ	sec⁻¹	ASTM D-4491	2.07	2.01	1.74	1.47	1.20	1.07	0.87	0.80	0.53
Permeability, k = Ψt	cm/sec	ASTM D-4491	.26	.28	.33	.36	.32	.34	.32	.31	.25
AOS	Sieve Size mm	ASTM D-4751	50 .300	50 .300	70 210	70 210	70 210	70 210	70 210	100 149	100 148

[1] These minimum values represent minimum test values as determined from Quality Control (Q.C.) testing.

This information contained herein is offered free of charge, and to our best knowledge, true and accurate, however, all recommendations or suggestions are made without guarantee, since the conditions of use are beyond our control. There is no expressed warranty and no implied warranty of merchantability or of fitness for purpose of the product or products described herein. In submitting this information, no liability is assumed or license or other rights implied given with respect to any existing or pending patent, patent applications or trademarks. The observance of all legal regulations and patents is the responsibility of the user.

9/93

APR-26-95 FRI 6:44

Manufacturer's Information on Perma-Con® Modular Containment System

3.3 All welding shall be performed by welders qualified by the American Welding Society. Welder qualifications shall be submitted with any proposal or supplied material.

3.4 Assembled modular panel containments shall be designed to be sufficiently air-tight and structurally rigid to maintain and withstand a negative pressure of 0.1 inch, water column upon completion of prescribed field erection instructions.

3.5 A seismic strength analysis for the assembled, ordered containment shall be provided using the equivalent static loads prescribed by the Uniform Building Code for the zone that applies to the location where the structure is to be used. Accepted engineering practices supported by test data when appropriate shall be used for this shear strength justification.

3.6 Each stainless steel sheet on a panel shall have the edges offset toward the steel frame. This offset will cause the sheet metal edges to press into the frame when the panel is fastened to the frame. This will preclude the sheathing from exposing raised/sharp edges.

3.7 Each stainless steel sheet panel shall have a 'crossbuck' crease on four foot centers. This crossbuck creasing feature will increase the rigidity of the sheet metal and reduce the possibility of an "oil canning" effect.

3.8 Panel sections shall be secured together using 1/2"dia. x 1" or longer bolted fasteners for primary field erection of modular panels. Fasteners shall comply to ASTM A307-84.

3.9 Carbon steel components shall be factory coated so as to resist rusting and mild acid and caustic wash down. Interior panel joints and seams shall be readily sealed to prevent contamination release after building assembly.

3.10 Materials to be excluded from use in the modular containment design (exclusive of fasteners) include *galvanized materials and other hard to decontaminate materials such as wood, aluminum and polyethylene.*

Large Span Modular Panel Containment Specifications

NFS-Radiation Protection Systems

PERMA-CON TAPE Part No. BA03

Description

Perma-Con Tape is used to cover and seal the small seam that occurs between Perma-Con Panels. The tape provides a smooth air-tight finish to the interior wall and is cosmetically matched to the stainless steel. The tape adhesive is designed to provide secure adhesion yet leave no residue when removed.

Physical Characteristics

Substrate: Poly Vinyl Chloride

Adhesive: Rubber based pressure sensitive

Thickness-- Substrate: .004"--10 mm

Adhesive: .001"--.025 mm

Total: .005"--125 mm

Tensile Strength: 17 lbs., inch width--3.1 kg cm width

Elongation (at break): 140%

Adhesion (to steel): 30 oz. inch width--340 grams cm width

Adhesion (to backing): 30 oz. inch width--340 grams cm width

Moisture Absorption: 1.50%

Moisture Vapor Transmission: 3 grams 100 hrs., (650 cm^2) 24 hrs.

Flame Retardancy: Self-Extinguishing

Tear Resistance: MD.--11 oz. (300 grams) TD--28 oz. (800 grams)

Operating Temperature: 13°F to 176°F--25°C to 80°C

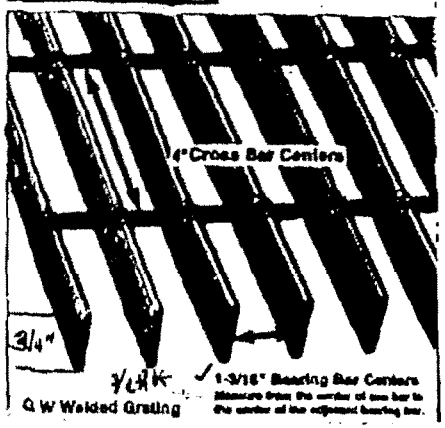
Chemical Characteristics:

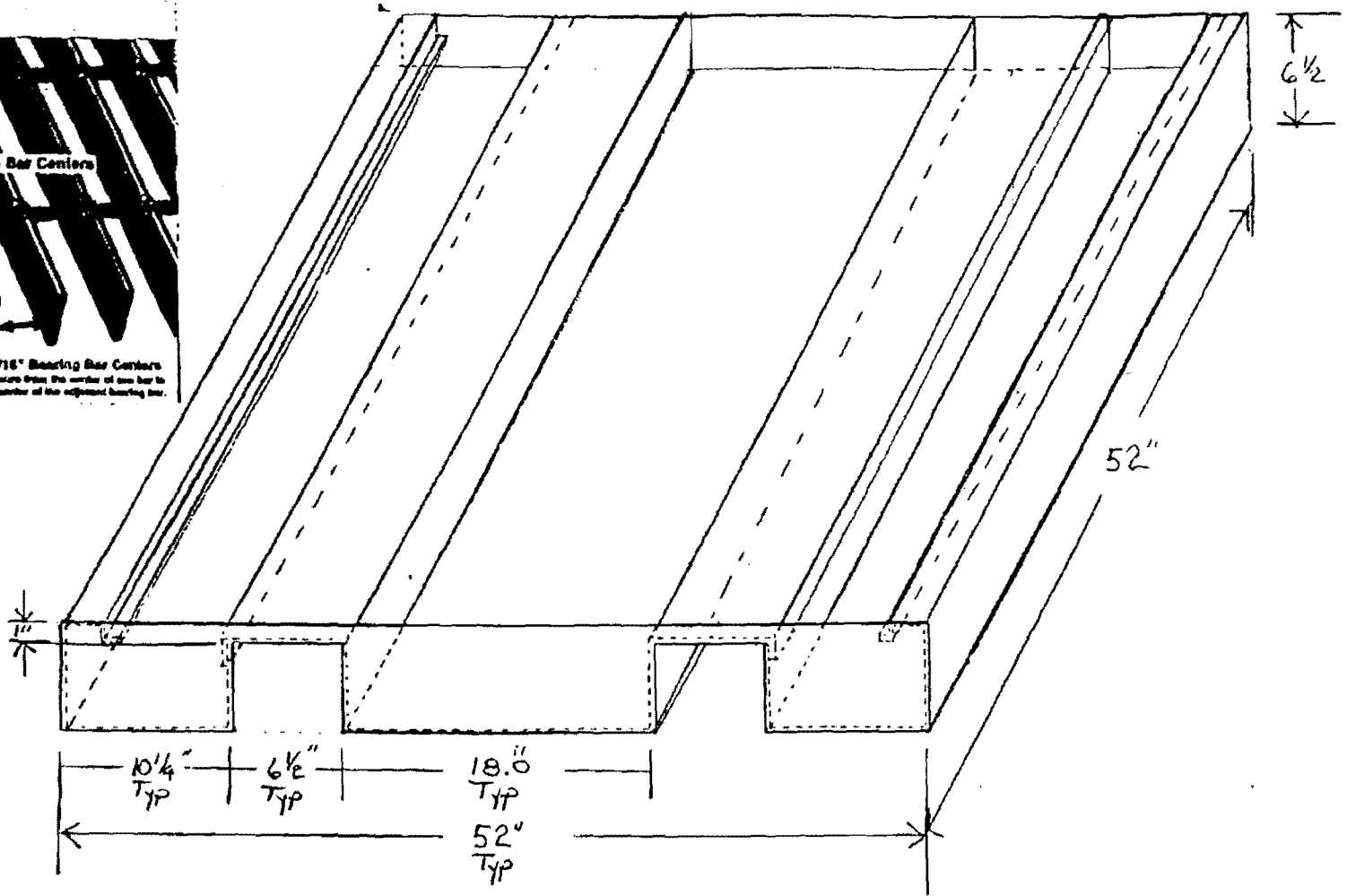
Resistance To:

Sunlight--Excellent; Saltwater--Excellent; Alkalies--Excellent; Alcohols, Water Soluble--Good; Acids Organic & Inorganic--Excellent; Animals & Plant Acids--Excellent; Hydrocarbons, Aliphatic--Fair, Hydrocarbons, Aromatic--Poor; Oils--Excellent; Bacteria--Excellent; Fungus--Excellent

Manufacturer's Information on Metal Pallets and Secondary Containment Pallets

Bar Grating





Notes:
material : 10gA HRS
Finish : urethane White or Black
Bar Grating Finish : Galvanized
Bar Grating To Be Installed on Top of Containment Allet
Volume = 57 gallons

International Metal Pallet Co.

SCALE: N/A	APPROVED BY: Len L. DIRECTOR
DATE: May of 98	
TITLE: Containment Pallet	
REVIEWED BY: Kevin L	DRAWN BY: —
DRAWING NUMBER: No 1290	

XR-5®, Urethane, Copolymer 2000®, and Polyethylene

CHEMICAL COMPATIBILITY GUIDE*

For Ultra-Containment Berms

According to EPA guidelines, spills must be cleaned up within 24 hours and any secondary containment areas must be inspected once a week. The chart below lists chemical compatibility of XR5, Urethane, Copolymer 2000 and Polyethylene. The information has been developed from industry available data and offers compatibility based on exposure of one week or less.

The rating system is indicated as:

A. Fluid has little or no effect at Room Temperature
B. Fluid has minor to moderate effect at Room
C. Fluid has severe effect at Room Temperature

Chemical	XR-5	Urethane	Copolymer 2000	Polyethylene
Kerosene	A	A	A	A
Diesel Fuel	A	A	A	A
Ohio Crude Oil	A	A	A	A
Hydraulic Fluid- Petroleum Based	A	A	A	A
Naptha	A	A	A	A
Conc. Ammonia Hydroxide	A	C	A	A
50% Acetic Acid	C	C	C	A
50% Phosphoric Acid	A	C	A	A
50% Hydrochloric Acid	A	C	A	A
50% Nitric	C	C	C	B
50% Sulfuric Acid	A	C	A	A
60% Sodium Hydroxide	A	C	A	A
Methyl Alcohol	A	A	A	A
JP-4 Jet Fuel	A	A	A	A
Salt Water 180°F	A	B	A	A
Phtlalate Plasticizers	B	A	B	A
SAE-30 Oil	A	A	A	A
Raw Linseed Oil	A	A	A	A

The above ratings were arrived at by visual and physical examination of the membrane samples after their removal from the test chemical. When considering XR-5Ò, Urethane, Copolymer 2000®, Polyethylene for specific applications, it is important to study the requirements such as permeability, service temperature, concentration, size to be contained, etc. Samples of XR-5Ò, Urethane, Copolymer 2000®, or Polyethylene should be tested close to actual service conditions and also your distributor should be consulted.

*IMPORTANT USER NOTICE FOR XR-5Ò, URETHANE, COPOLYMER 2000® & POLYETHYLENE CHEMICAL COMPATIBILITY GUIDE

This listing is offered only as a guide and utilizes information which, to the best of UltraTech's knowledge, is accurate and reliable. Due to variables and conditions of application beyond the control of UltraTech, none of the data shown in this guide is to be construed as a guarantee, expressed or implied. UltraTech International, Inc. assumes no responsibility, obligation or liability in conjunction with the use or misuse of the information herein.

ENPAC CORPORATION

POLY–SPILLPALLET™ 6000

PART NO. 5001
94 GALLON CAPACITY
49.5" X 49.5" X 17" O.D.
40 CFR 264.175

PATENT PENDING

ENPAC CORPORATION
Chardon, Ohio

LIMITED WARRANTY

ENPAC Corporation warrants its products to be free from defects in material and workmanship upon delivery, provided claim is made within 90 days from shipment of product by ENPAC. ENPAC's liability is limited in that ENPAC's sole obligation shall be to repair or replace product that ENPAC determines is defective in material or workmanship. In no event shall ENPAC be liable for indirect, incidental, consequential or special damages arising out of defects in material or workmanship, or arising out of misuse of product, or arising out of delay in or failure of delivery.

* User responsible for chemical compatibility.

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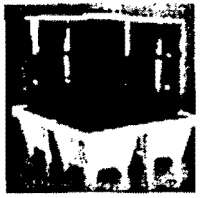

POLY-SPILLPALLET™ 6000

Designed to hold the heavy load.

Rated at 6,000 lbs. UDL weight with a 83-gallon sump capacity that meets EPA 40 CFR 264.175. Square 50" x 50" footprint saves space yet easily holds four 55- gallon drums. Includes the same rugged features as the 2000. Optional drain.

- Two removable grates hold up to 6,000 lbs. of UDL wt.
- Forkliftable from all sides

	Poly-spillpallet 6000
Product no.	5001-YE, 5001-YE-D
Dimensions	50"L x 50"W x 17"H
	127 cm x 127 cm x 43 cm
Weight	88 lbs. /40 kg
Load Bearing Capacity UDL	6000 lbs / 2700 kg
Sump	83 gal. / 315.4 liters
Regulations	EPA 40 CFR 264.175

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Polyethylene Chemical Compatibility Guide

Used in determining the compatibility of our polyethylene products with the chemicals you work with.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

KEY

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L Products should be suitable for prolonged or repeated contact with these substances, under the conditions specified.

S These substances may adversely affect the polyethylene.ENPAC products may be suitable for intermittent contact, however, some deterioration in properties may occur. The use should perform qualification tests before or during usage of the container.

N These substances aggressively attack polyethylene or have vapor pressures incompatible with closed containers. Do not use polyethylene containers in these applications.

A

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Acetaldehyde (40%)	L	Acetaldehyde (40%)	L	Acetamide	L
Acetic Acid (50%)	L	Acetic Acid Anhydride	S	Acetic Ether	S
Acetone	L	Acetylene Tetrabromide	S	Acrylic Emulsions	S
Acrylonitrile	L	Adipic Acid	L	Aliphatic Hydrocarbons (Hexane, Octane, Hexene, Octane, Etc.)	L
Allyl Alcohol (96%)	L	Alum (Aqueous Solutions)	L	Aluminum Chloride (20%)	L
Aluminum Fluoride	L	Aluminum Hydrogen Solution (10%)	L	Aluminum Hydroxide	L
Alums (All Types)	L	Ammonia (Anhydrous)	L	Ammonia (Aqueous)	L
Ammonia (100% Dry Gas)	L	Ammonium Salts	L	Ammonium Acetate	L
Ammonium Bifluoride	L	Ammonium Carbonate 50%	L	Ammonium Chloride	L

Ammonium Hydrogen Fluoride (50%)	L	Ammonium Hydroxide	L	Ammonium Metaphosphate Sat'd	L
Ammonium Nitrate (10%)	L	Ammonium Nitrate Sat'd	L	Ammonium Persulfate Sat'd	L
Ammonium Phosphate	L	Ammonium Sulfate (10%)	L	Ammonium Sulfate Sat'd	L
Ammonium sulfide Sat'd	L	Ammonium Thiocyanate Sat'd	L	Amyl Acetate	L
Amyl Alcohol (100%)	L	Amyl Chloride	N	Aniline (100%)	S
Aniline Hydrochloride	S	Animal Fats	L	Anti-Freeze	L
Antimony Salts	L	Antimony Trichloride 90%	L	Aqua Regia	N
Aqueous Salt Solutions (NaCl)	L	Aqueous Alkalies (NaOH)	L	Arsenic Acid	L
Arsenic Salts	L				

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Barium Salts	L	Barium Carbonate	L	Barium Chloride	L
Barium Cyanide	L	Barium Hydroxide	L	Barium Nitrate	L
Barium Sulfate	L	Barium Sulfide	L	Battery Fluid Acid	S
Beef Tallow Emulsion, Sulfonated	L	Beer	L	Benzaldehyde,	L
Benzene	L	Benzene Sulfonic Acid	S	Benzoic Acid	L
Benzyl Alcohol	L	Benzyl Chloroformate	L	Bismuth Salts	L
Bleach Lye (10%)	S	Black Liquor	L	Borax Cold Sat'd	L
Bonc Acid Dilute	L	Boric Acid Conc.	L	Bromine, Liquid	N
Bromine, Water	N	Bromobenzene	N	Bromoform	N
Butadiene	L	Butane	L	Butanediol (100%)	L
Butanol	L	Butyl Acetate	L	Butyl Alcohol (100%)	L
Butylene	N	Butylene Glycol	L	Butylene, Liquid	N
Butyl Phenol	N	Butyric Acid	L		

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Calcium Carbonate	L	Calcium Chloride	L	Calcium Hydroxide	L
Calcium Hypochlorite	L	Calcium Nitrate (50%)	L	Calcium Sulfate	L
Camphor Oil	N	Carbon Disulfide	N	Carbonic Acid (Aq CO2)	L
Carbon Monoxide	L	Carbon Tetrachloride	N	Castor Oil Conc.	L
Caustic (Aqueous)	L	Caustic Potash Sol (50%)	L	Caustic Soda Sol. (10%).	L
Chloral Hydrate	L	Chloroethanol	L	Chloric Acid (10%)	L

Chloroacetic Acid	L	Chlorobenzene	L	Chloroform	N
Chloromethane	N	Chlorosulfonic Acid 100%	N	Chrome Alum Sat'd	L
Chromic Acid (50%)	S	Cider	L	Citric Acid (All Conc.)	L
Clorox Bleach	L	Coconut Oil Alcohols	L	Cola Concentrates	L
Compressed Air Conditioning Oil	L	Copper Salts	L	Copper Cyanide	L
Copper Nitrate (50%)	L	Copper Sulfate	L	Camphor Oil	N
Cottonseed Oil	L	Cresol (90%)	L	Cresylic Acid	L
Crotonic Aldehyde	L	Cuprous Chloride Sat'd	L	Cyclohexane	L
Cyclohexanol	L	Cyclohexanone	S		

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Detergents, General	L	Developer, Photographic	L	Dextrin Sat'd	L
Dextrose Sat'd	L	Dibutyl Ether	N	Dibutylphthalate	S
Dibutyl Sebacate	S	Dichloroacetic Acid	S	Dichloroacetic Acid, Methyl Ester	S
Dichlorobenzene, Liquid	N	Dichloroethylene	N	Diesel Fuel	S
Diesel Oil	S	Diethyl Carbonate	L	Disodium Phosphate	L
Diazo Salts	L	Diethylene Glycol	L	Dithanolamine	S
Diglycolic Acid (30%)	L	Di-Isobutyl Ketone	S	Dimethylamine	S
Dimethyl Formamide	S	Dinonyl Phthalate	N	Dioctyl Phthalate	N
Dioxane	L	Diphenyl Oxide	N		

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Electrolyte	L	Emulsions, Photographic	L	Ethanol	L
Ether	N	Ethyl Acetate (100%)	S	Ethyl Alcohol	L
Ethyl Butyrate	S	Ethyl Chloride	N	Ethyl Ether	N
Ethylene Chloride	N	Ethylene Chlorohydrin	L	Ethylene Diamine	L
Ethylene Dichloride	N	Ethylene Glycol	L	Ethylene Oxide	N

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Fatty Acids	L	Fatty Alcohol Sulfonate	L	Ferric Salts	L
Ferric Sulfate	L	Ferrous Salts	L	Ferrous Sulfate	L
Fertilizer Salts	L	Fish Solubles	L	Fluoboric Acid	L

Fluosilicic Acid (All Conc.)	L	Formaldehyde (40%)	L	Formamide	L
Formic Acid (All Conc.)	L	Fruit Pulp	L	Fuel Oil	L
Furfural (100%)	L	Furfuryl Alcohol	N		

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Gallic Acid Sat'd	L	Gasoline	L	Gasohol	L
Gelatine	L	Gin	L	Gluconic Acid (All Conc.)	L
Glucose	L	Glycerine	L	Glycol	L
Glycol Ethers	L	Glycolic Acid (All Conc.)	L	Grape Sugar Sat'd Aq	L

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Heptane	L	Hexane	L	Hexanol Tert	L
Hydrazine Hydrate	L	Hydrosulfite (10%)	L	Hydroxylamine Sulfate	L
Hydrozine (35%)	L	Hydrazine Hydrochloride	L	Hydroiodic Acid (All Conc.)	L
Hydrobromic Acid (50%)	L	Hydrocyanic Acid Sat'd	L	Hydrochloric Acid (All Conc.)	L
Hydrofluoric Acid (All Conc.)	L	Hydrofluorisilicic Acid (All Conc.),	L	Hydrogen Bromide (10%)	L
Hydrogen Peroxide (90%)	L	Hydrogen Phosphide 100%	L	Hydroquinone	L
Hydrogen Sulfide	L	Hypochlorous Acid	L		

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Inks	L	Iodine (Alc. Sol.) Conc	L	Iron Salts	L
Iso-Octane	S	Isopropyl Acetate	L	Isopropyl Alcohol	L
Isopropyl Ether	N				

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Jetfuel	S

K

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Kerosene	S

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Lactic Acid (All Conc.)	L	Lanolin	L	Latex	L
Lead Salts	L	Lead Acetate Sat'd	L	Lime	L
Linseed Oil	L	Lithium Salts	L	Lube Oil	L

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Magnesium Salts	L	Magnesium Carbonate	L	Magnesium Hydroxide	L
Magnesium Nitrate	L	Magnesium Oxide	L	Magnesium Sulfate	L
Maleic Acid	L	Malic Acid (1%)	L	Mercuric Salts	L
Mercurous Salts	L	Mercury	L	Methanol	L
Methyl Acetate	L	Methyl Alcohol (100%)	L	Methyl Amine (32%)	L
Methyl Bromide	N	Methyl Chloride	N	Methylene Chloride	N
Methyl Ethyl Ketone	S	Methyl Isobutyl Ketone	S	Methyl Isopropyl Ketone	S
Methyl Sulfate	L	Methyl Sulfuric Acid (All Conc.)	L	Milk	L
Mineral Oils	L	Molasses	L	Monochloroacetic Acid Ethyl Ester	L
Monochloroacetic Acid Methyl Ester	L	Morphalin	L	Mowilith D	L

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Naptha	S	Napthalene	S	Nickel Salts	L
Nicotine, Dilute	L	Nicotinic Acid	L	Nitric Acid <50%	L
Nitrobenzene	S	Nitrotoluene	S		

O

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Octyl Cresol	L	Oils and Fats	L	Oleic Acid (All Conc.)	L
Oleum Conc	N	Olive Oil	L	Orange Extract	L
Oxalic Acid (All Conc.)	L				

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Sodium Nitrate	L	Sodium Oxalate	L	Sodium Persulfate	L
Sodium Phosphate	L	Sodium Silicate	L	Sodium Sulfide	L
Sodium Sulfide	L	Sodium Sulfite	L	Sodium Sulfonates	L
Sodium Thiosulfate	L	Spindle Oil	L	Stannic Salts	L
Stannous Salts	L	Starch Solution Sat'd	L	Stearic Acid (All Conc.)	L
Succinic Acid	L	Sugar Solutions, Glucose, Lactose, Sucrose, Etc.	L	Sulfur	L
Sulfuric Acid (98%)	S	Sulfuric Acid, Fuming	N	Sulfurous Acid	L
Sulfuryl Chloride	N				

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Tallow	L	Tannic Acid	L	Tanning Extracts	L
Tartaric Acid Sat'd	L	Tetrachloroethane	L	Tetrachloroethylene	N
Tetraethyl Lead	L	Tetrahydrufuran	N	Tetrahydronaphthalene	N
Thionyl Chloride	N	Tin Salts	L	Titanium Salts	S
Toluene	S	Toluene Sulfonic Acid (All Conc.)	S	Transformer Oil	L
Tributylphosphate	L	Trichloroacetic Acid	S	Trichloroethane	N
Trichloroethylene,	N	Tricresyl Phosphate	L	Triethanolamine	L
Trioctyl Phosphate	N	Trisodium Phosphate Sat'd	L	Trichloroethylene	N
Turpentine Oil	N				

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Urea	L	Urine	L		

V

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Vegetable Oil	L	Vinegar	L	Vanilla Extract	L

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Wax Alcohol	N	Wetting Agents	L	Whisky	L
White Acid (75%)	L	Wine	L		

X

Xylene N

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Y

Yeast L

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Z

Zinc Salts L Zinc Sulfate L

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ATTACHMENT H

CLOSURE/POST-CLOSURE PLAN
FOR THE TECHNICAL AREA 54
AREA L LANDFILL
(SHAFTS 1, 13-17, AND 19-34 AND IMPOUNDMENTS B AND D)

Closure/Post-Closure Plan for the Technical Area 54 Area L Landfill

(Shafts 1, 13-17, and 19-34 and Impoundments B and D)

LA-UR-02-2304
April 2002

Prepared by:
Los Alamos National Laboratory
Solid Waste and Regulatory Compliance Group (SWRC)
Los Alamos, New Mexico 87545

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
40 CFR	Code of Federal Regulations, Title 40
CMS	RCRA Corrective Measures Study
COC	contaminant(s) of concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ft	feet (foot)
FY	Fiscal Year
LANL	Los Alamos National Laboratory
MDA	material disposal area
NMED	New Mexico Environment Department
NMEID	New Mexico Environmental Improvement Division
OLASO	Office of Los Alamos Site Operations
R	regional aquifer
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	solid waste management unit
SWRC	Solid Waste and Regulatory Compliance Group
TA	technical area
TCA	1,1,1-trichloroethane
VOC	volatile organic compound

CLOSURE/POST-CLOSURE PLAN FOR THE TECHNICAL AREA 54 AREA L LANDFILL (SHAFTS 1, 13-17, AND 19-34 AND IMPOUNDMENTS B AND D)

This closure/post-closure plan describes the activities necessary to achieve closure and post-closure of the Area L landfill at Los Alamos National Laboratory (LANL) Technical Area (TA) 54. The Area L landfill is an "active" unit comprised of Shafts 1, 13-17, and 19-34 and Impoundments B and D because they received hazardous waste after November 19, 1980. Hereinafter, the phrase "Area L landfill" is used to denote the active unit. The Area L landfill is also a "regulated unit," as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 264.90(a)(2), revised June 14, 2000 [6-14-00]. The information provided in this plan is submitted to address the applicable closure and post-closure requirements specified in 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts F and G; and 20.4.1 NMAC § 264.310 [6-14-00].

The Area L landfill is located within the TA-54 Area L treatment and storage facility, which will continue to operate. The Area L landfill will be closed in place without removing the waste and is co-located with land disposal units that comprise solid waste management unit (SWMU) No. 54-006 managed under the LANL corrective action program. The closure and post-closure activities for the Area L landfill will be addressed through alternative requirements, as allowed by 20.4.1 NMAC § 264.110(c), to meet closure and post-closure care requirements. Alternative requirements are discussed further in Sections 1.3 and 3.2. Closure of the landfill will ensure that the existing asphalt cover and wastes and/or waste residues that remain in place are stabilized, as described in Section 2.0 of this plan. The cover will minimize the need for further maintenance and be protective of human health. Post-closure care will include monitoring, maintenance, and reporting, as described in Section 4.0 of this plan. These activities will occur in conjunction with and subject to the investigation and potential remediation efforts of the LANL corrective action program, as allowed by the alternative requirements process. Therefore, the final remedy for the Area L landfill will be part of the corrective measure for Area L as a whole when operations cease and will be implemented in accordance with the Corrective Action Chapter of this permit. An aid in demonstrating the proposed corrective action activities that will meet the applicable post-closure requirements for the regulated unit at Material Disposal Area (MDA) L is presented in Attachment A (MDA L: Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities) of this plan.

A "Closure and Post-Closure Plan for TA-54 Area H and Area L Landfill at Los Alamos National Laboratory" was submitted to the New Mexico Environmental Improvement Division (NMEID, precursor to the New Mexico Environment Department [NMED]) in November 1986 (LANL, 1986). A "Closure Plan for Technical Area 54, Material Disposal Area L" was submitted in March 1998 (LANL, 1998a). This closure/post-closure plan is a revision to the previous plans.

This plan for the Area L landfill is organized as follows:

- General closure information (Section 1.0).
- Specific closure information (Section 2.0).
- General post-closure information (Section 3.0)
- Specific post-closure information (Section 4.0)

Until closure is complete and has been certified in accordance with 20.4.1 NMAC § 264.115 [6-14-00], as discussed in Section 1.7, a copy of the approved closure/post-closure plan and any approved revisions will be on file at LANL's Solid Waste and Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy (DOE) Office of Los Alamos Site Operations (OLASO). Until final closure of the entire LANL facility, a copy of the approved plan will be furnished to the Secretary of the NMED, upon request, in accordance with 20.4.1 NMAC § 264.118(c) [6-14-00].

1.0 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H; and 20.4.1 NMAC § 264.310 [6-14-00], as applicable.

1.1 Partial and Final Closure Activities [20.4.1 NMAC § 264.112(d)]

Partial Resource Conservation and Recovery Act (RCRA) closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. This partial closure will consist of closing the Area L landfill, while leaving the other units at LANL in operation. Partial closure (hereinafter referred to as closure) will be deemed complete when closure in place has been verified, alternative requirements to meet post-closure care requirements have been implemented, the closure certification has been submitted to the NMED, and the NMED has approved the closure.

As described in the proposed General Closure Plan submitted to the NMED in November 2001, final RCRA closure of the entire LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each unit, including all previous partial clean closures as well as land-based units that have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED and the NMED has approved the final closure.

1.2 Closure Performance Standard [20.4.1 NMAC § 264.111]

The Area L landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D) will be closed to meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G and 20.4.1 NMAC § 264.310 [6-14-00].

To meet the above closure performance standards and the closure requirements in 20.4.1 NMAC § 264.310(a), the existing covers on the specified shafts and impoundments that comprise the Area L landfill have been designed and constructed to:

- Minimize migration of liquids through the closed unit
- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the cover
- Accommodate settling and subsidence so that the cover's integrity is maintained, and
- Have a permeability that is less than or equal to the permeability of the natural subsoils present.

1.3 Closure Activities and Alternative Requirements

Closure activities for the Area L landfill will be addressed under alternative requirements, pursuant to 20.4.1 NMAC § 264.118(b)(4). This allowable option is defined in 20.4.1 NMAC § 264.110(c) when a regulated unit is located among other SWMUs, releases potentially originating from both the regulated unit and the SWMU(s) have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. At

Area L, the impoundments and shafts identified as the regulated unit are in close proximity to (i.e., co-located with) similar disposal units (included in SWMU No. 54-006) to be addressed under the LANL corrective action program. A subsurface volatile organic compound (VOC) vapor-phase plume was detected in the vadose zone and has been monitored at MDA L since the mid-1980s. U. S. Environmental Protection Agency (EPA) guidance for the rule (EPA, 1998) discusses the transfer of the closure and post-closure process to the facility corrective action process (contained in the Corrective Action Chapter of this permit) as an appropriate mechanism to address this situation.

Closure of the Area L landfill will ensure that the existing cover and wastes and/or waste residues that remain in place are stabilized, as described in Section 2.0. The cover will minimize the need for further maintenance and be protective of human health.

1.4 Closure Schedule [20.4.1 NMAC § 264.112(b)(6)]

Written closure plans are required for owners and operators of a hazardous waste management facility, pursuant to 20.4.1 NMAC § 264.112(a)(1). In addition, the plan must be submitted with the permit application and approved by the Secretary of the NMED as part of the permit issuance procedures under the Code of Federal Regulations, Title 40 (40 CFR), Part 124.

In accordance with 20.4.1 NMAC § 264.112(d)(1), written notification must be provided to the Secretary of the NMED at least 60 days prior to the date on which final closure of the landfill is expected to begin. Closure will be conducted in accordance with the schedule presented in Table 1. In the event that the closure of the Area L landfill is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC § 264.113(b) [6-14-00].

1.5 Amendment of the Closure Plan [20.4.1 NMAC § 264.112(c)]

In accordance with 20.4.1 NMAC § 264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan
- There is a change in the expected year of closure
- Unexpected events occur during closure that require modification of the approved closure plan
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC §§ 264.90(f) and/or 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

1.6 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00] to provide a cost estimate, financial assurance mechanism, and liability insurance for closure actions.

1.7 Closure Certification [20.4.1 NMAC § 264.115]

Within 60 days after completion of closure activities for the Area L landfill, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC § 264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both the DOE/OLASO and the SWRC Group.

1.8 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the Area L landfill will be maintained by the DOE or another authorized federal agency for as long as necessary to prohibit public access. The security fence at TA-54 will be maintained to ensure that public access into Area L is prevented.

1.9 Closure Report

Upon completion of the closure activities at the Area L landfill, a closure report will be prepared and, upon request, provided to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section 1.7 of this plan
- A general summary of closure activities
- Any significant variance from the approved activities and the reason for the variance
- A summary of any sampling data associated with closure
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data)
- Storage or disposal location of hazardous/mixed waste resulting from closure activities
- A certification of accuracy of the report.

1.10 Survey Plat [20.4.1 NMAC § 264.116]

LANL intends to meet closure/post-closure requirements by implementing alternative requirements allowable under 20.4.1 NMAC § 264.110(c): leaving waste in place; ensuring waste/waste residues are stabilized; and performing the activities described in Sections 3.0 and 4.0. A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. A survey plat indicating the location and dimensions of Shafts 1, 13-17, and 19-34 and Impoundments B and D at MDA L with respect to permanently surveyed benchmarks will be submitted to the local zoning authority (i.e., Los Alamos County) and to the NMED at the time of submission of the certification of closure. The plat will be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority will contain a prominently displayed note, which states the obligation of LANL and DOE to restrict disturbance of the unit in accordance with the applicable regulations in 20.4.1 NMAC, Subpart V, Part 264, Subpart G.

2.0 SPECIFIC CLOSURE INFORMATION

This section provides a general description of TA-54, Area L, and MDA L. It also presents a more detailed description of the Area L regulated unit, as defined in 20.4.1 NMAC § 264.90(a)(2), and includes a discussion of the wastes in and the maximum capacities of the specified shafts and impoundments. In addition, specific closure information for the shafts and impoundments is

presented herein. LANL does not currently intend to reduce the areal extent nor the design capacities of the treatment and storage units at Area L during the active life of those units. The most recent estimated annual quantities for the waste treatment and storage units at Area L are provided in the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0/0.1/1.0/2.0 (LANL, 2001). A description of the geology, hydrology, and groundwater characterization at TA-54, Area L, is presented in Attachment B of this plan. Attachment C of this plan presents information on the nature and extent of releases at MDA L, as well as a brief assessment of present-day risk.

2.1 TA-54 Description

TA-54 is located on top of Mesita del Buey, an east-west trending mesa that is bordered on the north by Cañada del Buey and on the south by Pajarito Canyon. The elevation at TA-54 is approximately 6,800 feet (ft). TA-54 is used primarily for waste management. It includes four MDAs (one each at Areas G, H, J, and L) (Figure 1), hazardous/mixed waste storage and treatment areas, and numerous supporting offices. The Radioassay and Nondestructive Testing Facility is located in the western part of TA-54 (TA-54 West).

2.2 Area L and MDA L Description

Area L is a 2.58-acre site in the north-central portion of TA-54 (Figure 2). The irregularly-shaped area, located on the north side of Mesita del Buey Road, is surrounded by an 8-ft-high chain-link security fence with barbed wire or razor wire at the top. The fence is inspected weekly and repairs made, if necessary. Area L is kept locked at all times, with entrance to the area restricted to authorized and/or escorted personnel. Historically, MDA L was used for disposal of chemical wastes in 34 shafts, 3 impoundments, and 1 pit. MDA L is designated as SWMU No. 54-006. Disposal no longer occurs at MDA L. The surface of Area L is presently used for hazardous waste storage and treatment, and for mixed waste storage.

Near Area L, Cañada del Buey is roughly 100 ft below the north mesa rim, and Pajarito Canyon is approximately 140 ft below the south mesa rim. Runoff at Area L is primarily from sheet flow, which is channeled northward into a drainage that is a tributary of Cañada del Buey. Erosion controls at Area L divert water away from MDA L; these include an asphalt cover, asphalt curbing, and asphalt drainage channels.

The following are descriptions of the subsurface shafts, impoundments, and pit at MDA L. The descriptions were taken from the "RFI Work Plan for Operable Unit 1148" (LANL, 1992a) and the "Closure Report: Technical Area 54 Waste Oil Storage Tanks" (LANL, 1992b).

Between 1975 and 1985, 34 chemical waste disposal shafts at Area L were dry-drilled with an auger into the Bandelier Tuff. The shafts, located at the east and west ends of Area L, have all been capped with concrete and are no longer in use. Backfill was added around some of the shafts, where necessary, and the surface covered with asphalt. Only Shafts 1, 13-17, and 19-34 (Figure 2) received hazardous waste after November 19, 1980, making them subject to regulation under RCRA as active disposal shafts. Therefore, these shafts are subject to RCRA closure standards and are addressed in this plan.

Three unlined impoundments once used for waste treatment and disposal are located at MDA L. These impoundments are located in the north-central region of Area L and are designated from east to west as Impoundments B, C, and D (Figure 2). Only Impoundments B and D received hazardous waste after November 19, 1980. Hence, they are subject to RCRA closure standards and are addressed in this plan. Upon concurrence in 1988 with the NMEID, the impoundments were backfilled and the ground surface was covered with asphalt. Until RCRA closure is complete, these impoundments are considered active. Impoundment C became inactive prior to November 19, 1980, and is therefore subject to the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility Permit, but not closure standards. Impoundment C is currently included in an investigation of Area L by LANL's Environmental Restoration (ER) Project. A container storage dome (TA-54-215) was placed over a portion of the asphalt pad above the impoundments in 1995.

In previous documents, Impoundment C was described as a unit that received hazardous waste after November 19, 1980. Upon further investigation of LANL records, this has been determined to be incorrect. Logbooks of waste management activities indicate that Impoundment C was closed in July 1978. The impoundment is included in SWMU No. 54-006 and is subject to corrective action. Therefore, it is not addressed in this plan.

Pit A is located in the eastern portion of Area L. This unlined disposal pit was used from 1964 to 1978. Pit A became inactive prior to November 19, 1980, and is therefore subject to the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility permit, but not closure standards. It is currently included in an investigation of Area L by LANL's ER Project.

2.2.1 Shafts 1, 13-17, and 19-34

Shafts 1, 13-17, and 19-28 are located at the eastern end of Area L; Shafts 29-34 are located at the northwest end (Figure 2). The dates of use, dimensions, capacities, and waste contents of these shafts are presented in Table 2. Three feet of crushed tuff was placed in the bottom of each shaft to fill cracks and joints in the tuff. When in use, the shafts were covered with a heavy steel cap to prevent inflow of precipitation. The steel cap could be opened or removed, depending on the design, to allow emplacement of waste.

Prior to 1982, liquids were disposed of in drums or other containers without adding sorbents; containers were sometimes dropped into a shaft (LANL, 1992a). Noncontainerized waste was also disposed of in these shafts. After 1981, no noncontainerized wastes were disposed of in the shafts. From November 1982 until February 1985, wastes were accumulated on site and packaged in drums until sufficient quantities had amassed to facilitate subsequent emplacement. The drums were lowered by crane into a shaft through doors in the steel cap and arranged in layers. Layers in 3-ft and 4-ft diameter shafts contain 1 drum, layers in 6-ft diameter shafts contain 4 to 5 drums, and layers in 8-ft diameter shafts contain 6 drums. The space around the drums was filled with crushed tuff, and a 6-inch layer of crushed tuff was placed between each layer of drums. The crushed tuff provides structural support to help prevent failure of drums in the bottom of the shafts (LANL, 1992a). When the use period for these disposal shafts ended, they were backfilled with crushed tuff and approximately the uppermost 3 ft of each shaft was plugged with concrete, which was rounded at the surface to form a dome (LANL, 1986).

2.2.2 Impoundments B and D

Impoundment B was excavated in 1978. It is approximately 60 ft long, 18 ft wide, and 10 ft deep. Impoundment B was used from January 1979 through June 1985. This 7,560-cubic-ft capacity impoundment was used to evaporate batch-treated salt solutions (e.g., ammonium bifluoride) and electroplating wastes (e.g., chromium wastes). The impoundment capacity was calculated assuming it was to be filled to within 3 ft of the surface. The treated aqueous waste was discharged into the impoundment, where it pooled and was left to evaporate. Impoundment B was backfilled with clean fill and later covered with asphalt.

Impoundment D was used to treat small batch quantities of lithium hydride by reacting it with water. The neutralized liquid from this treatment was then allowed to evaporate. This practice, which began in 1972, was discontinued in 1984 for safety reasons. The approximately 75-ft-long, 18-ft-wide, 10-ft-deep impoundment was not used for disposal of any other hazardous wastes. Air

photos indicate that Impoundment D was backfilled with clean fill and covered with asphalt in the late 1980s (LANL, 1992a).

After treatment of lithium hydride was discontinued, a rectangular 5,650-gallon steel waste-oil storage tank was placed in the 9,450-cubic-ft capacity impoundment (LANL, 1992a). The impoundment capacity was calculated assuming it was to be filled to within 3 ft of the surface. A 5,086-gallon waste-oil tanker truck was parked at the surface adjacent to and just west of Impoundment D, and four 771-gallon fiberglass waste-oil storage tanks were stored at the surface adjacent to and just east of the impoundment. When the six waste-oil storage tanks were closed, it was decided that closure would not include removal of any associated contaminated soil; rather, the soil would be addressed during closure and corrective actions at Area L. Prior to backfilling the area with clean fill, a plastic liner was placed on the ground and in the open impoundment (LANL, 1992b). Closure of the tanks was completed by removal in 1990, and a closure report was submitted to the NMED in 1992 (LANL, 1992b).

2.3 Closure Procedures

The Area L landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D) is capped by the existing asphalt cover and the vadose zone is monitored. The wastes and/or waste residues in these specified shafts and impoundments will be closed in place as a landfill. No wastes will be removed at the end of active operations.

2.3.1 Shafts 1, 13-17, and 19-34 Closure Procedures

Historically, when a shaft was filled or when it was determined that a shaft would no longer be used for disposal, it was backfilled with crushed tuff. Concrete was used to plug approximately the uppermost 3 ft of each shaft. The surface of this plug was capped with a concrete dome, which extends approximately 1 ft beyond the shaft circumference. The height of each concrete cap above the surface ranged from 8 to 12 inches. Brass markers were placed in the centers of the domed concrete caps to identify individual shafts. The backfill in the shafts helps to stabilize the wastes in the shafts and accommodate settling and subsidence so that the cap's integrity is maintained, and the existing asphalt (described below) helps to minimize infiltration of precipitation to the closed shafts. The existing asphalt cover over the Area L landfill will be inspected and repaired (as necessary), as described in Section 4.2.1.

At the east end of Area L and near the south fence, between 4 and 8 inches of soil was used to backfill the area around the shafts to bring the surface level to near the top of the shafts. This

resulted in a benched area, over which a nominal 4-inch-thick layer of asphalt was then laid down. Asphalt also covers the sloped area between the benches, as well as the surrounding areas. The asphalt at the eastern end of Area L slopes to the northeast, providing a gradient for surface water runoff to the area's single discharge point through a flume that discharges into a tributary of Cañada del Buey. At the western end of Area L and along the north fence, up to 1.5 ft of soil was used to backfill the area and provide a gently sloping surface. A nominal 4-inch-thick layer of asphalt was then laid down over the backfill and the surrounding areas. Asphalt also covers the sloped areas at the edge of the backfill. The asphalt at the western end of Area L slopes gently to the north, and an asphalt swale surrounding the north side of the backfilled area channels precipitation toward the area's discharge point. The gently sloping asphalt, which also covers the surrounding areas, will help to minimize infiltration of precipitation, as well as function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and have a permeability less than that of the natural subsoils present, in accordance with 20.4.1 NMAC § 264.310(a). In addition, the asphalt provides run-on and runoff control, pursuant to 20.4.1 NMAC § 264.112(b)(5).

2.3.2 Impoundments B and D Closure Procedures

When it was determined that an impoundment would no longer be used for treatment or disposal, it was backfilled with clean fill and later covered with asphalt. Prior to placement of Storage Dome 215, this asphalt layer was broken up and left in place as a base coarse, upon which approximately four ft of clean fill was placed and compacted in lifts and graded. The new clean fill was then covered with an approximate 3-inch-thick asphalt pad. The original backfill helps to stabilize the waste residues in the impoundments, and the subsequent backfill helps to accommodate settling and subsidence so that the asphalt cover's integrity is maintained. The existing asphalt (further described below) helps to minimize infiltration of precipitation to the closed impoundments. The existing asphalt cover over the Area L landfill will be inspected and repaired (as necessary), as described in Section 4.2.1.

The asphalt cover slopes gently to the northeast and channels surface runoff to the area's discharge point. The gently sloping asphalt, which also covers the surrounding areas, will also help to minimize infiltration of precipitation, as well as function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and have a permeability less than that of the natural subsoils present, in accordance with 20.4.1 NMAC § 264.310(a). In addition, the asphalt provides run-on and runoff control, pursuant to 20.4.1 NMAC § 264.112(b)(5).

3.0 GENERAL POST-CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H; and 20.4.1 NMAC § 264.310 [6-14-00], as applicable.

3.1 Closure Performance Standard

Post-closure of the Area L landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D) will meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and N [6-14-00].

After closure, the measures by which LANL will meet the applicable 20.4.1 NMAC § 264.310(b) requirements (or equivalents thereof) are presented in Sections 4.1 and 4.2 of this plan. Post-closure of the landfill will be accomplished under alternative closure requirements, as allowed by 20.4.1 NMAC § 264.110(c) and as discussed in Section 3.2 below, to meet post-closure care requirements.

3.2 Post-Closure Care and Alternative Requirements

In accordance with 20.4.1 NMAC §264.117(a)(1), post-closure care for the Area L landfill will begin after completion of closure of the unit and will continue for 30 years. Post-closure care of the regulated unit under alternative requirements will begin after closure is complete, as described in Section 2.3 of this plan, and closure is certified by LANL and approved by the NMED. The Secretary of the NMED may shorten the post-closure care period at any time preceding partial closure or during the post-closure period if all disposal units at the facility are closed and it is determined that the reduced period is sufficient to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(i). Alternatively, the Secretary of the NMED may extend the post-closure care period if it is determined that the extended period is necessary to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(ii).

Post-closure activities for the Area L landfill will be addressed under alternative requirements, as allowed by 20.4.1 NMAC § 264.118(b)(4). This allowable option is defined in 20.4.1 NMAC §

264.110(c) when a regulated unit is located among SWMUs, releases potentially originating from both the regulated unit and the SWMU(s) have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. At the Area L landfill, the impoundments and shafts identified as the regulated unit are in close proximity to (i.e., co-located with) similar disposal units (SWMU No. 54-006) to be addressed under the LANL corrective action program. A subsurface VOC vapor-phase plume was detected in the vadose zone and has been monitored at MDA L since the mid-1980s. EPA guidance for the rule (EPA, 1998) discusses the transfer of the post-closure process to the facility corrective action process (contained in the Corrective Action Chapter of this permit) as an appropriate mechanism to address this situation. Therefore, some post-closure procedures for the Area L regulated unit will be established as part of the corrective measures to be identified for the ongoing corrective action program at TA-54.

As required by 20.4.1 NMAC § 264.117(a)(1)(i and ii), post-closure care of the Area L landfill will include maintenance, monitoring, and reporting as appropriate and in accordance with the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310, as described in Section 4.0. As described in Section 2.3 of this plan, the landfill is covered by the existing asphalt. The integrity and effectiveness of the cover will be maintained, including conducting inspections and making necessary repairs to correct the effects of settling, erosion, water damage, or other events.

A RCRA Facility Investigation (RFI) is currently ongoing at MDA L. NMED will determine whether a RCRA Corrective Measures Study (CMS) is required, based on the findings of the RFI. Vadose zone monitoring of the Area L landfill will be performed in accordance with the findings of the RFI regarding the current monitoring system. Groundwater monitoring will be developed for TA-54 as an aggregate under the LANL “Hydrogeologic Workplan” (LANL, 1998b) and implemented as appropriate by LANL’s Groundwater Protection Program, as described in Section 4.1.2.

If further corrective measures at the Area L landfill are deemed necessary to protect human health and the environment, they will be analyzed, selected, and implemented during the CMS process according to the requirements of the Corrective Action Chapter of LANL’s renewed Hazardous Waste Facility Permit and the most current and approved Installation Work Plan for the ER Project. The selected corrective measure will include alternative requirements for post-closure of the Area L landfill in a manner that complies with the requirements of 20.4.1 NMAC § 264.110(c)(2), and the selection and implementation must be approved by the NMED as a permit modification.

An aid in demonstrating the proposed corrective action activities that will meet the applicable post-closure requirements for the regulated unit at MDA L is presented in Attachment A of this plan.

3.3 Amendment of the Post-Closure Plan

In accordance with 20.4.1 NMAC § 264.118(d)(1) [6-14-00], LANL may submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan at any time during the active life of the facility or during the post-closure care period. In accordance with 20.4.1 NMAC § 264.118(d)(2) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:

- There are changes in operating plans or facility design that affect the approved post-closure plan
- There is a change in the expected year of final closure, if applicable
- Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan
- LANL requests the Secretary of the NMED to apply alternative requirements (e.g., if corrective action necessitates changes to the closure configuration or the post-closure care requirements) to a regulated unit under 20.4.1 NMAC § 264.90(f) and/or §264.110(c).

The written notification or request will include a copy of the amended post-closure plan for review or approval by the NMED, in accordance with 20.4.1 NMAC § 264.118(d).

LANL will submit a written request for a permit modification at least 60 days prior to the proposed change in unit design or operation, or no later than 60 days after an occurrence of an unexpected event that affects the post-closure plan. The Secretary of the NMED will approve, disapprove, or modify this plan in accordance with the procedures in 40 CFR, Part 124 and 20.4.1 NMAC, Subpart IX, Part 270. The approved post-closure plan will become a permit condition, in accordance with 20.4.1 NMAC § 270.32.

The Secretary of the NMED may request modifications to the plan under the conditions presented in the bulleted items above. LANL will submit the modified plan no later than 60 days after the Secretary's request. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in 40 CFR, Part 124 and 20.4.1 NMAC, Subpart IX, Part 270.

In accordance with 20.4.1 NMAC § 264.119(c), LANL or a subsequent owner or operator may request a modification to the approved post-closure plan to authorize the removal of hazardous wastes and hazardous waste residues or contaminated soils. If a permit modification to conduct such removal activities is granted, the owner or operator may request that the Secretary of the NMED approve the removal of the post-closure notice filed with the County of Los Alamos, other authorized agencies, or the Secretary of the NMED. Alternatively, the owner or operator may provide an additional post-closure notice indicating the removal of the hazardous waste, with approval from the Secretary of the NMED.

3.4 Post-Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00] to provide a cost estimate, financial assurance mechanisms, and liability insurance for post-closure actions.

3.5 Post-Closure Certification [20.4.1 NMAC § 264.120

Within 60 days after completion of the established post-closure care period for the Area L landfill, LANL will submit to the Secretary of the NMED, by registered mail, a certification that the post-closure care period for the unit was performed in accordance with the approved post-closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent, registered professional engineer. Documentation supporting the independent, registered professional engineer's certification will be furnished to the Secretary of the NMED upon request. A copy of the certification and supporting documentation will be maintained by DOE/OLASO. The supporting documentation may include, for example, the following:

- Any significant variance from the approved activities and the reason for the variance
- A summary of all sampling results
- A quality assurance/quality control statement on analytical data validation
- The location of the file of supporting documentation
- Storage or disposal location of hazardous/mixed waste resulting from post-closure activities.

3.6 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the Area L landfill will be under the care of the DOE or another

authorized federal agency during the post-closure care period. The security fence at TA-54 will be maintained during that period to prohibit public access into Area L.

3.7 Survey Plat and Post-Closure Requirements [20.4.1 NMAC § 264.116 and § 264.117 through § 264.120]

As stated in Section 1.10, a survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure. No later than 60 days after certification of closure of the Area L landfill, LANL will submit to the County of Los Alamos and other authorized agencies and to the Secretary of the NMED a record of the type, location, and quantity of hazardous wastes disposed of within the unit. For hazardous wastes disposed of before January 12, 1981, LANL will identify the type, location, and quantity of the hazardous wastes to the best of their knowledge and in accordance with any records that have been kept.

Post-closure care pursuant to 20.4.1 NMAC § 264.117 through § 264.120 [6-14-00] will begin after closure of a disposal unit. Post-closure notices will be filed with appropriate authorities within 60 days of certification of closure of the first disposal unit and within 60 days of certification of closure of the last disposal unit, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE will file a "Land Use Restriction Notice" or equivalent document with the County of Los Alamos and other authorized agencies. The "Land Use Restriction Notice" will indicate that the land has been used to manage hazardous wastes and that its use is restricted under 20.4.1 NMAC, Subpart V, Part 264, Subpart G regulations. It will also indicate that the survey plat and record of the type, location, and quantity of hazardous wastes disposed of have been filed with the County of Los Alamos and other authorized agencies and with the Secretary of the NMED. LANL will also submit a certification, signed by DOE and LANL, that they have recorded the notation specified in 20.4.1 NMAC § 264.119(b)(1), including a copy of the document in which the notation has been placed, to the Secretary of the NMED.

Within 60 days after completion of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00]. Certification of completion of post-closure care is described in Section 3.5.

4.0 SPECIFIC POST-CLOSURE INFORMATION

Pursuant to 20.4.1 NMAC § 264.118(b), the post-closure portion of this plan identifies the activities that will be conducted after closure of the Area L landfill and the frequency of these activities. Post-closure activities for the Area L landfill will be addressed under alternative requirements, pursuant

to 20.4.1 NMAC § 264.118(b)(4). These post-closure activities are described below in Sections 4.1 and 4.2, and include activities that are planned as well as those that may be conducted as a result of the corrective action process.

This section describes these activities, which include monitoring activities and the frequencies at which they will be performed to be consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F, as appropriate, and 20.4.1 NMAC § 264.310 during the post-closure care period, in accordance with 20.4.1 NMAC § 264.118(b)(1). The activities also include maintenance activities and the frequencies at which they will be performed, as required in 20.4.1 NMAC § 264.118(b)(2).

4.1 Monitoring and Frequency

The monitoring activities and the frequencies at which they will be performed, pursuant to 20.4.1 NMAC § 264.118(b)(1), are described to the extent known in the following sections. Monitoring of the vadose zone and groundwater will be conducted as appropriate according to currently existing schedules, pending potential modifications as determined by the RFI/CMS process and/or implementation of LANL's Groundwater Protection Program. The frequency of monitoring for each medium is also discussed.

4.1.1 Vadose Zone

Vadose zone monitoring at MDA L has been ongoing since the mid-1980s. As reported in Appendix C of the "Quarterly Technical Report July-September 2001" (ER Project, 2001), the VOC vapor-phase plume (as represented by 1,1,1-trichloroethane [TCA] screening data) has been measured to be near a steady condition since the first quarter of Fiscal Year (FY) 99. As indicated by the screening results, the 10-parts per million by volume contour remained relatively constant at depth, approximately 650 ft above the regional groundwater table. The report also indicated that the maximum TCA concentrations have been measured to remain relatively steady since FY 99.

As concluded in the "Subsurface Vapor-Phase Transport of TCA at MDA L: Model Predictions" (Stauffer et al., 2000), the observed site data and site numerical modeling results also indicate that, currently, the vapor-phase plume at MDA L is at a near steady condition, both in concentration and size. The authors also concluded that the current location of the vapor-phase plume is not expected to spread any closer to White Rock or to the deep aquifer. In addition, because there is no evidence of liquid migration and it has been determined that saturated flow through the tuff is not a viable transport mechanism, it is not anticipated that VOCs can migrate as liquids to the uppermost aquifer (Stauffer et al., 2000; IT Corporation, 1987). It is predicted that the plume size will begin to

decrease when the contaminant source is depleted (likely before the year 2060), based on estimates of a conservative TCA source. The site numerical model will provide a useful tool in the future to explore the effects of potential corrective measures (e.g., passive venting, optimized passive venting) (Stauffer et al., 2000).

The pore-gas monitoring program has been successful in defining both the nature and extent of the vapor-phase plume at MDA L, as indicated by the agreement of the numerical model with pore-gas and surface flux data. Both the current and future plume growth over the next 50 years are anticipated to be quite small, according to the simulations (e.g., by the year 2050, the simulation results for the 50 parts per million by volume TCA contour show very little lateral growth) (Stauffer et al., 2000). The modeling results indicate that pore-gas monitoring could be performed less frequently than the current quarterly regime, and less frequent monitoring is supported by the recent observations of slowly changing pore-gas concentrations. It is believed that annual monitoring would be sufficient to identify any significant changes in the plume, as demonstrated by the simulation of catastrophic drum failure that predicts that such an event would be captured in the monitoring data for several years. Overall, annual monitoring is believed to be capable of assessing the current rate of plume growth as well as detecting a large perturbation to the system (e.g., a drum failure) (Stauffer et al., 2000).

Although the actual frequency of monitoring is not precisely known at this time, the "RFI Report for Material Disposal Area L at Technical Area 54", which will be submitted to the NMED in 2002, may recommend semi-annual pore-gas monitoring for a 2-year period, followed thereafter with annual pore-gas monitoring. Monitoring and monitoring frequency of the vadose zone will also be addressed under the remaining portions of the corrective action process (e.g., CMS, Corrective Measures Implementation).

4.1.2 Regional Aquifer Groundwater

Five regional aquifer (R) wells are planned for installation in the vicinity of TA-54. These wells include R-16, R-20, R-21, R-22, and R-23. The five wells are included in or associated with Aggregate 2, the boundaries of which were drawn to encompass the SWMUs at TA-54. Well R-22 was installed in the fall of 2000. Currently, well R-21 is planned for completion in FY 02. The remaining wells (R-16, R-20, and R-23) are also planned for completion in FY 02, contingent upon the approval of additional funding requested in April 2002.

The groundwater analytical strategy being implemented at LANL is described herein. The first step in the strategy is installation of a characterization well, followed by collection of water samples from each well screen upon well completion. For single-completion wells, there is no activity for a 3-month period after borehole sampling while the well equilibrates. For multiple-completion wells, no activity occurs for a 6-month period after borehole sampling while the well equilibrates. The second step is collection of initial characterization samples (i.e., the first sampling round) from each well screen and analysis for a full suite of analytes, provided the yield at any screened interval is a sufficient volume for a full analytical suite. Otherwise, the analyses will be prioritized according to suspected contaminants of concern (COC). For each well screen, if compounds and/or radionuclides are not detected in the first sampling round, they will be deleted from the analyte list for the second and third sampling rounds unless the compound or radionuclide is a COC. If compounds and/or radionuclides are detected in the first sampling round, the appropriate well screens will be selected for subsequent sampling based on data needs; the plans for subsequent sampling and analysis will be discussed with the NMED. The third step is conducting the second and third sampling and analysis rounds. The final step is collection of the fourth round of samples from each well screen and analysis for a full suite of analytes.

Upon completion of four sampling rounds at each well installed pursuant to the "Hydrogeologic Workplan" (LANL, 1998b), the well will be incorporated into LANL's Groundwater Protection Program. These wells will be used to enhance the program by serving as monitoring wells and/or providing information to determine potential future locations for additional monitoring wells. The well data will be entered into the well inventory module of the Water Quality Database. This database will be available to LANL and external stakeholders. Data customers (e.g., regulators, LANL personnel, or other stakeholders) can then examine the information and, if appropriate and necessary, request samples, measurements, or other data to be collected from any well. Under the Groundwater Protection Program, all water sampling, water-level measurements, and other testing will be implemented consistent with laws, regulations, and DOE orders, and in consultation with the data customers.

Consistent with the site characterization and following a determination of the need for monitoring, the detection-type monitoring prescribed in 20.4.1 NMAC § 264.98 will be initiated. Detection is defined in 20.4.1 NMAC § 264.91(a)(1) as statistically significant evidence of contamination, as described in 20.4.1 NMAC § 264.98(f). A monitoring system and compliance period as described in Attachment A consistent with 20.4.1 NMAC §§ 264.96 and 264.97 will be utilized. In accordance with 20.4.1 NMAC § 264.98(f), LANL will determine whether there is statistically significant evidence

of contamination for any chemical parameter or hazardous constituent. An appropriate frequency for sample collection and statistical analysis will be proposed to the NMED that will be capable of determining statistically significant evidence of contamination, as required by 20.4.1 NMAC § 264.98(d). Data will be collected that are appropriate for the statistical methodology applied, sufficient in sample size, and utilizing sampling procedures and frequencies of sample collection established by the Groundwater Protection Program to ensure that potential contaminant release(s) to groundwater from the regulated unit can be detected, in accordance with 20.4.1 NMAC § 264.97. For TA-54, the point of compliance is the boundary of Aggregate 2. If a more comprehensive monitoring program is established, as described in Attachment A consistent with 20.4.1 NMAC § 264.99, and an increase in contamination is indicated, a program that takes action to address the increase will be implemented. Descriptions of each proposed activity equivalent to operating unit regulations for groundwater are presented in Attachment A.

4.2 Maintenance and Frequency

Pursuant to 20.4.1 NMAC § 264.118(b)(2), the planned maintenance activities and the frequencies at which they will be performed are discussed in the following sections. Planned maintenance will include inspections at prescribed frequencies and potential resulting maintenance activities consistent with 20.4.1 NMAC § 264.310. The planned maintenance will also ensure the function of the monitoring equipment consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310.

4.2.1 Integrity of Cap/Cover

The existing asphalt cover at the Area L regulated unit will be maintained during post-closure to preserve its integrity and effectiveness in accordance with 20.4.1 NMAC § 264.310(b)(1). Inspections of the existing cover will be conducted monthly while treatment and storage operations continue on the surface, and repairs will be made to the existing cover, if necessary, to correct the effects of settling, subsidence, erosion, or other events. After active operations cease, the asphalt cover will be inspected quarterly, unless changes are necessitated by the outcome of investigations currently being conducted under the corrective action program. Inspection results and subsequent repairs will be noted in the facility record. The final selected corrective measure will be maintained to prevent run-on and runoff from eroding or otherwise damaging the selected measure if waste remains in place, consistent with 20.4.1 NMAC § 264.310(b)(5).

4.2.2 Monitoring Equipment

As discussed in Section 4.1.1, LANL will continue to conduct vadose zone monitoring at MDA L and may modify the existing vadose zone monitoring program based on the results of groundwater transport modeling. Continued vadose zone monitoring will allow early detection of potential contaminant transport toward the regional aquifer. The continued vadose zone monitoring will be conducted in lieu of 20.4.1 NMAC § 264.310(b)(2) and (3) requirements, as allowed by the alternative requirements in 20.4.1 NMAC § 264.110(c). Prior to each sampling event, the protective surface casing of each selected borehole will be inspected to ensure that it has not been damaged. The locking mechanisms at each borehole will be checked to verify that they have not been compromised. Vapor ports will also be inspected to ensure that they are not obstructed and have not degraded or lost their plugs. In addition, vapor port depth tags will be inspected for legibility, as will the identification number on the inside of the borehole. Sampling equipment will also be inspected and tested, as necessary, prior to each sampling event. Over time, the monitoring systems that contain the sampling membranes (e.g., socks) within a borehole may require replacement. If the borehole is in an area where vehicle traffic might pose a hazard, the guard or bumper posts will be inspected to ensure their integrity is maintained. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

The groundwater monitoring system, discussed in Section 4.1.2, will also be maintained to ensure maximum operating conditions, consistent with 20.4.1 NMAC § 264.310(b)(4). Prior to each sampling event, the protective steel casing and locking mechanism(s) will be inspected to ensure that they have not been compromised. The well identification number on the inside and/or outside of the cover will also be inspected for legibility. In addition, the brass monument on the concrete protective pad, placed around the well casing to ensure long-term structural integrity of the well, will be inspected to verify that the location identification number remains clearly imprinted on the monument. If the well is in an area where vehicle traffic might pose a hazard, the guard or bumper posts will be inspected to ensure their integrity is maintained. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

Surveyed benchmarks used in accordance with 20.4.1 NMAC § 264.309 will be protected and maintained throughout the post-closure period, pursuant to 20.4.1 NMAC § 264.310(b)(6). If a benchmark is in an area where vehicle traffic might pose a hazard, guard or bumper posts will be installed to provide protection. The condition of the surveyed benchmarks will be inspected for legibility and to identify any potential maintenance needs. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

4.3 Reporting

Post-closure care will also include reporting consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310, as appropriate.

As described in Attachment A consistent with 20.4.1 NMAC § 264.98, LANL will notify the Secretary of the NMED if, under the detection monitoring program, it is determined [in accordance with 20.4.1 NMAC § 264.98(f)] that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents at any of the Aggregate 2 monitoring wells. This notification will be provided in writing within seven days of the determination. The notification will indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination.

If a more comprehensive monitoring program is established as described in Attachment A consistent with 20.4.1 NMAC § 264.99, LANL will analyze samples from the Aggregate 2 monitoring wells for all 20.4.1 NMAC, Subpart V, Part 264, Appendix IX constituents at least annually, in accordance with 20.4.1 NMAC § 264.99(g). This analysis will be used to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to the procedures in 20.4.1 NMAC § 264.98(f). If LANL finds Appendix IX constituents in the groundwater that are not identified as monitoring constituents in the permit, LANL may resample within one month and repeat the Appendix IX analysis. If the presence of new hazardous constituents is confirmed by the second analysis, LANL will report the concentration of these additional constituents to the Secretary of the NMED within seven days after completion of the second analysis. If LANL decides not to resample, the concentrations of the additional hazardous constituents will be reported to the Secretary of the NMED within seven days after completion of the initial analysis. In either event, these hazardous constituents will be added to the monitoring list.

If a compliance monitoring program is established in accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and LANL determines, pursuant to 20.4.1 NMAC § 264.99(d), that any concentration limits under 20.4.1 NMAC § 264.94 are being exceeded at any of the Aggregate 2 monitoring wells, notification to the Secretary of the NMED will be submitted in writing within seven days. Pursuant to 20.4.1 NMAC § 264.99(h)(1), the notification will indicate which concentration limits have been exceeded.

If a compliance monitoring program is established in accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and LANL determines, pursuant to 20.4.1 NMAC § 264.99(d), that the groundwater concentration limits are being exceeded at any of the Aggregate 2 monitoring wells, LANL may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the groundwater. In this case, LANL will notify the Secretary of the NMED within seven days that a demonstration will be made, in accordance with 20.4.1 NMAC § 264.99(i).

If a groundwater corrective action program is established pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart F, LANL will report in writing to the Secretary of the NMED on the effectiveness of the program. LANL will submit these reports semiannually, in accordance with 20.4.1 NMAC § 264.100(g).

4.4 Post-Closure Use of Property

In accordance with 20.4.1 NMAC § 264.117(c), post-closure use of property on or in which hazardous waste remains after partial or final closure will not be allowed to disturb the integrity of the final cover or any other components of the containment system, if present. In addition, post-closure use of property will not be allowed to disturb the function of the monitoring systems unless the Secretary of the NMED finds that the disturbance is necessary to the proposed use of the property and will not increase the potential hazard to human health or the environment, or it is necessary to reduce a threat to human health or the environment.

4.5 Post-Closure Care Period Contact Office

As required by 20.4.1 NMAC § 264.118(b)(3), the name, address, and phone number of the office to contact about the Area L landfill during the post-closure care period is:

U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
528 35th Street
Los Alamos, New Mexico
87544
505-667-5105

5.0 REFERENCES

EPA, 1998, "Standards Applicable to Owners and Operators of Closed and Closing Hazardous Waste Management Facilities: Post-Closure Permit Requirement and Closure Process; Final Rule," *Federal Register*, pp. 56710-56735.

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LANL, 2001, "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0/0.1/1.0/2.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

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LANL, 1992a, "RFI Work Plan for Operable Unit 1148," LA-UR-92-855, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1992b, "Closure Report: Technical Area 54 Waste Oil Storage Tanks," Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1986, "Closure and Post-Closure Plan for TA-54 Area H and Area L Landfill at Los Alamos National Laboratory," November 1986, Los Alamos National Laboratory, Los Alamos, New Mexico.

Stauffer, P., K. Birdsell, M. Witkowski, T. Cherry, and J. Hopkins, 2000, "Subsurface Vapor-Phase Transport of TCA at MDA L: Model Predictions" LA-UR-00-2080, Los Alamos National Laboratory, Los Alamos, New Mexico.

Table 1

Schedule for Closure Activities at Technical Area 54 Area L Landfill

Activity	Maximum Time Required[a]
Let contract request for proposals	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Approval of closure plan	Day 0
Submit closure certification to the NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously, may not require the maximum time listed, or may require more time than indicated above. Extensions to the schedule may be requested, as needed.

Table 2

Dates of Use, Dimensions, Capacities, and Contents of Shafts 1, 13-17, and 19-34 at Technical Area 54 Area L Landfill

Shaft No.	Start Date of Use	End Date of Use	Depth (feet)	Diameter (feet)	Capacity (cubic feet)	Waste Contents
1	4/80	8/83	60	3	424	Organics
13	6/79	4/82	60	8	3016	Inorganics
14	6/79	4/82	60	3	424	Reactives
15	6/79	4/82	60	3	424	Reactives
16	6/79	4/82	60	3	424	Gas Cylinders
17	6/79	4/82	60	3	424	Organics
19	4/80	4/82	60	8	3016	Waste Oil
20	3/82	8/83	60	3	424	Inorganics
21	3/82	12/85	60	3	424	Gas Cylinders
22	3/82	8/83	60	3	424	Organics
23	4/82	2/84	60	4	754	Waste Oil
24	4/82	3/84	60	4	754	Organics & Waste Oil
25	9/82	4/85	60	6	1696	Inorganics
26	9/82	2/84	60	6	1696	Organics
27	1/83	1/85	60	4	754	Special Waste[a]
28	1/82	4/85	60	4	754	Special Waste
29	12/83	7/84	65	6	1838	Organics
30	12/83	4/84	65	6	1838	Organics
31	12/83	8/84	61	6	1725	Organics
32	3/84	8/84	15	4	188	Organics
33	3/84	1/85	65	6	1838	Organics
34	2/85	4/85	63	6	1781	Organics

[a] Used for miscellaneous wastes requiring greater isolation.

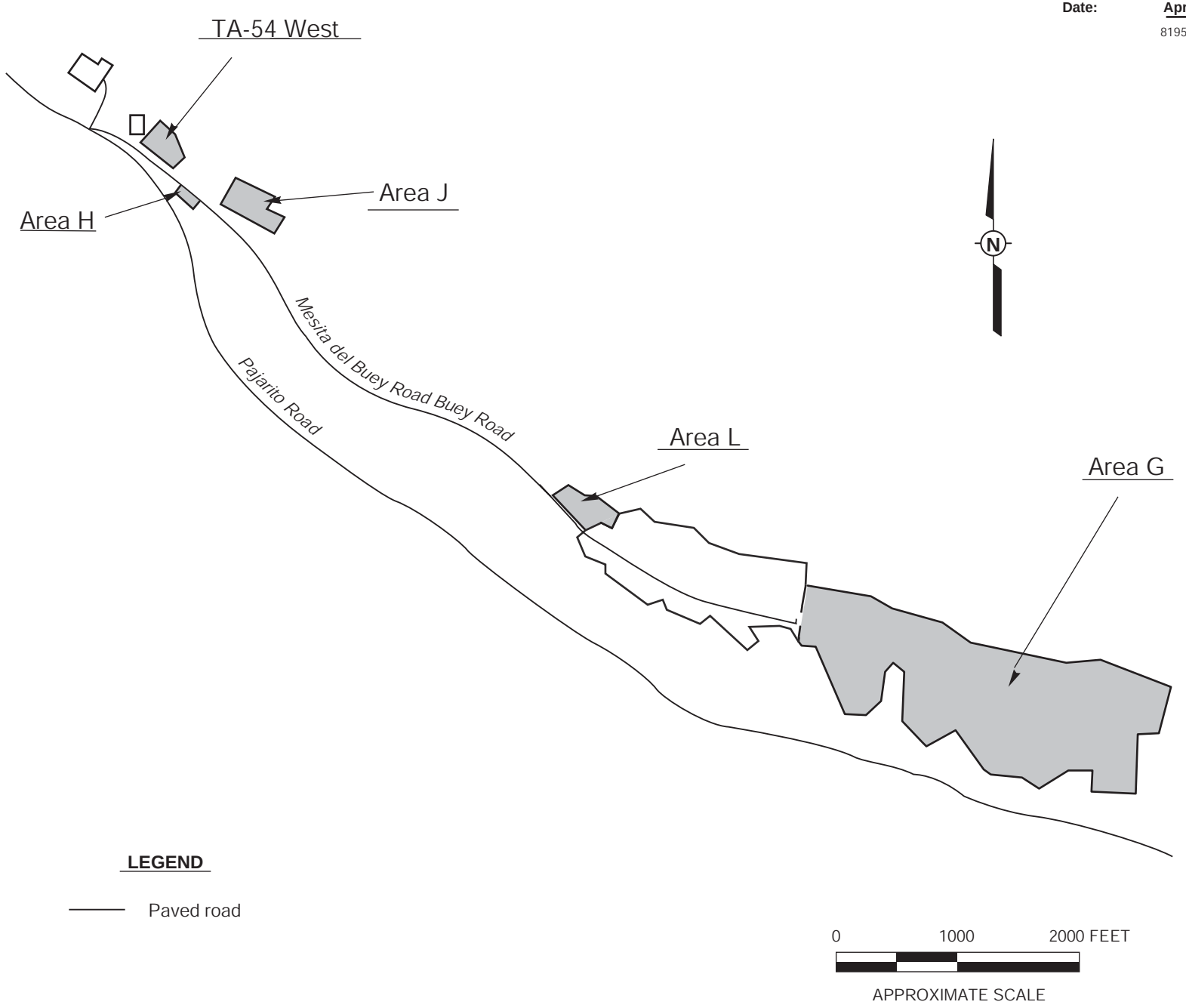

Figure 1
Technical Area (TA) 54 Site Location Map

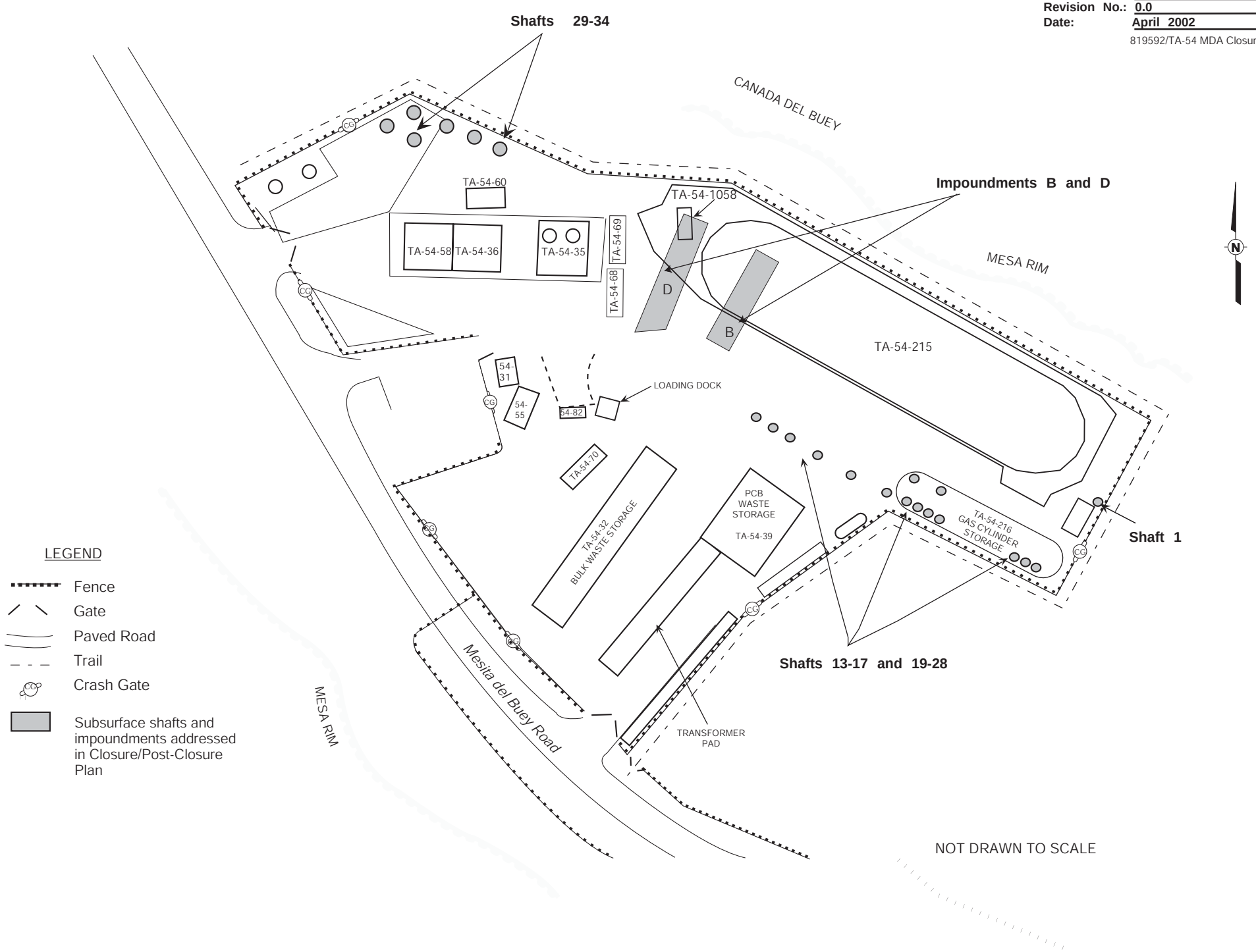

Figure 2
Technical Area (TA) 54, Area L

ATTACHMENT A

MDA L

OPERATING UNIT REGULATIONS FOR GROUND WATER/CLOSURE/POST-CLOSURE CARE AND CORRESPONDING HSWA ACTIVITIES

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90	Applicability		
§264.90(a)(1)	Except as provided in paragraph (b) of this section, the regulations in this subpart apply to owners or operators of facilities that treat, store or dispose of hazardous waste. The owner/operator must satisfy the requirements identified in paragraph (a)(2) of this section for all wastes (or constituents thereof) contained in solid waste management units at the facility, regardless of the time at which waste was placed in such units.		
§264.90(a)(2)	All solid waste management units must comply with the requirements in §264.101. A surface impoundment, waste pile, and land treatment unit or landfill that receives hazardous waste after July 26, 1982 (hereinafter referred to as a "regulated unit") must comply with the requirements of §§264.91 through 264.100 in lieu of §264.101 for purposes of detecting, characterizing and responding to releases to the uppermost aquifer. The financial responsibility requirements of §264.101 apply to regulated units.		
§264.90(b)	The owner/operator's regulated unit or units are not subject to regulation for releases into the uppermost aquifer under this subpart if:		
§264.90(b)(1)	The owner/operator is exempted under §264.1; or	NA	NA
§264.90(b)(2)	He operates a unit which the Secretary finds:	NA	NA
§264.90(b)(2)(i)	Is an engineered structure,	NA	NA
§264.90(b)(2)(ii)	Does not receive or contain liquid waste or waste containing free liquids,	NA	NA
§264.90(b)(2)(iii)	Designed and operated to exclude liquid, precipitation, and other run-on and run-off,	NA	NA
§264.90(b)(2)(iv)	Has inner and outer layers of containment enclosing the waste,	NA	NA
§264.90(b)(2)(v)	Has a leak detection system built into each containment layer,	NA	NA
§264.90(b)(2)(vi)	Continuing operation and maintenance of leak detection systems will be provided during active life and during closure/post-closure care periods, and	NA	NA
§264.90(b)(2)(vii)	To reasonable degree of certainty, will not allow hazardous constituents to migrate beyond outer containment layer prior to end of post-closure care period.	NA	NA
§264.90(b)(3)	The Secretary finds, pursuant to §264.280(d), that the treatment zone of a land treatment unit that qualifies as a regulated unit does not contain levels of hazardous constituents that are above background levels of those constituents by an amount that is statistically significant, and if an unsaturated zone monitoring program meeting the requirements of §264.278 has not shown a statistically significant increase in hazardous constituents below the treatment zone during the operating life of the unit. An exemption under this paragraph can only relieve an owner or operator of responsibility to meet the requirements of this subpart during the post-closure care period; or	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(b)(4)	The Secretary finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and the post-closure care period specified under §264.117. This demonstration must be certified by a qualified geologist or geotechnical engineer. In order to provide an adequate margin of safety in the prediction of potential migration of liquid, the owner or operator must base any predictions made under this paragraph on assumptions that maximize the rate of liquid migration.	Should sufficient information support this exemption for a regulated unit in the future, the HSWA activity would be equivalent to that prescribed by the exemption.	
§264.90(b)(5)	He designs and operates a pile in compliance with §264.250(c).	NA	NA
§264.90(c)	The regulations under this subpart apply during the active life of the regulated unit (including the closure period). After closure of the regulated unit, the regulations in this subpart:		NA
§264.90(c)(1)	Do not apply if all waste, waste residues, contaminated containment system components, and contaminated subsurface soils removed or decontaminated at closure;	For MDA L, a CMS report will be developed and will address this issue. If appropriate, the report will include a general description of an excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure is selected, details will be provided in the approved CMI Plan following permit modification.	
§264.90(c)(2)	Apply during post-closure care period if owner/operator is conducting a detection monitoring program under §264.98; or	The probable corrective measure to be implemented at MDA L will include monitoring in the vadose zone beneath MDA L. The LANL hydrogeologic characterization program (as implemented through the LANL Hydrogeologic Workplan) proposes the locations for characterization wells for TA-54 that after four sampling events will be included in LANL Environmental Surveillance Program, and may, if appropriate, be used as repetitive monitoring wells for TA-54 as a whole.	
§264.90(c)(3)	Apply during compliance period under §264.96 if the owner/operator is conducting a compliance monitoring program under §264.99 or a corrective action program under §264.100.	If monitoring indicates a more comprehensive program is needed to adequately comply with ground water protection standards in 264.91 and 264.92, additional characterization and/or well installation will occur, if appropriate.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(d)	Regulations in this subpart may apply to miscellaneous units when necessary to comply with §§264.601-603.	NA	NA
§264.90(e)	The regulations of this subpart apply to all owners and operators subject to the requirements of 40 CFR 270.1(c)(7), when the Bureau issues either a post-closure permit or an enforceable document (as defined in 40 CFR 270.1(c)(7)) at the facility. When the Bureau issues an enforceable document, references in this subpart to "in the permit" mean "in the enforceable document."	CMS and CMI plans and resulting CMS and CMI reports describing activities equivalent to post-closure permit requirements will be "enforceable documents" consistent with 265.121.	
§264.90(f)	The Secretary may replace all or part of the requirements of §§ 264.91 through 264.100 applying to a regulated unit with alternative requirements for groundwater monitoring and corrective action for releases to groundwater set out in the permit (or in an enforceable document) (as defined in 40 CFR 270.1(c)(7)) where the Secretary determines that:	Activities proposed and implemented in the above referenced plans will be effectively equivalent to the cited Subpart F requirements.	
§264.90(f)(1)	The regulated unit is situated among SWMUs or areas of concern (AOC), a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	As the possibility for this situation exists, alternative activities may appropriately replace all or part of the above cited Subpart F requirements.	
§264.90(f)(2)	It is not necessary to apply the groundwater monitoring and corrective action requirements of §§264.91-100 because alternative requirements will protect human health and the environment.	Should the above situation exist, §264.90(f)(1), alternative activities protective of human health and the environment and proposed in lieu of §264.91-264.100 will preclude the need for application of Subpart F requirements.	
§264.91	Required programs		
§264.91(a)	Owner/operators subject to this subpart must conduct a monitoring and response program as follows:		
§264.91(a)(1)	Whenever hazardous constituents under §264.93 from a regulated unit are detected at a compliance point under §264.95, owner/operator must institute a compliance monitoring program under §264.99. Detection is defined as statistically significant evidence of contamination as described in §264.98(f);	If detection is indicated, additional characterization and/or well installation will occur if appropriate - 264.90(c)(3)	
§264.91(a)(2)	Whenever the groundwater protection standard under §264.92 is exceeded, owner/operator must institute a corrective action program under §264.100. Exceedance is defined as statistically significant evidence of increased contamination as described in §264.99(d);	If detection is indicated, concentrations protective of human health and the environment will be established similar to ground water protection standards in §264.92. Actions necessary to correct any exceedances of such concentrations will be taken as necessary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.91(a)(3)	Whenever hazardous constituents under §264.93 from a regulated unit exceed concentration limits under §264.94 in groundwater between the compliance point under §264.95 and the downgradient facility property boundary, owner/operator must institute a corrective action program under §264.100; or	Should established concentration limits be exceeded between the point of compliance and the downgradient boundary, actions to correct such exceedances will be taken as necessary.	
§264.91(a)(4)	In all other cases, owner/operator must institute a detection monitoring program under §264.98.	TA-54 characterization wells will be sampled and analyzed as repetitive monitoring wells as appropriate through the LANL Environmental Surveillance Program.	
§264.91(b)	The Secretary will specify in the facility permit the specific elements of the monitoring and response program. The Secretary may include one or more of the programs identified in paragraph (a) of this section in the facility permit as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs will be required. In deciding whether to require the owner or operator to be prepared to institute a particular program, the Secretary will consider the potential adverse effects on human health and the environment that might occur before final administrative action on a permit modification application to incorporate such a program could be taken.	See above.	
§264.92	The owner/operator must comply with conditions specified in the facility permit that are designed to ensure that hazardous constituents under §264.93 detected in the ground water from a regulated unit do not exceed the concentration limits under §264.94 in the uppermost aquifer underlying the waste management area beyond the point of compliance under §264.95 during the compliance period under §264.96. The Secretary will establish this ground-water protection standard in the facility permit when hazardous constituents have been detected in the ground water.	Should "detection" consistent with the definition in §264.91(a)(1) occur, LANL will comply with concentration limits established through a process similar to that described in §264.94.	
§264.93	Hazardous constituents		
§264.93(a)	The Secretary will specify in the facility permit the hazardous constituents to which the ground-water protection standard of §264.92 applies. Hazardous constituents are constituents identified in appendix VIII of part 261 of this chapter that have been detected in ground water in the uppermost aquifer underlying a regulated unit and that are reasonably expected to be in or derived from waste contained in a regulated unit, unless the Secretary has excluded them under paragraph (b) of this section.	For any of the following information that is not already available or developed, it will be prepared and included in a manner consistent with §264.93 in corresponding corrective action/HSWA activity documents.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)	The Secretary will exclude an Appendix VIII constituent from the list of hazardous constituents specified in the facility permit if he finds that the constituent is not capable of posing a substantial present or potential hazard to human health or the environment. In deciding whether to grant an exemption, the Secretary will consider the following:	Concentration limits established for hazardous constituents following "detection" will not include those incapable of posing a substantial present or potential hazard to human health or the environment considering the following:	
§264.93(b)(1)	Potential adverse effects on groundwater quality, considering:	Potential adverse effects on groundwater quality considering:	
§264.93(b)(1)(i)	Physical and chemical characteristics of waste in the regulated unit, including its potential for migration;	Detailed information on waste inventory and chemical characteristics for Shafts 1, 13-17, and 19-34 and Impoundments B and D will be presented in the MDA L RFI Report and CMS Report including potential for migration and site conceptual model.	
§264.93(b)(1)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site specific information for MDA L will be presented in the MDA L RFI Report and MDA L CMS Report.	
§264.93(b)(1)(iii)	Quantity of groundwater and the direction of groundwater flow;	Information regarding quantity and direction of flow of groundwater can be obtained through the LANL Hydrogeologic Work Plan.	
§264.93(b)(1)(iv)	Proximity and withdrawal rates of groundwater users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	
§264.93(b)(1)(v)	Current and future uses of groundwater in the area;	Information regarding current and future users of groundwater in the area will be developed.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(1)(vi)	Existing quality of groundwater, including other sources of contamination and their cumulative impact on groundwater quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Workplan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER site characterization efforts.	
§264.93(b)(1)(vii)	Potential health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA L will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Attachment C
§264.93(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA L will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Attachment C
§264.93(b)(1)(ix)	Persistence and permanence of the potential adverse effects; and	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	
§264.93(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	RFI and CMS Reports for MDA L will be developed and will address this issue.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(2)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA L can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, and will be presented in the MDA L RFI and CMS Reports.	
§264.93(b)(2)(iii)	Quantity and quality of groundwater, and the direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	
§264.93(b)(2)(iv)	Rainfall patterns in the region;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)(v)	Proximity of regulated unit to surface waters;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described, will be developed.	
§264.93(b)(2)(vii)	Existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program multi-sector CWA permit, as well as through ER Project characterization activities.	
§264.93(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)(x)	Persistence and permanence of potential adverse effects.	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility, the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	
§264.94	Concentration limits		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(a)	The Secretary will specify in the facility permit the concentration limits in the groundwater for hazardous constituents established under §264.93. The concentration of a hazardous constituent:	Proposed concentration limits of detected hazardous constituents will be consistent with evaluation of parameters set forth in 264.94. To the extent that information necessary to establish provisions of this section do not already exist, they will be developed. Otherwise this information will be found in the previously identified documents.	
§264.94(a)(1)	Must not exceed background level of that constituent in the groundwater at the time that limit is specified in the permit; or	See above.	
§264.94(a)(2)	For any constituent listed in §264.94, Table 1, must not exceed the respective value given in that table if the background level of the constituent is below the value given in Table 1; or	See above.	
§264.94(a)(3)	Must not exceed an alternate limit established by the Secretary under paragraph (b) of this section.	See above.	
§264.94(b)	The Secretary will establish an alternate concentration limit for a hazardous constituent if he finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In establishing alternate concentration limits, the Secretary will consider the following factors:	See above.	
§264.94(b)(1)	Potential adverse effects on groundwater quality, considering:		
§264.94(b)(1)(i)	Physical and chemical characteristics of the waste in the regulated unit, including its potential for migration;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(b)(1)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization in facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site-specific information for MDA L will be found in the MDA L RFI Report and CMS Report.	
§264.94(b)(1)(iii)	Quantity of groundwater and direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(1)(iv)	Proximity and withdrawal rates of groundwater users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	
§264.94(b)(1)(v)	Current and future uses of groundwater in the area;	Information regarding current and future users of groundwater in the area will be developed.	
§264.94(b)(1)(vi)	Existing quality of groundwater, including other sources of contamination and their cumulative impact on groundwater quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Workplan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER Project site characterization efforts.	
§264.94(b)(1)(vii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA L will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA L will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(1)(ix)	Persistence and permanence of potential adverse effects; and	RFI and CMS Reports for MDA L will be developed and will address this issue.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	
§264.94(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(b)(2)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site-specific information for MDA L will be presented in the MDA L RFI Report and CMS Report.	
§264.94(b)(2)(iii)	Quantity and quality of groundwater and direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	
§264.94(b)(2)(iv)	Patterns of rainfall in the region;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(b)(2)(v)	Proximity of regulated unit to surface waters;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described, will be developed.	
§264.94(b)(2)(vii)	Existing surface water quality, including other sources of contamination and their cumulative impact on surface water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program multi-sector CWA permit, as well as through ER Project characterization activities.	
§264.94(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA L will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA L will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(2)(x)	Persistence and permanence of potential adverse effects.	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	
§264.95	Point of compliance	In establishing a point of compliance, the limits of the waste management area can be delineated by circumscribing an imaginary line around more than one unit. The aggregate approach used in the Hydrogeologic Workplan was intended to be consistent with this concept. As characterization efforts progress, the appropriateness of the aggregate boundary for TA-54 will be assessed.	
§264.95(a)	The Secretary will specify in the facility permit the point of compliance at which the groundwater protection standard of §264.92 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.	See above. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the aggregate that extends down into the uppermost aquifer underlying the regulated units.	
§264.95(b)	The waste management area is the limit projected in horizontal plane of the area on which waste will be placed during active life of regulated unit.	See above.	
§264.95(b)(1)	The waste management area includes horizontal space taken up by any liner, dike, or other barrier designed to contain waste in a regulated unit.	NA	
§264.95(b)(2)	If facility contains more than one regulated unit, the waste management area is described by an imaginary line circumscribing the several regulated units.	See above.	
§264.96	Compliance period		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.96(a)	The Secretary will specify in the facility permit the compliance period during which the ground-water protection standard of §264.92 applies. The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting, and the closure period.)	The implementing document for these alternative activities will specify the period during which concentration limits similar groundwater protection standards and will be equivalent to the remaining active life (including closure period) of the waste management area.	
§264.96(b)	The compliance period begins when the owner/operator initiates a compliance monitoring program meeting requirements of §264.99.	This period will begin upon detection as defined in 264.91, and, if a more comprehensive program is needed to adequately address concentration limits, additional characterization and/or monitoring well installation will occur if appropriate.	
§264.96(c)	If the owner/operator is engaged in a corrective action program at the end of the compliance period specified in paragraph (a) of this section, the compliance period is extended until the owner/operator can demonstrate that the ground-water protection standard of § 264.92 has not been exceeded for a period of three consecutive years.	This period will be established for a period of 3 years if, at the end of the active life and closure period, the concentration limits described above continue to be exceeded.	
§264.97	The owner/operator must comply with following requirements for any groundwater monitoring program developed to satisfy §264.98, §264.99, or §264.100:	Alternative requirements will be met there.	
§264.97(a)	The groundwater monitoring system must consist of sufficient number of wells, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that:	All groundwater monitoring wells will be sufficient in number and placed at appropriate locations and depths in the uppermost aquifer as determined by characterization efforts performed during implementation of the Hydrogeologic Workplan.	
§264.97(a)(1)	Represent the quality of background water that has not been affected by leakage from a regulated unit;	Background wells will be placed in an upgradient locations determined to be unaffected by potential releases from the waste management area.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(a)(1)(i)	A determination of background quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:	Should existing conditions preclude the location of background wells upgradient, other wells will be used. These wells will be capable of determining background quality passing the aggregate boundary. This determination will be made in part by ongoing characterization efforts establishing groundwater gradient, flow directions, potential transport mechanisms, and waste-specific migration characteristics.	
§264.97(a)(1)(i)(A)	Hydrogeologic conditions do not allow the owner/operator to determine what wells are hydraulically upgradient; and	See above.	
§264.97(a)(1)(i)(B)	Sampling at other wells will provide an indication of background groundwater quality that is representative or more representative than that provided by the upgradient wells; and	See above.	
§264.97(a)(2)	Represent the quality of groundwater passing the point of compliance.	The above-mentioned geologic, hydrologic, and waste characteristics will be considered in determining the representativeness of the groundwater passing the downgradient aggregate boundary and the monitoring system's capability of detecting contamination if hazardous waste or hazardous constituents migrate from the aggregate to the uppermost aquifer.	
§264.97(a)(3)	Allow for the detection of contamination when hazardous waste or hazardous constituents have migrated from the waste management area to the uppermost aquifer.	See above.	
§264.97(b)	If a facility contains more than one regulated unit, separate groundwater monitoring systems are not required for each unit provided that provisions for sampling the groundwater in the uppermost aquifer will enable detection and measurement at the compliance point of hazardous constituents from the regulated units that have entered groundwater in the uppermost aquifer.	Consistent with establishing a point of compliance by circumscribing an imaginary line around more than one unit, a groundwater monitoring system capable of detecting and measuring hazardous constituents at the aggregate boundary will meet the intent of this requirement.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(c)	All monitoring wells must be cased in a manner that maintains the integrity of the monitoring-well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.	The integrity of the monitoring well borehole will be maintained by casing in a manner most appropriate for the use and surrounding subsurface environment. Screen materials should be selected based on compatibility with geochemistry and long-term structural integrity. Well casing size should be determined based on the size of purging and equipment necessary to sample the well and the depth of the well. Filter pack material should be inert (i.e., silica sand). Gravel filters are acceptable pending sieve analysis. Annular space should be sealed with materials chemically compatiable with the anticipated contaminants and have a permeability one to two orders of magnitude less than the surrounding formation. A cement and bentonite mixture, bentonite chips, or antishrink cement mixtures can be used in the unsaturated zone and below the frost line. The cap should consist of concrete blending into an apron extending at least three feet from the outer edge of the borehole. Remaining annular space should be sealed with expanding cement. A suitable threaded or flanged cap or compression seal should then be placed and locked. A quarter-inch vent hole pipe will allow gas to escape, and bumper guards should be placed around the well to prevent damage by vehicles.	
§264.97(d)	The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results provide a reliable indication of groundwater quality below the waste management area. At a minimum, the program must include procedures and techniques for:	Groundwater sampling and analysis procedures will be in written form and will address the following:	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(d)(1)	Sample collection;	1) Groundwater level measurements will be determined prior to collection of sample in accordance with a written procedure describing level of accuracy, measurement reference points, required equipment decontamination, and time period measured. 2) Water collection will occur in accordance with a written procedure describing sampling devices and procedures for use and decontamination, well evacuation volumes and procedures, field measurements, and appropriate sample container types.	
§264.97(d)(2)	Sample preservation and shipment;	*SW-846* requirements will be followed to ensure appropriate preservation and temperature controls are utilized.	
§264.97(d)(3)	Analytical procedures; and	*SW-846* or other approved analytical methods, holding times, and approved QA/QC analytical procedures will be used.	
§264.97(d)(4)	Chain-of-Custody control.	Chain-of-custody will include: sample number, time, and date; collector's signature; sample type; well identification; number of containers; parameters to be analyzed; signatures of subsequent handlers; inclusive dates of possession; storage temperature at shipment and receipt; and verification of temperature control upon receipt at analytical laboratory.	
§264.97(e)	The groundwater monitoring program must include sampling and analytical methods appropriate for groundwater sampling and that accurately measure hazardous constituents in groundwater samples.	See above.	
§264.97(f)	The groundwater monitoring program must include determination of the groundwater surface elevation each time the water is sampled.	Groundwater levels will be determined each time water is sampled.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(g)	In detection monitoring or where appropriate in compliance monitoring, data on each hazardous constituent specified in the permit will be collected from background wells and wells at the compliance point(s). The number and kinds of samples collected to establish background shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. Sample size shall be as large as necessary to ensure with reasonable confidence that a contaminant release to ground water from a facility will be detected. The owner or operator will determine an appropriate sampling procedure and interval for each hazardous constituent listed in the facility permit which shall be specified in the unit permit upon approval by the Secretary. The sampling procedure shall be:	Data will be collected that are appropriate for the statistical methodology applied, sufficient in sample size, and utilizing sampling procedures and frequencies of sample collection to ensure that potential contaminant release(s) to groundwater from the waste management unit(s) can be detected.	
§264.97(g)(1)	A sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained, by reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants, or	An adequate number of samples will be collected at appropriate frequencies to ensure representativeness considering aquifer and potential contaminant characteristics. Information such as retardation potential for metals and organics and transport time based on groundwater velocity and constituent mobility will be considered in developing the sampling procedure.	
§264.97(g)(2)	An alternate sampling procedure proposed by the owner/operator and approved by the Secretary.	Should an alternative to the sampling procedure described above be more appropriate, it will be proposed.	
§264.97(h)	Owner/operator will specify one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent which will be specified in the unit permit. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. Where practical quantification limits (pql's) are used in any of the following statistical procedures to comply with §264.97(i)(5), the pql must be proposed by the owner or operator and approved by the Secretary. Use of any of the following statistical methods must be protective of human health and the environment and must comply with the performance standards outlined in paragraph (i) of this section.	One of the statistical methods described in §264.97(h) or an alternative approved by the Secretary will be chosen to evaluate groundwater monitoring data. It is premature at this time to prescribe a specific method until adequate characterization has been performed.	
§264.97(h)(1)	A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(h)(2)	An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.	See above.	
§264.97(h)(3)	A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.	See above.	
§264.97(h)(4)	A control chart approach that gives control limits for each constituent.	See above.	
§264.97(h)(5)	Another statistical test method submitted by the owner or operator and approved by the Secretary.	See above.	
§264.97(i)	Any statistical method chosen under §264.97(h) for specification in the unit permit shall comply with the following performance standards, as appropriate:	The appropriate performance standard used for the statistical method applied will be consistent with those prescribed in §264.97(i).	
§264.97(i)(1)	The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.	See above.	
§264.97(i)(2)	If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experimentwise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts.	See above.	
§264.97(i)(3)	If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be proposed by the owner or operator and approved by the Secretary if he or she finds it to be protective of human health and the environment.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(i)(4)	If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be proposed by the owner or operator and approved by the Secretary if it finds these parameters to be protective of human health and the environment. These parameters will be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.	See above.	
§264.97(i)(5)	The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantification limit (pql) approved by the Secretary under §264.97(h) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.	See above.	
§264.97(i)(6)	If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.	See above.	
§264.97(j)	Ground-water monitoring data collected in accordance with paragraph (g) of this section including actual levels of constituents must be maintained in the facility operating record. The Secretary will specify in the permit when the data must be submitted for review.	Groundwater monitoring data obtained will be maintained in the facility records.	
§264.98	An owner/operator required to establish a detection monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Upon completion of adequate characterization through the Hydrogeologic Workplan, and a determination that monitoring would be appropriate, the detection-type monitoring prescribed in §264.98 would be initiated.	
§264.98(a)	The owner/operator must monitor for indicator parameters (e.g., specific conductance, total organic carbon, or total organic halogen), waste constituents, or reaction products that provide a reliable indication of the presence of hazardous constituents in ground water. The Secretary will specify the parameters or constituents to be monitored in the facility permit, after considering the following factors:	As a result of sampling performed during the four events following well installation under the Hydrogeologic Workplan, indicator parameters, waste constituents, or reaction products will be prescribed that consider the following:	
§264.98(a)(1)	The types, quantities, and concentrations of constituents in wastes managed at the regulated unit;	Waste information has been obtained and reviewed, identifying hazardous constituents, concentrations, and waste volumes during the RFI/CMS process.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(a)(2)	The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;	Further refinement of the hydrogeologic regime at TA-54 and the behavior of hazardous constituents in the unsaturated zone will be developed and reported through the Hydrogeologic Workplan activities and the RFI/CMS process. Substantial information regarding these issues has already been provided in the "Hydrogeologic Assessment of Technical Area 54, Areas G and L", the "Performance Assessment and Composite Analysis for Los Alamos National Laboratory Material Disposal Area G", and the "RFI Report for Material Disposal Areas G, H and L at Technical Area 54".	
§264.98(a)(3)	The detectability of indicator parameters, waste constituents, and reaction products in ground water; and	Based on data collected during the four sampling events following well installation under the Hydrogeologic Workplan, detectability of indicator parameters, waste constituents, and reaction products will be established using *SW-846* or Secretary-approved methodologies and detection limits.	
§264.98(a)(4)	The concentrations or values and coefficients of variation of proposed monitoring parameters or constituents in ground-water background values.	Considerations for establishing concentrations and coefficients of varience of background parameters or constituents include: location of the unit, groundwater flow direction, depth to groundwater, appropriate number and location of background wells, available geologic and hydrologic information, drilling methods, well installation details, and sampling data.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(b)	Owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Should it be determined that a groundwater monitoring system will be necessary, installation of this system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary. Vadose zone investigation including delineation of contaminant movement and potential impact can be used to enhance and/or supplement monitoring efforts as an early detection mechanism.	
§264.98(c)	The owner/operator must conduct ground-water monitoring for each chemical parameter and hazardous constituent specified in the permit pursuant to paragraph (a) of this section in accordance with §264.97(g), and maintain a record of ground-water analytical data as measured and in a form necessary for the determination of statistical significance under §264.97(h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance.	
§264.98(d)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine whether there is statistically significant evidence of contamination for any parameter or hazardous constituent specified in the permit under paragraph (a) of this section in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during detection monitoring.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of contamination as described in §264.98(d).	
§264.98(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the upper-most aquifer will be determined and reevaluated annually.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(f)	The owner/operator must determine whether there is statistically significant evidence of contamination for any chemical parameter of hazardous constituent specified in the permit pursuant to paragraph (a) of this section at a frequency specified under paragraph (d) of this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of contamination exists within a reasonable timeframe.	
§264.98(f)(1)	In determining whether statistically significant evidence of contamination exists, the owner/operator must use the method(s) specified in the permit under §264.97(h). These method(s) must compare data collected at the compliance point(s) to the background ground-water quality data.	See above.	
§264.98(f)(2)	The owner/operator must determine whether there is statistically significant evidence of contamination at each monitoring well as the compliance point within a reasonable period of time after completion of sampling. The facility permit will specify what period of time is reasonable, based on the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of ground-water samples.	See above.	
§264.98(g)	If the owner/operator determines pursuant to paragraph (f) of this section that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she must:	If statistically significant evidence of contamination for established chemical parameters or hazardous constituents exists, notification will be made and ground water wells will be sampled for Appendix IX constituents. If present and confirmed with a second analysis within the timeframes described in §264.98(g), these constituents will be used in a more comprehensive monitoring program.	
§264.98(g)(1)	Notify the Secretary of this finding in writing within seven days. The notification must indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination;	See above.	
§264.98(g)(2)	Immediately sample the ground water in all monitoring wells and determine whether constituents in the list of Appendix IX of part 264 are present, and if so, in what concentration.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(3)	For any Appendix IX compounds found in the analysis pursuant to paragraph (g)(2) of this section, resample within one month and repeat the analysis for those compounds detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If groundwater is not resampled for the compounds found pursuant to paragraph (g)(2) of this section, the hazardous constituents found during this initial Appendix IX analysis will form the basis for compliance monitoring.	See above.	
§264.98(g)(4)	Within 90 days, submit to the Secretary an application for a permit modification to establish a compliance monitoring program meeting the requirements of §264.99. The application must include the following information:	Within 90 days, a request for modification of an enforceable document will be submitted to establish a more comprehensive monitoring program. It will include:	
§264.98(g)(4)(i)	An identification of the concentration or any Appendix IX constituent detected in the ground water at each monitoring well at the compliance point;	Appendix IX constituents and associated concentrations confirmed in downgradient aggregate boundary wells;	
§264.98(g)(4)(ii)	Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of §264.99;	Any proposed modifications/enhancements to the existing groundwater monitoring system if necessary:	
§264.98(g)(4)(iii)	Any proposed additions or changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical methods used at the facility necessary to meet the requirements of §264.99;	Any proposed changes to monitoring frequency, sampling and analysis procedures or statistical methods, if necessary to address provisions of the more comprehensive monitoring program.	
§264.98(g)(4)(iv)	For each hazardous constituent detected at the compliance point, a proposed concentration limit under §264.94(a)(1) or (2), or a notice of intent to seek an alternate concentration limit under §264.94(b); and	For hazardous constituents detected (as defined in §264.91(a)(1)), either background concentrations, maximum concentration limits or alternate concentration limits (ACLs) (or the intent to demonstrate ACLs) will be proposed.	
§264.98(g)(5)	Within 180 days, submit to the Secretary:	Within the specified time frame of 180 days, unless an alternative approach is more appropriate, submit to the Secretary the following:	
§264.98(g)(5)(i)	All data necessary to justify an alternate concentration limit sought under §264.94(b); and	Consideration of geologic and hydrologic conditions, waste inventory, receptor location(s), travel time, and degradation mechanisms may be included in the justification.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(5)(ii)	An engineering feasibility plan for a corrective action program necessary to meet the requirement of §264.100, unless:	A feasibility plan for a groundwater corrective action program will be developed during the CMS/CMI process unless:	
§264.98(g)(5)(ii)(A)	All hazardous constituents identified under paragraph (g)(2) of this section are listed in Table 1 of §264.94 and their concentrations do not exceed the respective values given in that Table; or	Concentrations of hazardous constituents are not greater than MCLs; or	
§264.98(g)(5)(ii)(B)	The owner or operator has sought an alternate concentration limit under §264.94(b) for every hazardous constituent identified under paragraph (g)(2) of this section.	An ACL demonstration has been submitted for all constituents found.	
§264.98(g)(6)	If the owner/operator determines that, pursuant to paragraph (f) of this section, there is a statistically significant difference for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he/she demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. The owner/operator may make a demonstration under this paragraph in addition to, or in lieu of, submitting a permit modification application under paragraph (g)(4) of this section; however, owner/operator is not relieved of the requirement to submit a permit modification application within the time specified in paragraph (g)(4) of this section unless the demonstration made under this paragraph successfully shows that a source other than a regulated unit caused the increase, or that the increase resulted from error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.98(g)(6) and monitoring will continue.	
§264.98(g)(6)(i)	Notify the Secretary in writing within seven days of determining statistically significant evidence of contamination at the compliance point that he intends to make a demonstration under this paragraph;	See above.	
§264.98(g)(6)(ii)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation;	See above.	
§264.98(g)(6)(iii)	Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the detection monitoring program facility; and	See above.	
§264.98(g)(6)(iv)	Continue to monitor in accordance with the detection monitoring program established under this section.	See above.	
§264.98(h)	If the owner/operator determines that the detection monitoring program no longer satisfies the requirements of this section, he/she must within 90 days submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99	An owner/operator required to establish a compliance monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituents be "detected" (consistent with §264.91(a)(1)) resulting in the subsequent development of concentration limits consistent with §264.93 and §264.94, a more comprehensive monitoring program will be established that determines compliance with these limits. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	
§264.99(a)	The owner/operator must monitor the ground water to determine whether regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above.	
§264.99(a)(1)	A list of the hazardous constituents identified under §264.93;	See above.	
§264.99(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above.	
§264.99(a)(3)	The compliance point under §264.95;	See above.	
§264.99(a)(4)	The compliance period under §264.96.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(b)	The owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Installation of a more comprehensive monitoring system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary.	
§264.99(c)	The Secretary will specify the sampling procedures and statistical methods appropriate for the constituents and the facility, consistent with §264.97 (g) and (h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance using appropriate sampling procedures and statistical methods.	
§264.99(c)(1)	The owner/operator must conduct a sampling program for each chemical parameter or hazardous constituent in accordance with §264.97(g).	See above.	
§264.99(c)(2)	The owner/operator must record ground-water analytical data as measured and in form necessary for the determination of statistical significance under §264.97(h) for the compliance period of the facility.	See above.	
§264.99(d)	The owner/operator must determine whether there is statistically significant evidence of increased contamination for any chemical parameter or hazardous constituent specified in the permit, pursuant to paragraph (a) of this section, at a frequency specified under paragraph (f) under this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of increased contamination exists within a reasonable timeframe.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(d)(1)	In determining whether statistically significant evidence of increased contamination exists, owner/operator must use the method(s) specified in the permit under §264.97(h). The methods(s) must compare data collected at the compliance point(s) to a concentration limit developed in accordance with §264.94.	See above.	
§264.99(d)(2)	The owner/operator must determine whether there is statistically significant evidence of increased contamination at each monitoring well at the compliance point within a reasonable time period after completion of sampling. The Secretary will specify that time period in the facility permit, after considering the complexity of the statistical test and the availability of analytical laboratories to perform the analysis of ground-water samples.	See above.	
§264.99(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the uppermost aquifer will be determined and reevaluated annually.	
§264.99(f)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine statistically significant evidence of increased contamination in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during the compliance period of the facility.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of increased contamination as described in §264.99(f).	
§264.99(g)	The owner/operator must analyze samples from all monitoring wells at the compliance point for all constituents contained in Appendix IX of part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to procedures in §264.98(f). If the owner/operator finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the owner/operator may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the owner/operator must report the concentration of these additional constituents to the Secretary within seven days after the completion of the second analysis and add them to the monitoring list. If the owner/operator chooses not to resample, then he or she must report the concentrations of these additional constituents to the Secretary within seven days after completion of the initial analysis and add them to the monitoring list.	If annual sampling for all Appendix IX constituents indicates new constituents that are not already addressed statistically exceed background, and resampling within one month confirms this, the Secretary will be notified and the new constituents will be added to the monitoring list.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(h)	If the owner/operator determines pursuant to paragraph (d) of this section that any concentration limits under §264.94 are being exceeded at any monitoring well at the point of compliance, must:	If it has been determined that a statistically significant increase in contamination due to an exceedance of the previously established concentration limits has occurred at the downgradient aggregate boundary, the Secretary will be notified and a modification to the enforceable document requested to establish a corrective action program. It will include the actions necessary to correct the increase in contamination and a plan for a groundwater monitoring program to demonstrate the effectiveness of the action. An analysis of applicable remedial technologies will be performed through the CMS process, and the capabilities of the existing groundwater monitoring system will be assessed. Modifications/enhancements to the existing system will be proposed if necessary.	
§264.99(h)(1)	Notify the Secretary of finding in writing within seven days. The notification must indicate what concentration limits have been exceeded.	See above.	
§264.99(h)(2)	Submit to the Secretary an application for a permit modification to establish a corrective action program meeting the requirements of §264.100 within 180 days, or within 90 days if an engineering feasibility study has been previously submitted to the Secretary under §264.98(h)(5). The application must at a minimum include the following information:	See above.	
§264.99(h)(2)(i)	A detailed description of corrective actions that will achieve compliance with the ground-water protection standard specified in the permit under paragraph (a) of this section; and	See above.	
§264.99(h)(2)(ii)	A plan for a ground-water monitoring program that will demonstrate the effectiveness of the corrective action. Such a ground-water monitoring program may be based on a compliance monitoring program developed to meet the requirements of this section.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(i)	If the owner/operator determines, pursuant to paragraph (d) of this section, that the ground-water concentration limits under this section are being exceeded at any monitoring well at the point of compliance, may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. In making a demonstration under this paragraph, the owner/operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.99(i) and monitoring will continue.	
§264.99(i)(1)	Notify the Secretary in writing within seven days that he intends to make a demonstration under this paragraph;	See above.	
§264.99(i)(2)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the standard to be exceeded or that the apparent noncompliance with the standards resulted from error in sampling, analysis, or evaluation;	See above.	
§264.99(i)(3)	Within 90 days, submit an application for a permit modification to the Secretary to make any appropriate changes to the compliance monitoring program at the facility; and	See above.	
§264.99(i)(4)	Continue to monitor in accord with the compliance monitoring program established under this section.	See above.	
§264.99(j)	If the owner/operator determines that the compliance monitoring program no longer satisfies the requirements of this section, must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	
§264.100	An owner/operator required to establish a corrective action program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituent concentration levels be exceeded, a program that takes action to address the statistically significant increase identified will be established. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(a)	Owner/operator must take corrective action to ensure that regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above.	
§264.100(a)(1)	A list of the hazardous constituents identified under §264.93;	See above.	
§264.100(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above.	
§264.100(a)(3)	The compliance point under §264.95; and	See above.	
§264.100(a)(4)	The compliance period under §264.96.	See above.	
§264.100(b)	The owner/operator must implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance point by removing the hazardous waste constituents or treating them in place. The permit will specify the specific measures that will be taken.	A program will be implemented to prevent hazardous constituent concentration exceedances at the downgradient aggregate boundary that considers: contaminant distribution and mobility, additional characterization and/or monitoring needs (including vadose zone investigation), source term removal, and applicable remedial techniques.	
§264.100(c)	The owner/operator must begin corrective action within a reasonable time period after the ground-water protection standard is exceeded. The Secretary will specify that time period in the facility permit. If a facility permit includes a corrective action program in addition to a compliance monitoring program, the permit will specify when the corrective action will begin and such a requirement will operate in lieu of §264.99(i)(2).	Corrective action will begin within a reasonable time period after hazardous constituent concentration limits have been exceeded and will be conducted pursuant to the requirements established in the above-referenced corrective action program.	
§264.100(d)	In conjunction with a corrective action program, owner/operator must establish and implement a ground-water monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under §264.99 and must be as effective as that program in determining compliance with the ground-water protection standard under §264.92 and in determining the success of a corrective action program under paragraph (e) of this section, where appropriate.	A groundwater monitoring program to demonstrate the effectiveness of the corrective action will be established and implemented. It will be based on considerations identified in the corrective action program and capable of detecting statistically significant exceedances in previously established hazardous constituent concentration limits. Additional monitoring wells may be installed and sampled if necessary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(e)	In addition to the other requirements of this section, owner/operator must conduct a corrective action program to remove or treat in place any hazardous constituents under §264.93 that exceed concentration limits under §264.94 in groundwater:	The corrective action will also address hazardous constituents that exceed the concentration limits between the downgradient aggregate boundary and the downgradient property boundary, and off-site. Removal or in situ treatment of such constituents will occur in a reasonable time period, and, if off site, where necessary to protect human health and the environment. Corrective action can cease once limits are no longer exceeded.	
§264.100(e)(1)	Between the compliance point under §264.95 and the downgradient property boundary; and	See above.	
§264.100(e)(2)	Beyond the facility boundary, where necessary to protect human health and the environment, owner/operator demonstrates to the satisfaction of the Secretary that, despite the owner's or operator's best efforts, the owner or operator was unable to obtain the necessary permission to undertake such action. The owner/operator is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis.	See above.	
§264.100(e)(3)	Corrective action measures under this paragraph must be initiated and completed within a reasonable period of time considering the extent of contamination.	See above.	
§264.100(e)(4)	Corrective action measures under this paragraph may be terminated once the concentration of hazardous constituents under §264.93 is reduced to levels below their respective concentration limits under §264.94.	See above.	
§264.100(f)	The owner/operator must continue corrective action measures during the compliance period to the extent necessary to ensure that the ground-water protection standard is not exceeded. If the owner or operator is conducting corrective action at the end of the compliance period, he must continue that corrective action for as long as necessary to achieve compliance with the ground-water protection standard. Owner/operator may terminate corrective action measures taken beyond the period equal to the active life of the waste management area (including the closure period) if he can demonstrate, based on data from the ground-water monitoring program under paragraph (d) of this section, that the ground-water protection standard of §264.92 has not been exceeded for a period of three consecutive years.	Corrective action measures will continue until hazardous constituent concentration limits are no longer exceeded during the period equivalent to the remaining active life of the waste management area (including closure period). If corrective action is still occurring at the end of this period, it will continue until concentration limits are no longer exceeded for 3 consecutive years.	
§264.100(g)	The owner/operator must report in writing to the Secretary on the effectiveness of the corrective action program. The owner/operator must submit these reports semi-annually.	Semi-annual reports on the effectiveness of the corrective action will be provided to the Secretary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(h)	The owner/operator determines that the corrective action program no longer satisfies the requirements of this section, he must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if it is determined that this program is no longer appropriate.	
§264.110(a)	Sections 264.111 through 264.115 apply to owners/operators of all hazardous waste management facilities.		Sections 1.0 and 2.0
§264.110(b)	Sections 264.116 through 264.120 apply to the owners/operators of:		Sections 3.0 and 4.0
§264.110(b)(1)	All hazardous waste disposal facilities;		Sections 3.0 and 4.0
§264.110(b)(2)	Waste piles and surface impoundments from which the owner/operator intends to remove wastes at closure . . .;		
§264.110(b)(3)	Tank systems that are required . . . to meet the requirements for landfills; and		
§264.110(b)(4)	Containment buildings that are required . . . To meet closure requirements for landfills.		
§264.110(c)	The Secretary may replace all or part of the requirements of this subpart (and the unit-specific standards referenced in §264.111(c) applying to a regulated unit), with alternative requirements set out in a permit or enforceable document, where the Secretary determines that:	The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the closure and post-closure care requirements of 264.111 - 264.120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet closure/post-closure care requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA L once they are approved .	Sections 1.0, 2.0, 3.0, and 4.0
§264.110(c)(1)	The regulated unit is situated among SWMUs or AOCs, a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	MDA L meets the criteria for alternative requirements because the existing land-based unit (Shafts 1, 13-17, and 19-34 and Impoundments B and D) is situated among SWMUs, a release has occurred, and the origin of the release is uncertain.	Sections 1.0 and 3.0, Attachment C
§264.110(c)(2)	It is not necessary to apply the closure requirements of this subpart (and those referenced herein) because the alternative requirements will protect human health and the environment and will satisfy the closure performance standard of §264.111(a) and (b).	The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet applicable closure and post-closure care requirements of §264.111 - 264.120; details will be provided in the CMI Plan.	Sections 1.0 and 3.0

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.111	Closure Performance Standard: Owner/operator must close the facility in a manner that:	For MDA L, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Section 1.2
§264.111(a)	Minimizes the need for further maintenance; and	For MDA L, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Sections 1.0, 2.0, and 3.0
§264.111(b)	Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.	For MDA L, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Sections 1.0, 2.0, and 3.0
§264.111(c)	Complies with the closure requirements of this subpart, including . . . the requirements of . . . 264.310 . . .	See 264.310 regulatory requirement in this table.	
§264.112(a)(1)	Owner/operator of a hazardous waste management facility must have a written closure plan. . . . The plan must be submitted with the permit application . . . and approved by the Secretary as part of the permit issuance procedures . . . In accordance with 270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit.	A closure plan for MDA L is included in this submittal. The closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the closure requirements of 264.111-264.115. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet the closure requirements.	Sections 1.0 and 2.0
§264.112(a)(2)	The Secretary's approval of the plan must ensure that the approved closure plan is consistent with 264.111 through 264.115 and the applicable requirements of Subpart F of this Part, . . . 264.310 . . .. Until final closure is completed and certified in accordance with 264.115, a copy of the approved plan and all approved revisions must be furnished to the Secretary upon request, including requests by mail.	NA	Introduction
§264.112(b)	Closure plan must identify steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least:	NA	Section 1.0
§264.112(b)(1)	A description of how each hazardous waste management unit at the facility will be closed in accordance with §264.111;	NA	Section 2.3

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(2)	A description of how final closure of the facility will be conducted in accordance with §264.111. The description must identify the maximum extent of the operations which will be unclosed during the active life of the facility; and	NA	Section 1.1
§264.112(b)(3)	An estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the type(s) of the off-site hazardous waste management units to be used, if applicable; and	NA	Sections 2.2 and 2.3
§264.112(b)(4)	A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard; and	NA	Section 2.3
§264.112(b)(5)	A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control; and	NA	Section 2.3
§264.112(b)(6)	A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover must be included.)	NA	Section 1.4
§264.112(b)(7)	For facilities that use trust funds to establish financial assurance under §264.143 or §264.145 and that are expected to close prior to the expiration of the permit, an estimate of the expected year of final closure.	NA	Section 1.6

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(8)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d), either the alternative requirements applying to the regulated unit, or a reference to the enforceable document containing those alternative requirements.	The closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet closure requirements. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet closure requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA L once they are approved.	Section 1.3
§264.112(c)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan in accordance with the applicable procedures in Parts 124 and 270. The written notification or request must include a copy of the amended closure plan for review or approval by the Secretary.	NA	Section 1.5
§264.112(c)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the closure plan at any time prior to the notification of partial or final closure of the facility.	NA	Section 1.5
§264.112(c)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:	NA	Section 1.5
§264.112(c)(2)(i)	Changes in operating plans or facility design affect the closure plan, or	NA	Section 1.5
§264.112(c)(2)(ii)	There is a change in the expected year of closure, if applicable, or	NA	Section 1.5
§264.112(c)(2)(iii)	In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan.	NA	Section 1.5
§264.112(c)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or § 264.140(d).	NA	Section 1.5

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(c)(3)	The owner/operator must submit a written request for a permit modification including a copy of the amended closure plan for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the owner or operator must request a permit modification no later than 30 days after the unexpected event. . . . . the Secretary will approve, disapprove, or modify this amended plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit issued.	NA	Section 1.5
§264.112(c)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.112(c)(2). The owner/operator must submit the modified plan within 60 days of the Secretary's request, or within 30 days if the change in facility conditions occurs during partial or final closure. Any modifications requested by the Secretary will be approved in accordance with the procedures in parts 124 and 270.	NA	Section 1.5
§264.112(d)	Notification of partial closure and final closure.		
§264.112(d)(1)	Owner/operator must notify the Secretary in writing at least 60 days prior to the date on which he expects to begin closure of a surface impoundment, waste pile, land treatment or landfill unit, or final closure of a facility with such a unit. . . .	NA	Section 1.4
§264.112(d)(2)	The date when it "expects to begin closure" must be either:		
§264.112(d)(2)(i)	No later than 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional hazardous wastes, no later than one year after the date on which the unit received the most recent volume of hazardous wastes. If the owner/operator of a hazardous waste management unit can demonstrate to the Secretary that the hazardous waste management unit or facility has the capacity to receive additional hazardous wastes and it has taken all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit; or	NA	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(d)(2)(ii)	For units meeting the requirements of §264.113(d), no later than 30 days after the date on which the hazardous waste management unit receives the known final volume of non-hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional non-hazardous wastes, no later than one year after the date on which the unit received the most recent volume of non-hazardous wastes. If the owner/operator can demonstrate to the Secretary that the hazardous waste management unit has the capacity to receive additional non-hazardous wastes and it has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit.	NA	
§264.112(d)(3)	If the facility's permit is terminated, or if the facility is otherwise ordered, by judicial decree or final order under section 3008 of RCRA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the owner/operator must close the facility in accordance with the deadlines established in §264.113.	NA	
§264.112(e)	Nothing in this section shall preclude the owner/operator from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure.	NA	NA
§264.113	Closure; Time allowed for closure		
§264.113(a)	Within 90 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner/operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at a hazardous waste management unit or facility, the owner/operator must treat, remove from the unit or facility, or dispose of on-site, all hazardous wastes in accordance with the approved closure plan. The Secretary may approve a longer period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	NA	NA
§264.113(a)(1)(i)	The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; or	NA	NA
§264.113(a)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	NA	NA
§264.113(a)(1)(ii)(B)	There is a reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	NA	NA
§264.113(a)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(a)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements.	NA	NA
§264.113(b)	The owner/operator must complete partial and final closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner or operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at the hazardous waste management unit or facility. The Secretary may approve an extension to the closure period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	NA	NA
§264.113(b)(1)(i)	The partial or final closure activities will, of necessity, take longer than 180 days to complete; or	NA	NA
§264.113(b)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	NA	NA
§264.113(b)(1)(ii)(B)	There is reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	NA	NA
§264.113(b)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	NA	NA
§264.113(b)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit or facility, including compliance with all applicable permit requirements.	NA	NA
§264.113(c)	The demonstrations referred to in paragraphs (a)(1) and (b)(1) of this section must be made as follows:		
§264.113(c)(1)	The demonstrations in paragraph (a)(1) of this section must be made at least 30 days prior to the expiration of the 90-day period in paragraph (a) of this section; and	NA	NA
§264.113(c)(2)	The demonstration in paragraph (b)(1) of this section must be made at least 30 days prior to the expiration of the 180-day period in paragraph (b) of this section, unless the owner/operator is otherwise subject to the deadlines in paragraph (d) of this section.	NA	NA
§264.113(d)	The Secretary may allow an owner/operator to receive only non-hazardous wastes in a landfill, land treatment, or surface impoundment unit after the final receipt of hazardous wastes at that unit if:	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(d)(1)	The owner or operator requests a permit modification in compliance with all applicable requirements in parts 270 and 124 of this title and in the permit modification request demonstrates that:	NA	NA
§264.113(d)(1)(i)	The unit has the existing design capacity as indicated on the part A application to receive non-hazardous wastes; and	NA	NA
§264.113(d)(1)(ii)	There is a reasonable likelihood that the owner or operator or another person will receive non-hazardous wastes in the unit within one year after the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(1)(iii)	The non-hazardous wastes will not be incompatible with any remaining wastes in the unit, or with the facility design and operating requirements of the unit or facility under this part; and	NA	NA
§264.113(d)(1)(iv)	Closure of the hazardous waste management unit would be incompatible with continued operation of the unit or facility; and	NA	NA
§264.113(d)(1)(v)	The owner or operator is operating and will continue to operate in compliance with all applicable permit requirements; and	NA	NA
§264.113(d)(2)	The request to modify the permit includes an amended waste analysis plan, ground-water monitoring and response program, human exposure assessment required under RCRA section 3019, and closure and post-closure plans, and updated cost estimates and demonstrations of financial assurance for closure and post-closure care as necessary and appropriate, to reflect any changes due to the presence of hazardous constituents in the non-hazardous wastes, and changes in closure activities, including the expected year of closure if applicable under § 264.112(b)(7), as a result of the receipt of non-hazardous wastes following the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(3)	The request to modify the permit includes revisions, as necessary and appropriate, to affected conditions of the permit to account for the receipt of non-hazardous wastes following receipt of the final volume of hazardous wastes; and	NA	NA
§264.113(d)(4)	The request to modify the permit and the demonstrations referred to in paragraphs (d)(1) and (d)(2) of this section are submitted to the Secretary no later than 120 days prior to the date on which the owner/operator of the facility receives the known final volume of hazardous wastes at the unit, or no later than 90 days after the effective date of this rule in the state in which the unit is located, whichever is later.	NA	NA
§264.113(e)	Requirements for the owner/operator of a hazardous waste surface impoundment that is not in compliance with the liner and leachate collection system requirements.	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.114	During the partial and final closure periods, all contaminated equipment, structures and soils must be properly disposed of or decontaminated unless otherwise specified in §§ 264.197, 264.228, 264.258, 264.280 or § 264.310. By removing any hazardous wastes or hazardous constituents during partial and final closure, the owner/operator may become a generator of hazardous waste and must handle that waste in accordance with all applicable requirements of part 262 of this chapter.	NA	NA
§264.115	Within 60 days of completion of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill unit, and within 60 days of the completion of final closure, the owner/operator must submit to the Secretary, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for closure under §264.143(i).	NA	Section 1.7
§264.116	No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary, a survey plat indicating the location and dimensions of landfills cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable Subpart G regulations.	NA	Section 1.10
§264.117	Post-closure care and use of property		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(a)(1)	Post-closure care for each hazardous waste management unit subject to the requirements of §§ 264.117 through 264.120 must begin after completion of closure of the unit and continue for 30 years after that date and must consist of at least the following:	A post-closure plan for MDA L is included in this submittal. The post-closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	Section 3.2
§264.117(a)(1)(i)	Monitoring and reporting in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	Sections 4.1 and 4.3
§264.117(a)(1)(ii)	Maintenance and monitoring of waste containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part.	See above.	Sections 4.1 and 4.2
§264.117(a)(2)	Any time preceding partial closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period for a particular unit, the Secretary may, in accordance with the permit modification procedures in parts 124 and 270:		
§264.117(a)(2)(i)	Shorten the post-closure care period applicable to the hazardous waste management unit, or facility, if all disposal units have been closed, if he finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or ground-water monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit or facility is secure); or	NA	Section 3.2
§264.117(a)(2)(ii)	Extend the post-closure care period applicable to the hazardous waste management unit or facility if he finds that the extended period is necessary to protect human health and the environment (e.g., leachate or ground-water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment).	NA	Section 3.2

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(b)	The Secretary may require, at partial and final closure, continuation of any of the security requirements of §264.14 during part or all of the post-closure period when:	NA	Section 3.6
§264.117(b)(1)	Hazardous wastes may remain exposed after completion of partial or final closure; or	NA	Section 3.6
§264.117(b)(2)	Access by the public or domestic livestock may pose a hazard to human health.	NA	Section 3.6
§264.117(c)	Post-closure use of property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the facility's monitoring systems, unless the Secretary finds that the disturbance:	NA	Section 4.4
§264.117(c)(1)	Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or	NA	Section 4.4
§264.117(c)(2)	Is necessary to reduce a threat to human health or the environment.	NA	Section 4.4
§264.117(d)	All post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in §264.118.	The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	Section 3.2
§264.118	Post-Closure Plan, Amendment of Plan		
§264.118(a)	The owner/operator of a hazardous waste disposal unit must have a written post-closure plan. . . . The plan must be submitted with the permit application, . . . , and approved by the Secretary as part of the permit issuance procedures under Part 124 of this chapter. In accordance with §270.32 of this chapter, the approved post-closure plan will become a condition of any RCRA permit issued.	A post-closure plan for MDA L is included in this submittal. The post-closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	Introduction, Sections 3.0 and 4.0
§264.118(b)	For each hazardous waste management unit subject to the requirements of this section, the post-closure plan must identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least:	See above.	Section 4.0

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(b)(1)	A description of the planned monitoring activities and frequencies at which they will be performed to comply with subparts F, K, L, M, N, and X of this part during the post-closure care period; and	See above.	Section 4.1
§264.118(b)(2)	A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure:	See above.	Section 4.2
§264.118(b)(2)(i)	The integrity of the cap and final cover or other containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	See above.	Section 4.2.1
§264.118(b)(2)(ii)	The function of the monitoring equipment in accordance with the requirements of subparts, F, K, L, M, N, and X of this part; and	See above.	Section 4.2.2
§264.118(b)(3)	The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure care period.		Section 4.5
§264.118(b)(4)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §§264.90(f), 264.110(c), and/or §§264.140(d), either the alternative requirements that apply to the regulated unit, or a reference to the enforceable document containing those requirements.		Section 3.2
§264.118(c)	Until final closure of the facility, a copy of the approved post-closure plan must be furnished to the Secretary upon request, including request by mail. After final closure has been certified, the person or office specified in §264.188(b)(3) must keep the approved post-closure plan during the remainder of the post-closure period.		Introduction
§264.118(d)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan in accordance with the applicable requirements in parts 124 and 270. The written notification or request must include a copy of the amended post-closure plan for review or approval by the Secretary.		Section 3.3
§264.118(d)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period.		Section 3.3
§264.118(d)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:		Section 3.3
§264.118(d)(2)(i)	Changes in operating plans or facility design affect the approved post-closure plan, or		Section 3.3
§264.118(d)(2)(ii)	There is a change in the expected year of final closure, if applicable, or		Section 3.3
§264.118(d)(2)(iii)	Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan.		Section 3.3
§264.118(d)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d).		Section 3.3

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(d)(3)	The owner/operator must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan. An owner/operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to submit a contingent post-closure plan under § 264.228(c)(1)(ii) and §264.258(c)(1)(ii) must submit a post-closure plan to the Secretary no later than 90 days after the date that the owner or operator or the Secretary determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §264.310. The Secretary will approve, disapprove or modify this plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved post-closure plan will become a permit condition.		Section 3.3
§264.118(d)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.118(d)(2). The owner/operator must submit the modified plan no later than 60 days after the Secretary's request, or no later than 90 days if the unit is a surface impoundment or waste pile not previously required to prepare a contingent post-closure plan. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in parts 124 and 270.		Section 3.3
§264.119(a)	No later than 60 days after certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the owner/operator must identify the type, location, and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records it has kept.		Section 3.7
§264.119(b)	Within 60 days of certification of closure of the first hazardous waste disposal unit and within 60 days of certification of closure of the last hazardous waste disposal unit, the owner/operator must:		Section 3.7
§264.119(b)(1)	Record, in accordance with State law, a notation on the deed to the facility property -- or on some other instrument which is normally examined during title search -- that will in perpetuity notify any potential purchaser of the property that:		Section 3.7
§264.119(b)(1)(i)	The land has been used to manage hazardous wastes; and		Section 3.7
§264.119(b)(1)(ii)	Its use is restricted under 40 CFR subpart G regulations; and		Section 3.7

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.119(b)(1)(iii)	The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the facility required by §264.116 and §264.119(a) have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Secretary; and		Section 3.7
§264.119(b)(2)	Submit a certification, signed by the owner/operator, that he has recorded the notation specified in paragraph (b)(1) of this section, including a copy of the document in which the notation has been placed, to the Secretary.		Section 3.7
§264.119(c)	If the owner/operator or any subsequent owner/operator of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes and hazardous waste residues, the liner, if any, or contaminated soils, it must request a modification to the post-closure permit in accordance with the applicable requirements in parts 124 and 270. The owner/operator must demonstrate that the removal of hazardous wastes will satisfy the criteria of §264.117(c). By removing hazardous waste, the owner/operator may become a generator of hazardous waste and must manage it in accordance with all applicable requirements of this chapter. If it is granted a permit modification or otherwise granted approval to conduct such removal activities, the owner/operator may request that the Secretary approve either:		Section 3.3
§264.119(c)(1)	The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or		Section 3.3
§264.119(c)(2)	The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.		Section 3.3
§264.120	No later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the owner/operator must submit to the Secretary, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification must be signed by the owner/operator and an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for post-closure care under §264.145(i).		Section 3.5

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310	Closure and post-closure care for landfills.	A post-closure plan for MDA L is included in this submittal. The post-closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	
§264.310(a)	At final closure of the landfill or upon closure of any cell, the owner/operator must cover the landfill or cell with a final cover designed and constructed to:	See above.	Section 2.3
§264.310(a)(1)	Provide long-term minimization of migration of liquids through the closed landfill;	See above.	Section 2.3
§264.310(a)(2)	Function with minimum maintenance;		Section 2.3
§264.310(a)(3)	Promote drainage and minimize erosion or abrasion of the cover;		Section 2.3
§264.310(a)(4)	Accommodate settling and subsidence so that the cover's integrity is maintained; and		Section 2.3
§264.310(a)(5)	Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	See above.	Section 2.3
§264.310(b)	After final closure, the owner/operator must comply with all post-closure requirements contained in §264.117 through §264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under §264.117). The owner/operator must:	See above.	Section 4.0
§264.310(b)(1)	Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;	See above.	Sections 3.2 and 4.2.1
§264.310(b)(2)	Continue to operate the leachate collection and removal system until leachate is no longer detected;	See above.	Section 4.2.2
§264.310(b)(3)	Maintain and monitor the leak detection system in accordance with § 264.301(c)(3)(iv) and (4) and §264.303(c), and comply with all other applicable leak detection system requirements of this part;	See above.	Sections 4.1 and 4.2
§264.310(b)(4)	Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of subpart F of this part;	See above.	Sections 4.1 and 4.2
§264.310(b)(5)	Prevent run-on and run-off from eroding or otherwise damaging the final cover; and	See above.	Sections 3.2 and 4.2
§264.310(b)(6)	Protect and maintain surveyed benchmarks used in complying with §264.309.	See above.	Section 4.2.2

ATTACHMENT B

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA L

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA L

April 2002

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LIST OF ABBREVIATIONS/ACRONYMS

bgs	below ground surface
CA	composite analysis
cm	centimeter(s)
cm^2	square centimeters
cm/hr	centimeters per hour
cm/sec	centimeters per second
cm/yr	centimeters per year
DQO	Data Quality Objective
EP	Extraction Procedure
ER	Environmental Restoration
FEHM	Finite Element Heat and Mass
ft	feet (foot)
ft/d	feet per day
ft/yr	feet per year
FY	Fiscal Year
HE	high explosives
in.	inch(es)
in./yr	inches per year
LANL	Los Alamos National Laboratory
m	meter(s)
MCL	maximum concentration level
MDA	material disposal area
µg/L	micrograms per liter
mg/L	milligrams per liter

LIST OF ABBREVIATIONS/ACRONYMS (Continued)

mm	millimeter(s)
mm/yr	millimeters per year
NMED	New Mexico Environment Department
PA	performance assessment
pCi/L	picocuries per liter
ppm	parts per million
R	regional aquifer
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
TA	technical area
VOC	volatile organic compound

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA L

1.0 GEOLOGY AND HYDROLOGY AT TECHNICAL AREA 54, AREA L

Numerous investigations of the geology and hydrology at Technical Area (TA) 54 have been conducted at Los Alamos National Laboratory (LANL). The following sections describe the extensive studies conducted at TA-54 in the past, and present information on future characterization activities and hydrologic modeling. LANL's TA-54, Area L, is located on Mesita del Buey, an east-west trending mesa bordered on the north by Cañada del Buey and on the south by Pajarito Canyon.

1.1 Geology and Stratigraphy

The following information on the geology and stratigraphy at TA-54 was obtained from borehole core logs. Unit 2 of the Tshirege Member of the Bandelier Tuff is at the surface of Mesita del Buey. This moderately welded ash-flow tuff forms nearly vertical cliffs on the sides of mesas, and at Area L is approximately 45 to 50 feet (ft) thick. A series of thin, discontinuous surge beds mark the base of Unit 2. Tshirege Member Unit 1v underlies Unit 2. This vapor-phase altered cooling unit forms sloping outcrops, and is further divided into Units 1vu and 1vc. Unit 1vu is a poorly welded ash-flow tuff. At TA-54, the thickness of Unit 1vu ranges from about 90 ft near Material Disposal Area (MDA) H to about 46 ft near MDA G. Unit 1vc is a moderately to poorly welded ash-flow tuff and ranges from 49 ft thick at the western end of Mesita del Buey to 23-26 ft thick at the eastern end. At the base of Unit 1v is Tshirege Member Unit 1g, which is a vitric, pumiceous, nonwelded ash-flow tuff. This unit is about 150 ft thick at MDA H, and thins to about 49 ft thick at the eastern end of MDA G. A distinctive pumice-poor surge deposit forms the base of Unit 1g. Beneath Unit 1g is the Tsankawi Pumice Bed, which at Area L is a thin (about 3-ft-thick) bed of gravel-sized pumice. It is the basal air fall deposit of the Tshirege Member. The Cerro Toledo interval is stratigraphically beneath the Tsankawi Pumice Bed; it separates the Tshirege and Otowi Members of the Bandelier Tuff, and averages about 40 ft thick at Area L. The Otowi Member is a massive, nonwelded, pumice-rich ash-flow tuff. At Area L, it ranges from about 64 to 109 ft thick. At the base of the Otowi Member is the Guaje Pumice Bed. At Area L, this basal air fall deposit averages about 9 ft thick. Beneath the Guaje Pumice Bed are the Cerros del Rio basalts. It is inferred that these basalts exist beneath Mesita del Buey, based on borehole data at Area L, and the thickness beneath TA-54 was extrapolated to be between 262 and 492 ft. Although the depth to and thickness of the Puye Formation

beneath the Cerros del Rio basalts at TA-54 were not determined as a result of borehole investigations, they were encountered beneath the basalts at a water-supply well in Pajarito Canyon, approximately one mile west of Mesita del Buey.

1.2 Soils

Mesa-top soils at TA-54 form from weathering of the Tshirege Member of the Bandelier Tuff and from aeolian deposits. These soils are primarily Hackroy sandy loams that typically range from a brown sandy loam in the top 8 centimeters (cm) to a reddish brown from 8 to 30 cm in depth. Where present, the native soils are thickest near the mesa's center and thinner near the edges. Generally, the mesa surface soils are thin and poorly developed. Near the surface, their texture is sandy; beneath the surface, they exhibit a more clay-like texture. Permeability rates range from 5 to 15 cm per hour (cm/hr) in the top layers down to 0.15 to 0.50 cm/hr in the lower layers. In addition to Hackroy sandy loams, soil types at TA-54 include Nyjack loam, Totavi gravelly loamy sand, Hackroy-Rock outcrop complex, Servilleta loam, Penistaja sandy loam, and Prieta silt loam (Nyhan et al., 1978).

1.3 Surface Water

Mesita del Buey is one of the drier mesas at LANL and there are no streams on the mesa. Surface water flows only as storm water and snowmelt runoff. South of Mesita del Buey, Pajarito Canyon is one of the wetter canyons at LANL; north of Mesita del Buey, Cañada del Buey is one of the driest. Streams in these canyons are intermittent.

1.4 Perched Water

To meet a May 7, 1985 Compliance Order/Schedule, test wells were installed in the canyons north and south of TA-54 to determine if perched water existed within canyon alluvium, to determine if perched water extended beneath Mesita del Buey, and to sample/monitor perched water, if present (IT Corporation, 1987). In 1985, three test wells were installed in a tributary to Cañada del Buey; they include CDBO-1 (to a depth of 15 ft), CDBO-2 (30 ft), and CDBO-3 (20 ft); test well CDBO-4 (to a depth of 21 ft) was installed further to the east in Cañada del Buey. All 4 wells were dry; however, they were completed as observation wells to monitor the alluvium for possible water in the future (Purtymun, 1995). The 1985 investigation indicated that the alluvium in Cañada del Buey contained no perched water (Devaurs and Purtymun, 1985).

Three test wells were also installed in Pajarito Canyon in 1985; they are PCO-1, PCO-2, and PCO-3 (Purtymun, 1995). These 3 wells are sampled for radionuclides, metals, general inorganics, and organics. Sampling results are compiled annually in environmental surveillance reports and submitted to the New Mexico Environment Department (NMED). To ensure that the alluvial aquifer in Pajarito Canyon did not extend northward beneath Mesita del Buey, 4 test holes were drilled in the canyon floor north of the intermittent stream channel in 1985 (Devaurs and Purtymun, 1985). These 4 test holes, designated PCM-1, PCM-2, PCM-3, and PCM-4, were dry. They were completed for use as moisture-access holes (Purtymun, 1995). It was concluded that perched water in Pajarito Canyon is confined to the alluvium in the stream channel and does not extend to the flank of the canyon (Purtymun, 1995). As stated in the "Hydrogeologic Workplan" (LANL, 1998), no perched groundwater has been identified beneath Mesita del Buey.

In addition to the seven test holes drilled in Pajarito Canyon in 1985, two test holes were drilled in 1950 as part of a water-supply study (Griggs, 1964; Purtymun, 1975). These holes are identified as T-5 and T-6; they were drilled to depths of 263 ft and 300 ft, respectively, and completely penetrated the Bandelier Tuff beneath the floor of Pajarito Canyon. No water was encountered. The same holes were dry when measured in 1985 (Devaurs and Purtymun, 1985).

Two mesa-top test holes at Area G were drilled to depths that were equivalent to up to 40 ft beneath the base of the alluvium in Pajarito Canyon, and three mesa-top test holes at Area L were drilled to depths that were equivalent to up to 48 ft beneath the Pajarito Canyon allluvium. None of these test holes encountered perched water (IT Corporation, 1987).

Five observation wells were installed in Cañada del Buey, mostly up-gradient from Area L, as part of a 1992 investigation for a proposed sanitary wastewater treatment plant. These wells, installed to study the effect of effluent release on the environment in the canyon, are CDBO-5, CDBO-6, CDBO-7, CDBO-8, and CDBO-9. In addition, two moisture-access holes (CDBM-1 and CDBM-2) were drilled north of Area L in 1992. Perched water was encountered in the canyon alluvium at wells CDBO-6 and CDBO-7. It was determined that the perched water at these locations is likely only the result of operational discharges from well PM-4 (Purtymun, 1995).

1.5 Vadose Zone

A summary of the hydrogeology of Areas G and L and additional data and discussions relevant to the potential for migration of hazardous waste from MDAs G and L is presented in the "Hydrogeologic Assessment of Technical Area 54, Areas G and L, Los Alamos National Laboratory" (IT Corporation, 1987). The assessment was prepared in response to a May 7, 1985 Compliance Order/Schedule issued to LANL by the New Mexico Environmental Improvement Division. The Order mandated specific tests and investigations be performed at Areas G and L to obtain information on the hydrologic characteristics of the waste disposal areas relevant to the potential for hazardous waste or hazardous constituent migration into the groundwater. The discussion that follows is extracted from the assessment (IT Corporation, 1987) prepared using numerous reports by Bendix Field Engineering Corporation and LANL on the results of individual tests or groups of tests.

In late 1985 and 1986, an investigation was initiated to fulfill the testing requirements of the Order, which included characterizing the vadose zone in and around MDA L. Eighteen (18) boreholes were drilled to a depth ranging from 60 to 145 ft into the Bandelier Tuff from the top of Mesita del Buey. Nearly 1,700 ft of core was obtained from 16 of these holes. An additional 60-ft deep borehole was drilled near a surface impoundment at Area L. Hydrologic testing and geophysical logging were performed in the boreholes, and selected core samples were analyzed for numerous parameters. A number of boreholes were completed for pore-gas sampling, neutron moisture monitoring, and psychrometer installation. As discussed in Section 1.4, holes were also drilled in Cañada del Buey and Pajarito Canyon, adjacent to Mesita del Buey, to investigate possible alluvial aquifers.

To provide a quantitative analysis of moisture movement in the Bandelier Tuff, vadose zone characterization studies were conducted at Areas G and L. The quantitative analyses would help to determine the likelihood of contaminant migration from Areas G and L through the vadose zone and into groundwater beneath the sites. To quantify moisture movement in the tuff, a two-tiered approach was utilized. First, hydrologic characteristics of the tuff and hydraulic head were measured to calculate seepage velocity and rates of moisture flux. Second, the moisture content of the tuff was measured after precipitation events to determine changes in moisture content with depth.

Hydrologic testing was performed in the boreholes and on borehole core samples in the laboratory to allow calculation of seepage velocity and moisture flux rates in the tuff. Intrinsic permeability was measured in boreholes through air injection and vacuum tests. Laboratory tests included the Dynamic Method to measure gas-water relative permeability, and gas injection with correction for slippage. Intrinsic permeability ranged from about 10^{-8} to 10^{-9} square centimeters (cm^2) for fractured and unfractured intervals. Similar results were obtained from a water injection test performed to verify the results of the air injection tests. Vacuum tests performed in the same boreholes yielded slightly lower permeability values; however, they also averaged in the 10^{-8} to 10^{-9} cm^2 range. In the laboratory tests, intrinsic permeability yielded values in the low 10^{-9} cm^2 range. Because discontinuities that occur in the rock intersected by the borehole are not typically present in laboratory-tested cores, lower intrinsic permeability values are expected for laboratory tests.

Laboratory measurements were conducted for gravimetric moisture content, soil-moisture characteristic curves, and unsaturated hydraulic conductivity of borehole tuff samples. The gravimetric moisture content generally ranged from 2 to 4%, with isolated intervals that ranged up to 10 to 28%. Soil moisture characteristic curves were determined for 20 tuff samples, and moisture content was determined for capillary pressures in the range of -0.03 to -0.34 bar. Attempts to measure moisture contents at lower capillary pressures were not successful because samples disaggregated. Hence, moisture characteristic curves could only be determined for volumetric moisture contents above 22%, which is considerably higher than the values observed from testing core samples of field measurements. From the characteristic curve data, it was concluded that moisture retention values of the tuff are extremely high, and ranged up to 80% (60% volumetric moisture). The moisture retention value of 80% indicates that no liquid transport can occur at moisture content below this value. Because all of the moisture content measurements for the tuff were significantly below 80%, it was concluded that capillary transport of liquids does not contribute to moisture movement and vapor transport is clearly the major mechanism of water transport. Unsaturated flow is not likely to be a major factor in liquid transport at these moisture content levels.

This conclusion was supported by actual measurements of moisture content in the tuff at depth. Neutron logging was performed every two weeks at one borehole each in Areas G and L for approximately eight months. In addition, neutron logging was performed daily for a period after three major precipitation events. Moisture profiles measured with neutron logging showed the

upper 10 to 20 ft of tuff to be affected by precipitation events and subject to seasonal fluctuations. However, below 20 ft, the moisture content is extremely low and in the range of the gravimetric moisture values (2 to 4%).

The 1986 moisture profiles were consistent with moisture measurements conducted previously on the Bandelier Tuff. Neutron-moisture data of the tuff at various locations at LANL were measured between 1960 and 1980 (Abeele et al., 1981). Those data showed that moisture conditions ranged from 10 to 40% by volume in the upper 10 to 15 ft of tuff, and that below 15 ft, moisture rarely exceeded 5 to 10%. In addition, those data showed that in the uppermost four meters of disturbed areas at Area G, significant seasonal fluctuations in moisture content exist. Those findings are consistent with the 1986 data. Overall, the moisture data reported in Abeele et al. (1981) and in the hydrogeological assessment (IT Corporation, 1987) are consistent and show the following:

- Throughout the area, moisture content of the tuff is low (typically between 2 to 5% with intervals ranging up to 10 to 28%)
- In the upper 10 to 20 ft of tuff, seasonal variation of moisture content occurs; however, below ~20 ft, seasonal variations are not measurable
- Precipitation from monitored autumn storms does not infiltrate below ~10 ft.

From these studies, the following conclusions were made: 1) the tuff is not saturated and is in fact very dry; and 2) moisture from precipitation does not infiltrate to a significant depth. Therefore, meteoric water infiltration is not a viable process for transport of hazardous waste or hazardous constituents through the vadose zone at Areas G and L.

Thermocouple psychrometers were installed at numerous depths in one borehole each in Areas G and L to measure capillary potential. The psychrometer data were highly variable, but indicated that soil moisture tensions ranged from 1 to 15 bars. Moisture flux calculations were performed using measured hydraulic conductivity values for the tuff and hydraulic head data from the psychrometers to determine maximum rates of moisture movement in the tuff. A maximum downward flux (using average measured hydraulic conductivity) of 0.254 ft per year (ft/yr) and a maximum upward flux of 0.198 ft/yr were calculated using average measured hydraulic conductivity for Area L. Because only hydraulic conductivity values at higher percentages of saturation than those actually observed in the field were available, the

calculated flux rates very likely overestimate the moisture flux values. Because hydraulic conductivity in the vadose zone typically increases with increases in percent saturation, the measured hydraulic conductivity values are greater than the actual field conditions. If calculated (rather than measured) hydraulic conductivity values are used, lower flux rate values (by approximately an order of magnitude) are predicted. The moisture flux values, though highly conservative, show that very long periods of time would be required for water and contaminants to move by unsaturated flow from the MDAs to the groundwater. In summary, there is no evidence to suggest that saturation of the tuff and subsequent transport of contaminants by saturated flow is likely.

Based on the data collected in the 1985/1986 investigation, the following conclusions were made regarding the hydrologic characterization of the vadose zone and potential aqueous phase migration of contaminants:

- The Bandelier Tuff is characterized by very low moisture content (typically in the range of 2 to 5%). This value is well below the porosity; thus, moisture movement by unsaturated flow processes predominate over saturated flow.
- The tuff has high moisture retention properties and is very porous, averaging 50% porosity.
- Intrinsic permeability tests (both field and laboratory) indicate average permeability of the tuff to be 10^{-8} to 10^{-9} cm^2.
- Permeability tests conducted in the field do not indicate increased permeability in zones adjacent to fractures in boreholes. Aperture, trace, and degree of fracture filling is variable, however, and permeability along fractures may vary significantly.
- The tuff's unsaturated hydraulic conductivity was determined to be approximately 10^{-8} centimeters per second at approximately 20 to 40% moisture content, determined by measured effective permeability and using van Genuchten's model. Actual moisture conditions and unsaturated hydraulic conductivity are likely lower than these values.
- Due to the low moisture content in the tuff and the low degree of consolidation within the sampled tuff, soil-characteristic curves for intact cores could not be determined for the range of moisture/tension conditions present in the field.
- Soil water tension measured by thermocouple psychrometers range from 1 to 15 bars. Monthly averages typically ranged from 2 to 7 bars.
- Seasonal variation of moisture occurs in the upper 10 to 15 ft of the vadose zone, as indicated by neutron measurements of vadose zone moisture. Below 15 ft, moisture content does not appear to change with time. Neutron measurements of moisture following precipitation events indicate the maximum depth of wetting to be approximately 10 ft. At a

depth of 22 ft, no influence of precipitation on moisture content was observed; moisture is assumed to be returned to the surface by evapotranspiration.

- The maximum flux rate using average measured hydraulic conductivity at Area L ranged from a downward rate of 0.254 ft/yr to a maximum upward rate of 0.198 ft/yr. These moisture flux values show that very long periods of time would be required for water and contaminants to move by unsaturated flow.

Chemical characterization of the Bandelier Tuff vadose zone was also conducted at Areas G and L to fulfill the requirements of the May 7, 1985 Compliance Order. The data were obtained from core sample analysis and pore-gas sampling and analysis. A total of 70 core samples were collected from seven boreholes at Areas G and L (Devaurs, 1985). In addition, three test hole locations adjacent to Impoundment B at Area L were selected for coring, together with one shallow test hole location selected within the impoundment. All cores except two had Extraction Procedure (EP) Toxic metals below detection limit concentrations, which are well below EP Toxicity concentrations. An Area L core sample, collected from the 10- to 20-ft depth near Impoundment B, slightly exceeded the EP Toxic regulatory limit for chromium. Chromium and cadmium concentrations above EP Toxic levels were also present in the 8 to 29-inch depth samples from Impoundment B. No EP Toxic metals were detected in any boreholes at Area L below a depth of 30 ft. It was noted that the lower detection limit for most of the volatile organic compounds (VOC) was in the parts per million (ppm) range, which did not allow detection for possible trace concentrations present. At Area L, VOCs were detected in core samples from various depths in five of the boreholes from which samples were collected. The detected compounds included a suite of common solvents and ketones (e.g., methylene chloride, acetone, tetrahydrofuran, and methyl ethyl ketone). The concentrations of these compounds ranged from parts per billion to ppm at depths up to 100 ft, the approximate depths of the holes.

Twenty-three sampling ports were installed in seven boreholes to allow collection of pore-gas at various depths (Devaurs and Bell, 1986). The pore-gas samples were collected by pumping air from the sampling port through charcoal adsorption tubes. The volatile organics were then extracted from the charcoal for analysis. The analytical results indicated that VOCs in the pore gas were present in ppm concentrations at depths up to approximately 100 ft, the approximate depths of the holes.

The core analyses and the pore-gas data suggested that volatile organic constituents from the wastes disposed of at MDA L have migrated into the tuff. It was determined that, based on the

vadose zone characterization studies, vapor diffusion is the predominant mechanism for migration.

As noted in the hydrogeologic assessment prepared in 1987 (IT Corporation), the regional aquifer was encountered at a depth of approximately 875 ft just west of Areas G and L. Calculations using the hydraulic gradient of the Tesuque Formation (0.015) predicted depths to the regional aquifer beneath Area L as 950 ft.

Water samples collected from the wells in Pajarito Canyon (described in Section 1.4) were analyzed for VOCs, selected metals, and radionuclides. No VOCs were detected in these samples, and metal and radionuclide concentrations were found to be below drinking water standards. It was concluded that there appears to be no discernable effect on water quality in Pajarito Canyon from disposal operations at Area L.

Based on the hydrogeologic investigations performed at Mesita del Buey in 1985 and 1986 and on other previous work, several specific conclusions were reached regarding the characteristics of Areas G and L and the potential for contaminant migration from the waste disposal units there. These conclusions are:

- The stratigraphy of the Bandelier Tuff at Areas G and L is similar to that throughout the western portion of the Pajarito Plateau.
- Vertical and near-vertical cooling fractures are common in the tuff at Mesita del Buey.
- No major fault zones are known to exist at or near Areas G and L that could serve as conduits from the shallow subsurface to the regional groundwater.
- Together, the very low moisture content in the tuff, the empirical determination that moisture from precipitation does not infiltrate below a depth of 10 to 22 ft, and the very low calculated flux rates all suggest that aqueous transport of contaminants is not a viable mechanism for contaminant migration at Areas G and L.
- Based on the results of core and pore-gas analyses, volatile organic constituents have migrated (predominantly in the vapor phase) from the MDAs into the tuff.
- At Area L, elevated levels of metals were detected in samples from only two locations (within and adjacent to Impoundment B) at shallow depths (30 ft or less).
- Based on the presence of volatile organic vapors at depths of up to 100 ft, core and pore-gas data support vapor phase migration as the dominant transport mechanism at TA-54.

- No perched water bodies that could be connected hydraulically to the regional aquifer were detected beneath Areas G and L.

- No perched water was detected in Cañada del Buey. Perched water in Pajarito Canyon is confined to the alluvium within the canyon and does not extend vertically or horizontally into the Bandelier Tuff that forms Mesita del Buey.

- There is no evidence of liquid migration from Areas G and L into the alluvial perched water in Pajarito Canyon.

Hydrogeologic conditions at TA-54 were also investigated as part of the performance assessment (PA) and composite analysis (CA) for the low-level radioactive waste disposal facility at MDA G, which is only 0.5 miles east of Area L. The following discussion summarizes the hydrogeologic conditions reported in the "Performance Assessment and Composite Analysis for Los Alamos National Laboratory Material Disposal Area G" (LANL, 1997), which presents the most recent vadose zone information available. This information is indicative of the condition at Area L because of its close proximity to Area G. Overall, the report was generally in agreement with previous investigations and stated that when combined with the semiarid climate, the Bandelier Tuff is typically very dry and that the volumetric moisture content averages about 5%, although it is quite variable depending on location. Moisture variations due to near-surface climatic influences, influences of fractures, and textural differences between tuff units and interbeds are suggested by routine moisture measurements taken from boreholes at numerous locations around MDA G. Evaporation and transpiration from the mesa's surface (i.e., evapotranspiration) remove much of the moisture from precipitation absorbed by the tuff. This investigation also found that evapotranspiration is effective to depths of 1 to 2 meters (m) (3 to 7 ft), where plant roots are abundant. In addition to the near-surface drying, evaporation appears to occur along the sides of the mesa and in fractures and surge beds, which are layers within the mesa that appear to allow air flow. The relative absence of moisture nearly eliminates the possibility that contaminants will be transported through the tuff to the regional aquifer (LANL, 1997).

The PA/CA was supported by a fairly complete set of data and observations to characterize the uppermost 60 m (200 ft) of the Tshirege Member of the Bandelier Tuff beneath MDA G. Unit 2 of the Bandelier Tuff is the caprock that forms the top of Mesita del Buey. This unit is extensively fractured as a result of contraction upon post-depositional cooling. The cooling-joint fractures, which are mostly vertical, generally dissipate at the bottom of Unit 2, which at Area G is about 12 m (39 ft) thick. Mean spacing between fractures is about 1 m (3.3 ft), and fracture

widths range from less than 1 millimeter (mm) to 13 mm (<0.03 to 0.51 inches [in.]) with a median of 3 mm (0.12 in.). Typically, fractures are filled with smectite clays to a depth of about 3 m (10 ft). Smectite clays (e.g., montmorillonite) are known for their tendency to swell when water is present and for their ability to strongly bind certain elements. Both of these properties have implications for transport of contaminants in fractures (LANL, 1997). Typically, fractures in Unit 2 do not extend into Unit 1vu. Only the more prominent cooling fractures originating in Unit 2 continue into the more welded upper section of Unit 1 vu; however, they die out in the less consolidated lower section.

The degree of welding and devitrification are two properties of the tuff that influence fluid flow. In welded, devitrified tuff, there are several competing effects that determine moisture content and fluid flux. Welded tuffs tend to be more fractured than non-welded tuffs. Although water moves slowly through an unsaturated tuff matrix, it can move relatively rapidly through fractures only if nearly saturated conditions exist (LANL, 1997). As indicated by modeling studies, moisture is absorbed into the matrix when fractures disappear at contacts between stratigraphic subunits, when fracture fills are encountered, or when coatings are interrupted. Because fractures are open to the passage of both air and water, they can have both wetting and drying effects, depending on the relative abundance of water in the fractures and matrix (LANL, 1997).

As a rule, the Tshirege Member of the Bandelier Tuff is very dry and does not readily transmit moisture. Most of the pore spaces in the tuff are small enough to be of capillary size and have a strong tendency to hold water against gravity by surface-tension forces. Moisture content is generally more variable near the top of the mesa than in the central portions as a result of variations in temperature, humidity, and evapotranspiration. Vegetation is very effective at removing moisture near the surface by transpiration. During the summer rainy season when rainfall is highest, near-surface moisture content is variable due to the effects of higher rates of evaporation and of transpiration by vegetation, which flourishes during this time (LANL, 1997).

For the PA/CA, a great deal of information was needed to first conceptualize and then model moisture flow and contaminant transport in the vadose zone. The necessary information included the basic properties of the tuff (e.g., porosity, density, fracture patterns, and mineralogy); these can be measured accurately. It also included the complicated relationships describing how fluids move through the tuff (e.g., moisture content, matric suction, and hydraulic conductivity), which are more difficult to establish with a great deal of certainty in a matrix with

very low moisture content. A number of field, laboratory, and analytical studies were performed to support the development of conceptual and mathematical models for flow and transport in the vadose zone (LANL, 1997).

Characteristic curves are relationships used to model unsaturated liquid flow through rock, and include moisture retention and hydraulic conductivity curves. The moisture retention of a material is controlled by the relationship between the suction within the matrix and the water content for a porous material. Hydraulic conductivity is the rate at which water can travel through a rock or soil sample under the influence of gravity. Generally, rocks and soils have higher hydraulic conductivities when more moisture is present, with the maximum hydraulic conductivity occurring when the material is fully saturated with water. This condition is the saturated hydraulic conductivity. Texture has a large impact on moisture retention and hydraulic conductivity as well, where low surface area materials (e.g., sand) have a higher hydraulic conductivity than high surface area materials (e.g., clays).

The volumetric moisture content for the units beneath MDA G range between 2 and 14% by volume, and the unsaturated hydraulic conductivity curves prepared for the PA/CA are very steep at such low moisture contents. This indicates that for a unit increase in water, there is a large increase in hydraulic conductivity. For example, in Unit 2 the unsaturated hydraulic conductivity changes from 10^{-12} cm per second (cm/sec) at 3% volumetric moisture content to 10^{-10} cm/sec at 5% volumetric moisture content. This also illustrates the effects of the physical characteristics discussed above. The slopes of the conductivity curves generally level out when the moisture content reaches 7% and indicate that the hydraulic conductivity remains relatively constant over a wide range of moisture content (between 10 and 30%). The conductivity curves steepen again when the moisture content exceeded 34%; however, the high moisture contents were obtained under experimental conditions and are not expected *in situ* except under very localized conditions (LANL, 1997).

The rate of moisture movement beneath Mesita del Buey is perhaps the most important parameter in modeling the subsurface transport of contaminants (LANL, 1997). Moisture movement largely controls the minimum time required for contaminants to potentially be transported from MDA G through the vadose zone into the regional aquifer. The moisture movement through the undisturbed vadose zone is complex and is further complicated at MDA G by man-made disturbances associated with waste management activities.

Three moisture-content zones are consistently shown within the subsurface at MDA G (LANL, 1997). The volumetric moisture content in the top few meters varies between about 3 and 12% and reflects the seasonal effects of precipitation and evapotranspiration. Between mid-mesa depths of about 8 and 23 m (25 and 75 ft), volumetric moisture content is quite low, from 0.5 to 2%. Below 25 m (80 ft), moisture content increases to between 9 and 19%. The mid-mesa dry zone occurs consistently near the surge beds at the base of Unit 2 of the Tshirege Member. Based on unsaturated hydraulic conductivity estimates, estimates of flux rates through the low moisture content region are negligible (LANL, 1997). Water-pressure profiles estimated beneath the mesa, using hydraulic properties from cores, suggest that moisture moves toward the base of Unit 2 from above and below. These observations are consistent with a hypothesis that the mesa is dried out to a significant extent by evaporation and air movement along surge beds and fractures that are prevalent near this horizon (LANL, 1997).

Different rates of moisture movement corresponding to the three moisture-content zones are inferred by several independent analyses. Although the analyses invoke simplifying assumptions, they provide consistent qualitative evidence of variable rates of moisture movement within and across Mesita del Buey (LANL, 1997). The inferred zones include:

- A near-surface zone with an apparent rate of moisture movement on the order of several mm per year (mm/yr);
- An intermediate zone through the mid-depths of the mesa with rates of moisture movement on the order of tenths or hundredths of mm/yr; and
- A deeper zone in which the apparent rate of moisture movement may be several centimeters per year (cm/yr).

The analyses corroborating the apparent variable rates of moisture movement include natural tracer analyses, unit hydraulic gradient assumption, moisture profile analysis, and vapor flux studies. Details of these studies are presented in Section 2.1.5.6 of the PA/CA (LANL, 1997) and are summarized below.

Natural tracers used to infer information about moisture in the vadose zone include chloride, ^{18}O, and ^{2}H (deuterium). These constituents are present in precipitation in relatively constant amounts and, thus, are present in vadose-zone pore water, which is derived from precipitation. Results of the chloride tracer analysis showed the near-surface and deep-mesa fluxes are high

relative to the mid-mesa flux. In the shallow and deep zones, the inferred flux rates are on the order of 2 to 3 mm/yr (0.08 to 0.1 in. per year [in./yr]). In the intermediate zone, the inferred flux rates are between 0.03 to 0.8 mm/yr (0.001 to 0.03 in./yr). The steep slope on the cumulative water/cumulative chloride plot for the mid-mesa region indicates that cumulative chloride increases faster than cumulative water (i.e., water is being lost from the system at that location). Estimated chloride accumulation ages also suggest that water movement through Mesita del Buey is very slow (LANL, 1997).

The naturally occurring stable isotopes of oxygen and hydrogen (^{18}O and ^{2}H) are useful indicators of evaporation. The results of the stable isotope study were compared to the chloride profiles to test the deep evaporation hypothesis. It was concluded that surface evaporation effects are limited to the shallowest 1 to 2 m (3.3 to 6.6 ft), and that at depths of 5 m (16 ft) and deeper, there is strong evidence that there is an evaporative sink at intermediate depths in the mesa (LANL, 1997).

The average van Genuchten parameters may be used to estimate rates of moisture movement through the stratigraphic units using the unit hydraulic gradient assumption. Different rates are necessary to match the moisture conditions measured in the various units of the Bandelier Tuff. It was found that near the surface, the best fit to the field moisture data to a depth of approximately 5 m (15 ft) corresponds to a moisture movement rate between 0.01 and 10 mm/yr (0.0004 and 0.4 in./yr). In Unit 2 and Unit 1vu, the apparent moisture movement rate that matches the field moisture data is between 0 and 0.1 mm/yr (0 and 0.004 in./yr). In Units 1vc and 1g, a moisture movement rate of 1 mm/yr (0.04 in./yr) best matches the field data. The Tsankawi-Cerro Toledo and Otowi Member stratigraphic layers match field moisture data with a much larger apparent moisture movement rate on the order of 10 mm/yr (0.4 in./yr). These estimated rates support the hypothesis that moisture movement is not steady state, or that significant changes in movement of moisture occur at depths (LANL, 1997). One explanation that accounts for the results of this analysis is that water may be removed at intermediate depths by evaporation and vapor-phase diffusion.

The unit-gradient approximation was also used to identify depths within Mesita del Buey where moisture may be lost to evaporation or vapor-phase diffusion (LANL, 1997). A moisture profile analysis was performed, and the rates of moisture movement calculated as the gradient of moisture were plotted, as was the gradient of the vertical flux. The results suggest a downward

flux and a source of moisture to depths of about 7 m (23 ft). Below this, to depths near 28 m (92 ft), the average vertical flux is small but downward and the source is very small. The average local flux in this low-moisture zone is -0.017 mm/yr (-0.0007 in./yr) and the average moisture source is -0.0013 mm/yr (-0.005 in./yr). A moisture peak at 30 m (100 ft) occurs at the vapor-phase notch (the base of Unit 1vc). Overall, the average rate of moisture movement near the surface is about 10 mm/yr (0.4 in./yr), with a large standard deviation suggesting high variability. The average rate of moisture movement through the middle depths of the mesa is very small, and in the vapor-phase notch portion is relatively large (0.73 mm/yr). Although increased moisture at the vapor-phase notch at MDA G may be interpreted as a moisture source from the relatively wet canyons, this hypothesis does not explain high moisture content values (10 to 20% volumetric) observed at the vapor-phase notch at other locations across the Laboratory where the notch is not coincident with a canyon bottom or other moisture source.

Another study to understand the potential influence of water moving within and out of the mesa in the vapor phase was conducted by analyzing the vapor flux through the mesa (LANL, 1997). Analyses were performed on neutron-probe moisture measurements from several boreholes at MDA G. The results of the study indicated that water moves predominantly in the vapor phase at depths between 12 and 23 m (40 and 75 ft). The results also indicate that a fairly wide region within the mesa is dominated by vapor-flux and that this region corresponds to the region of low liquid flux, discussed above. The vapor-flux analysis also suggests that vapor flux dominates rates of moisture movement in regions of the mesa where volumetric moisture is below 5%, and the magnitude of the vapor flux in the low moisture region of the mesa is about 1 mm/yr (0.04 in./yr). In addition, there is no apparent direction associated with the vapor movement; instead, vapor appears to move in different directions throughout the dry region (LANL, 1997).

Water-balance components through covers resembling the operational pit cover used at MDA G have been measured during studies of test plots at LANL. The data show that 87% of precipitation is lost to evapotranspiration, approximately 6% remains as infiltration below the root zone, and the remainder is retained in the surface soil. The data also indicate that moisture movement through a conventional vegetated crushed-tuff cover was greatest in the late winter and early spring when snowmelt occurred and evapotranspiration was low because vegetation was not active (LANL, 1997). In 1973, volumetric moisture measurements were made in holes augered into the covers over Pits 1 and 2 at MDA G. These pits were covered in 1961 and 1963, respectively. The measured volumetric moisture content was quite variable, with

measurements of 12% and 17% by volume in Pit 1 and 4% and 8% by volume in Pit 2. Peak water concentrations occurred at depths of 2 m (6.6 ft) and decreased between 2 and 3 m (6.6 and 10 ft). The variation was tentatively attributed to differences in soil conductivity of surface slope (LANL, 1997). Using the unit-gradient assumption, these moisture measurements indicate infiltration rates between several mm/yr and several cm/yr within the covers at Pits 1 and 2.

The moisture content within Pit 37, which was open for several years, was measured periodically over a three-year period in the 1990s to better understand infiltration through disposal units at MDA G. This pit, while open, was expected to have moisture contents in excess of most of the covered pits at MDA G, since it was open longer than the average disposal pit. The pits are assumed to have, while open, higher infiltration rates than the surrounding mesa top, due to the lack of vegetation (transpiration). A maximum moisture content of about 11% by volume was measured at Pit 37, with a mean moisture content of approximately 8%. Using the unit approximation, the average rate of moisture movement through Pit 37 is 5 mm/yr (0.2 in./yr) at the average (mean) pit moisture content (LANL, 1997).

In 1976, horizontal boreholes were drilled approximately 1 m (3.3 ft) beneath a pit at MDA G that was closed in 1966. Moisture measurements at the same boreholes were made in 1992 with a neutron probe. The volumetric moisture content values beneath the pit were in the range of 1 to 4%, and were generally 1 to 2% higher beneath the pit than moisture content values away from the pit. These data suggest that pit excavation has a small effect on moisture contents beneath the pits (LANL, 1997).

1.6 Groundwater

The most recent projected depth to groundwater at Area L, based on currently available data, is approximately 1,000 ft (LANL, 2001a). Additional information on groundwater at TA-54 is provided in the "Characterization Well R-22 Completion Report" (LANL, 2002); the "Supplement to Quarterly Technical Report April-June 2001" (ER Project, 2001); and the "Quarterly Technical Report October-December 2001" (ER Project, 2002). The following are summaries of the information in those reports.

Well R-22 is located on Mesita del Buey, east of TA-54, and was funded and installed by LANL's Environmental Restoration (ER) Project. This well is one of the 11 regional aquifer (R)

wells drilled to date as part of the "Hydrogeologic Workplan" (LANL, 1998) in support of the "Groundwater Protection Management Program Plan" (LANL, 1996). Well R-22 is the first of five planned regional aquifer wells at or in the vicinity of TA-54. This well was designed primarily to provide water-quality and water-level data for potential intermediate-depth perched zones and for the regional aquifer downgradient of TA-54. In addition, it was designed to collect geologic, hydrologic, and geochemical data that will contribute to the understanding of the vadose zone and regional aquifer in this area of LANL. Although the location of well R-22 was originally proposed for installation in Pajarito Canyon, just south of Mesita del Buey, its final location was changed to the mesa top in order to be in closer proximity to and more directly downgradient of TA-54 and to be better suited for a future monitoring well.

Well R-22 was drilled to a total depth of 1,489 ft in 2000. A multiscreen well containing five screened intervals that can be sampled individually was installed. In descending order, the geologic units encountered during drilling consisted of ash flows of the Tshirege and Otowi Members of the Bandelier Tuff (including the basal Guaje Pumice Bed); lavas, cinder units, interflow units, and subflow deposits of the Cerros del Rio volcanic field; an upper sequence of fanglomerate deposits of the Puye Formation; an older basalt; and a lower sequence of fanglomerate deposits of the Puye Formation. Depths and elevations of the contacts between these units are shown in the "Characterization Well R-22 Completion Report" (LANL, 2002). Notable differences between the predicted and as-found stratigraphy at this well was the greater thickness of the Cerros del Rio volcanic sequence, the absence of Puye Formation axial river gravels, and the absence of Santa Fe Group sediments within the drilled depth.

Two potential perched zones and one regional zone of saturation were originally predicted at well R-22. Two zones that could potentially support perched water were predicted at a depth of 148 ft in the Cerros del Rio basalt and at a depth of 487 ft in the Puye Formation. The regional water table was anticipated to be at a depth of 922 ft in the Puye Formation at the well R-22 location. No water was encountered, however, until the drillers first noted water at a depth of approximately 890 to 900 ft. After 30 minutes, the water-level depth was measured at 883.05 ft. The water is believed to be associated with the regional zone of saturation because the regional water table was projected to be at a similar depth, no obvious perching horizon was encountered, and saturation continued to the total depth drilled.

Both a direction and a rate are required to characterize groundwater movement. Although the

data from this single well do not allow a determination of horizontal flow direction, vertical direction can be evaluated by analysis of head distribution along the borehole. In addition, the hydraulic properties of the saturated materials (determined from analysis of field testing data) provide a general idea of potential flow rate. During drilling, hydraulic heads obtained during testing clearly indicated a downward vertical gradient at well R-22. The downward vertical gradient at well R-22 was supported after testing by a piezometric profile constructed using a pressure-measurement system.

Field tests at depth targeting for screened intervals were performed during drilling to determine hydraulic properties at well R-22. The five screened intervals were distributed through the zone of saturation. Hydraulic conductivities ranged from 0.27 ft/day (ft/d) to 2.32 ft/d at four screened intervals, based on straddle-packer/slug-injection tests performed.

Extensive borehole geophysical data were collected during drilling. Borehole video and natural gamma radiation surveys were conducted, and a suite of borehole geophysical logs was obtained. The surveys were conducted in cased hole from the surface to a depth of 1,330 ft. Below 1,330 ft, the surveys were conducted in open hole. Geophysical logging in open hole included caliper, resistivity, natural gamma radiation, spontaneous potential, lithodensity, magnetic resonance, borehole color video, epithermal neutron, neutron porosity, and spectral natural radiation. Volumetric water content beyond the casing in the vadose zone was measured using a Compensated Neutron Tool as a means to evaluate moist/porous zones and to estimate porosity in the saturated zone. Overall and spectral natural gamma ray activity was measured using a Hostile Natural Gamma Spectroscopy tool as a means to evaluate geology and lithology and the presence of clay versus sand. As a means to characterize mineralogy, lithology, and water content of the formation, concentrations of hydrogen, silicon, calcium, sulfur, iron, potassium, titanium, and gadolinium were measured using an Elemental Capture Spectroscopy tool. To measure bulk density and photoelectric effect as a means to estimate total porosity and characterize lithology, a Litho-Density Tool was used. Calibrated gross gamma ray readings were recorded to match the depth of the logging runs. The log results indicated that at the time of logging, a well-water level of 995 ft below ground surface (bgs) was recorded and that the probable regional groundwater level was 886 ft bgs. The log results also showed increased vadose zone moisture content (an average of 5%) in the intervals between 50 and 180 ft bgs, and 10% or greater between 350 and 715 ft bgs. In addition, in the interval from 1,405 to 1,478 ft (the total log depth), log data indicated an increased saturated zone

porosity (greater than 40%) corresponding to the Lower Puye Formation. Clearly defined stratigraphic/lithologic boundaries were also indicated from the spectral gamma and geochemical logs.

During drilling, samples of groundwater were collected from depths of 883 ft and 1,489 ft. The potential contaminants of concern at the well R-22 location include VOCs, perchloric acid, tritium, and other radionuclides (LANL, 2002). The samples were analyzed for major anions, VOCs, semivolatile organic compounds, high explosives (HE), radionuclides, and stable isotopes. Samples collected for major anions analysis were filtered; nonfiltered samples were collected for the remainder of the analyses. Due to the presence of drilling fluids, the borehole water samples are not representative of groundwater.

While the following compounds are not subject to regulation under the hazardous waste program, data are provided herein for informational purposes only. Upper zone borehole water showed concentrations of bicarbonate (120 milligrams per liter [mg/L]), chloride (21 mg/L), fluoride (1.19 mg/L), oxalate (1.05 mg/L), and sulfate (19.9 mg/L). Oxalate may be produced by the breakdown of one of the drilling fluids used, and can occur naturally at very low concentrations in groundwater and surface water around LANL and elsewhere (Broxton et al., 2001).

Methylene chloride was also detected at a level above the instrument detection limit but less than the practical quantitation limit. This chemical is used in analytical laboratories for extraction during gas chromatography/mass spectrometry analyses and may provide a source of laboratory contamination. Concentrations of bromide, phosphate, and perchlorate were less than detection. Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) was detected at a concentration of 90 micrograms per liter (µg/L). Based on similar chemical structures between RDX and one of the drilling fluids used, this result is believed to be a false positive. The HE compound 2-A-4,6-DNT was also detected above the instrument detection limit but below the practical quantitation limit. The U.S. Environmental Protection Agency *SW-846* Method 8330, which uses high-performance liquid chromatography, is susceptible to false positives for HE compounds and degradation products. Consequently, an alternative and more accurate analytical method using diode array was used when the analytical laboratory reran the sample; the results using this analytical method showed that HE compounds and degradation products were less than detection (0.25 µg/L). A further discussion about the investigation of false positives for HE

compounds and associated degradation products is presented in Section 13.2 of the "Characterization Well R-22 Completion Report" (LANL, 2002). During characterization in the completed well, additional groundwater samples will be collected to evaluate the presence or absence of HE compounds at well R-22. Acetone at a concentration of 0.820 mg/L was detected at the regional water table during drilling at well R-22. An investigation was conducted to determine the source of this organic compound, which may be present due to oxidation of one of the drilling fluids that contains isopropyl alcohol. Based on this investigation, the mass spectra from the initial analysis demonstrated high concentrations of isopropyl alcohol in the injection water used during drilling at well R-22. The isopropyl alcohol had in fact been misidentified as acetone by the analytical laboratory.

As previously mentioned, the following compounds are not subject to regulation under the hazardous waste program; however, data are provided herein for informational purposes only. Tritium was present at an activity of 109 picocuries per liter (pCi/L); this screening value suggests that the age of the tritium is less than 60 years old. More recent sampling shows lower tritium levels. During the first round of groundwater sampling in March 2001, tritium levels ranged from 2 to 77 pCi/L. During the second round of sampling in June 2001, tritium levels continued to decrease and ranged from 1 to 14 pCi/L. (The Drinking Water maximum concentration level [MCL] for tritium is 20,000 pCi/L.) Activities of americium-241, plutonium-238, plutonium-239/-240, and strontium-90 were less than detection. Activities of uranium-234, uranium-235, and uranium-238 were at levels of 1.48, 0.126, and 1.41 pCi/L, respectively. Nitrogen isotopes were analyzed for the water sample collected at 1,489 ft to evaluate the source(s) of nitrate at well R-22. The $\delta^{15}N(NO_3)$ value was +9.6 permil, which suggests that the water sample is enriched with nitrogen-15.

The Cerros del Rio lavas at well R-22 were nearly three times thicker than predicted (983 ft vs. 339 ft). The most significant hydrogeologic impact of this thick set of lavas is that the regional water table is within these lavas rather than within Puye Formation fanglomerates. Therefore, all flow and transport within the upper ~300 ft of the regional aquifer is within basaltic fractures and interflow rubble rather than through Puye Formation pore spaces. This difference in stratigraphy implies different flow rates and pathways, and the lavas provide an environment in which certain constituents (e.g., ferrous iron) can influence water chemistry.

Several features contribute to the peculiarities of the as-drilled stratigraphy at well R-22. It is

believed that the exceptional thickness of the Cerros del Rio lavas and cinder indicate fill within a paleocanyon. The absence of axial river gravels at the base of the Cerros del Rio volcanics suggests that the paleocanyon was not a through-going drainage ancestral to the modern Rio Grande. Because cuttings were not returned from some key intervals beneath the Cerros del Rio lavas, it is possible that axial river gravels may have been present within 5 ft of the base of the lavas but were not sampled. Therefore, the orientation of the paleocanyon (east-west vs. north-south) is uncertain.

The first round of groundwater sampling at well R-22 was conducted in March 2001 and the available data were reported in the supplement to the "Quarterly Technical Report April-June 2001" (ER Project, 2001). As noted in that supplement, because of a delay in analytical services, the $^{15}N/^{14}N$ isotopic suite was not available and would be reported at a later date. In addition, the supplement noted that because of an ongoing focused validation effort by the contract analytical laboratories, HE data were not available for reporting. No organics were found to exceed Drinking Water MCLs or NMED Groundwater Standards.

As indicated in the "Quarterly Technical Report October-December 2001" (ER Project, 2002), the second round of sampling at well R-22 was completed in June 2001. The data reported include field parameters and organic, inorganic, and radiological constituents. Because of analytical laboratory backlog, stable isotopes of nitrogen ($^{15}N/^{14}N$) were not available for inclusion in that report. In addition, because of an ongoing focused validation effort by the contract analytical laboratories, HE data were not available for reporting. Lead was found in Screen 3 (1,273 ft in depth) at a concentration of 19.7 µg/L. The Drinking Water MCL for lead is 15 µg/L; the NMED Groundwater Standard of 50 µg/L was not exceeded. No organics were found to exceed Drinking Water MCLs or NMED Groundwater Standards.

The third groundwater sampling round for well R-22 was conducted in November 2001; results of this sampling effort will be included in a quarterly report once the data are validated. The fourth groundwater sampling round was scheduled for March 2002, and the results will be provided in a subsequent quarterly report upon completion of data validation.

2.0 HYDROGEOLOGIC WORKPLAN CHARACTERIZATION ACTIVITIES

Pursuant to U.S. Department of Energy Order 5400.1, the LANL "Groundwater Protection

Management Plan" was developed in 1995, which identified the need for site-wide hydrogeologic characterization. In the same year, NMED denied LANL's previously submitted groundwater monitoring waiver demonstrations. In a letter dated August 17, 1995, the NMED requested that LANL prepare a "Hydrogeologic Workplan." Hence, LANL began developing the "Hydrogeologic Workplan" (LANL, 1998) that, upon implementation, would collect data on the hydrogeologic setting. These data would be useful for making decisions regarding monitoring and environmental restoration using the Data Quality Objective (DQO) process. The workplan was approved by the NMED in March 1998.

The primary purpose of the "Hydrogeologic Workplan" is to gain an understanding of the hydrogeologic setting that is adequate to design a detection monitoring network capable of detecting water quality threats to the regional aquifer. As stated in the Executive Summary of the workplan, the expected outcomes of implementing the plan's activities are:

- A "refined understanding of the hydrogeologic framework at the Laboratory, including recharge areas, hydraulic interconnections, flow paths, and flow rates, synthesized by modeling simulations;
- Information sufficient either to design and implement a detection monitoring program that meets applicable requirements and/or to demonstrate that groundwater monitoring requirements can be waived; and
- Defined areas of existing or potential groundwater contamination, and the potential pathways of contaminant transport from the surface to the regional aquifer, with predictions of directions and rates of movement and risk based on modeling simulations."

A series of decisions established in the plan were intended to focus data collection activities on information important to a better understanding of the hydrogeologic regime as well as monitoring design. Areas with the highest potential for contaminant impacts are where hydrogeologic data collection is more focused. The potential pathways and rates of contaminant migration can be determined using the resulting data and analyses. One workplan objective is to identify areas of groundwater contamination. Determining the extent of contamination and risk posed by that contamination is conducted by LANL's ER Project because investigation of contaminant plumes is not within the scope of the "Hydrogeologic Workplan" (LANL, 1998).

The "Hydrogeologic Workplan" provides for an iterative process of gaining understanding from each activity, especially from installed wells. This iterative process is then used in guiding the

succeeding DQOs and the location and data collection of subsequent wells. Although the interpretive process is not as highly visible as data collection, it is equally as important as the well installation and data collection. A primary tool used to interpret data collected from drilling and testing in the wells is numerical modeling. When sufficient new data and data interpretation have been accomplished to change the conceptual understanding, the iteration process is conducted. The data collection and modeling reached a level of maturity in Fiscal Year (FY) 01 to allow iteration of the DQOs. The FY 01 DQO iteration process began with a comprehensive evaluation of all groundwater-related data collected, analyzed, and interpreted in the program at that time. This process resulted in a determination of what is known and what data are required to complete the scope of the workplan. The comprehensive evaluation and the FY 01 DQO process iteration resulted in proposed amendments to the scope of the workplan (LANL, 2001b).

Initially, 32 regional aquifer wells were proposed in the "Hydrogeologic Workplan". As of April 2002, 11 R wells have been installed. LANL's Groundwater Integration Team worked together to determine which of the remaining wells and other studies are still necessary to complete the scope of the workplan, and added new studies as appropriate to provide the data. The current proposed amendments to the "Hydrogeologic Workplan" scope include installing 15 more R wells, and eliminating 6 R wells. The proposed scope also includes 13 field-based activities, 11 analytical activities, and three project management activities.

In the "Hydrogeologic Workplan", the activities proposed to characterize the hydrogeologic setting beneath LANL and to enhance LANL's groundwater monitoring program are summarized by "aggregates". The aggregate boundaries were drawn to focus discussions and attention on specific areas of LANL that collectively contain numerous sources of potential contamination. However, the hydrogeologic characterization activities relevant to a particular aggregate are proposed within as well as outside the aggregate boundaries.

Aggregate 2, located in the east-central portion of LANL, is bounded on the north by Cañada del Buey, on the south by Pajarito Canyon, on the west by TAs 18 and 51, and on the east by the LANL boundary. Essentially, the boundary of Aggregate 2 was drawn to encompass the solid waste management units associated with TA-54. It includes Cañada del Buey, the middle reach of Pajarito Canyon, and Mesita del Buey, where TA-54 is located.

In the initial workplan, one R well (well R-16) was planned for installation in Cañada del Buey east of the Aggregate 2 boundary. The purpose of this proposed well was to provide stratigraphic and hydrologic control off site near the Rio Grande and to provide an off-site detection monitoring point downgradient of LANL activities. In addition, two R wells (well R-20 and well R-22) in Pajarito Canyon were proposed for Aggregate 2 to identify the presence of intermediate perched zones, measure the thickness of the zones, and analyze for the presence of contaminants within the zones that could indicate actively occurring contaminant transport. As noted in Section 1.6, well R-22 was installed in 2000 on the mesa top just east of the TA-54 disposal areas. The location of this well was changed from its original siting in Pajarito Canyon to determine if perched zones are present beneath Mesita del Buey and to better understand the hydrogeologic conditions just east of the disposal areas at TA-54. Other proposed R wells for Pajarito Canyon included wells R-17, R-18, and R-19, which would provide information about sources in other aggregates upgradient of Aggregate 2; they are not discussed further in this attachment. Also in the initial workplan, one R well (R-21) was proposed for installation on Mesita del Buey near MDA L. The purpose of this proposed well is to evaluate and monitor hydrologic and geochemical conditions in the regional aquifer beneath MDA L. Data from well R-21 will be compared to data from well R-20, just northwest of Aggregate 2, to evaluate migration of organic contaminants, potential pathway behavior, and potential contaminant movement toward supply well PM-2. Recently, it was determined that an additional well (well R-23) be included in Aggregate 2. Well R-23 is proposed to be located in Potrillo Canyon, approximately 3,700 ft south of Area G. This well will provide water-quality and water-level data for potential intermediate perched zones and the regional aquifer. It will also provide data that may be used to calibrate the potential for a southeasterly groundwater flow direction, evaluate recharge, and determine the presence of perched zones and the influence of the regional aquifer in the area of a hydrologic sink. It should be noted that the locations of the four additional R wells associated with Aggregate 2 (wells R-16, R-20, R-21, and R-23) are subject to change as the DQO iteration process continues.

3.0 REGIONAL AQUIFER HYDROLOGIC MODELING

A hydrologic model for the Pajarito Plateau beneath LANL is an important tool for protecting groundwater that could potentially be impacted by past Laboratory operations. The purpose of modeling the regional aquifer is two-fold. First, the model can be used to synthesize hydrologic, geochemical, and geologic data relevant to the regional aquifer. Second, the model can be

used to predict flow directions and velocities as well as technically defensible estimates of uncertainty in the predictions.

A numerical groundwater model for the Pajarito Plateau beneath LANL was developed in 1998 and has been refined continuously as new groundwater data are collected. From the detailed technical descriptions of the modeling efforts, a simplified description is presented in the following. The simplified description addresses the purpose of modeling, why the model code was selected, the elements of the conceptual model, and modeling calibration and results.

3.1 Introduction

In the dictionary, a "model" is defined as a "small representation of a planned or existing object". A numerical groundwater model has flow equations that represent the physical processes of water flowing through the subsurface. From the earth's surface, groundwater movement cannot be observed directly; therefore, numerical groundwater modeling is used as a tool to understand groundwater flow. In a simple sandy aquifer, it is possible to derive groundwater flow directions and velocities using water level data, pump test data, and pencil-and-paper calculations. In a geologically complex aquifer such as that which exists beneath the Laboratory, however, is it not feasible to derive flow directions and velocities from hydrologic data without the assistance of a computer model. In addition, models are useful in that they provide a range of plausible answers, using the available hydrologic data set and understanding of the varied character of the aquifer.

Development of a numerical groundwater model for the regional aquifer beneath the Laboratory was initiated in 1998 and has been continuously refined as new groundwater data are collected. The description presented herein of the modeling efforts has been greatly simplified from the detailed technical descriptions of the modeling efforts found in the reports in Keating et al. (1998, 1999, 2000, and 2001). The following sections describe the model code, conceptual model, flow model development, calibration, and sensitivity analyses. Accordingly, LANL intends to use groundwater models to aid in many decisions, such as where monitoring wells are best placed and what additional data are needed.

3.2 Purpose of Modeling

A hydrologic model for the Pajarito Plateau beneath the Laboratory is an important tool for protecting groundwater that could be impacted by past Laboratory operations. The purpose of modeling the regional aquifer is two-fold: (1) to synthesize hydrologic, geochemical, and

geologic data relevant to the regional aquifer; and (2) to predict flow directions and velocities, along with technically defensible estimates of uncertainty in those predictions.

There are at least three modes of groundwater beneath the Pajarito Plateau: (1) groundwater in alluvium in some canyons; (2) perched intermediate groundwater (groundwater above a less permeable layer that is separated from the underlying groundwater by an unsaturated zone at intermediate depths (150-400 ft); and (3) the regional aquifer, which is separated from the upper groundwater by hundreds of ft of tuff, basalts, and volcanic sediments in the western portion of the Laboratory, with the vadose zone becoming thinner to the east. The regional aquifer beneath the Pajarito Plateau provides the community and Laboratory water supply.

Hydrologic models have two parts that work together: the conceptual model and the numeric model. The conceptual model is the synthesis of all the known geologic and hydrologic data, which provides the estimated input parameters for the numeric model. The numeric model uses mathematical equations to translate the rock and water properties to numbers. A model is "calibrated" when the numbers that result from the numeric model match reasonably well to actual observations (e.g., water levels in wells). The process of calibrating a model involves revising the conceptual and numeric models consistent with the known data until there is reasonable match between model outputs and observed data. After calibration, the regional aquifer model is used for sensitivity analyses. Sensitivity analyses are a tool to evaluate the uncertainty of the model by testing how much each of the inputs affects the outcome of the model. Those inputs that have a big effect on the model outcome are considered "sensitive" and the input values should be based on appropriate site-specific data. Those inputs that do not affect model outcomes are "insensitive" and are not as important to site-specific data.

3.3 Model Code Selection

The numeric model is the computer code that runs calculations with the input parameters provided. The numeric model selected by the Laboratory is the Finite Element Heat and Mass (FEHM) computer code. It was developed at the Laboratory for the High-Level Radioactive Waste Repository Program. It simulates the flow of water and air and the transport of heat or substances in water through saturated or partially saturated rock. It can simulate flow or transport in either 2-dimensions or 3-dimensions. It was selected because it has been rigorously tested and certified for use in radioactive waste disposal and because its capabilities match the specific investigation needs at the Laboratory. For example, FEHM can be used for both unsaturated and saturated flow modeling, both of which are important at the Laboratory. This

computer code is publicly available from LANL.

At the outset of the modeling effort, the decision was made to develop a regional-scale model of the Española Basin. Modeling the Española Basin was selected as a platform for the Pajarito Plateau model as it would incorporate all the existing hydrogeologic information and aquifer stress data in terms of water supply wells and streams. The large areal extent of an Española Basin model also allowed use of simulated data for boundary conditions that were needed for the Pajarito Plateau model. Obtaining distant, but accurate, boundary conditions improves the overall accuracy and reliability of the model.

The Pajarito Plateau-scale model grid was developed using the Octree Mesh Refinement methods to embed a high-resolution zone within the relatively coarse Española Basin grid. The grid is better suited to capture site-scale flow and transport processes in areas of interest, while allowing boundary conditions from the Española Basin-scale model to be applicable without adversely affecting the computation time or the computer memory required to run the model. The smaller-scale model uses calculated values of head and flux from the large model to define boundary conditions in the smaller-scale model. The grid spacing in the Pajarito Plateau portion of the model is finer grid spacing than the Española Basin-scale model (Table 1).

3.4 Conceptual Model of Flow

The conceptual model that is the basis of the regional aquifer modeling efforts extends throughout the Española Basin. Elements of the conceptual model are the **boundaries** of the model, the **hydraulic gradient**, **aquifer properties**, **recharge**, and **discharge**.

The **boundaries** of the model are based on the physical boundaries of the regional aquifer within the Española Basin. The basement rocks and surrounding uplifts and mountains that define the Española Basin also define the aquifer boundaries in the model. In the model, the aquifer boundaries are areas where there is expected to be little flow because the aquifer material does not extend beyond the boundary. The exception is the La Bajada Fault, which forms the southern boundary of the model area. Others (Kernodle et al., 1995) have estimated the flow across the La Bajada fault. The Española Basin is a low area bounded by high areas:

- Sangre de Cristo Mountains on the east
- Nacimento uplift to the west
- La Bajada Fault on the south

- To the north, the Brazos uplift and Picuris Range
- Lower boundary is the basement rocks of the Española Basin, which are metamorphic rocks that can also be seen in the Sangre de Cristo Mountains
- The upper boundary is the water table of the regional aquifer.

Of the boundary conditions, the upper boundary is considered the most important because that is where all the recharge occurs. The other boundaries represent hydrologic divides, where little water enters or exits the basin. The upper boundary surface is the water table of the regional aquifer. The grid nodes on the upper boundary surface are assigned one of three kinds of boundary conditions. The first kind of boundary condition is for nodes that occur in one of the major rivers (Rio Grande or Rio Chama). The boundary condition for the nodes in the rivers allows water to either flow into or out of the river, depending on if the water table is higher than (water flows out of the aquifer into the river) or lower than (water flows out of the river and into the aquifer) the river. The elevation of the river grid nodes was set at the elevation of the river.

The second kind of boundary condition for the upper model boundary is the higher elevation where recharge occurs. These grid nodes are set to allow a specific amount of water into the regional aquifer. The amount of water at each grid node was calculated based on the elevation of the land surface. This approach was taken because a graph of actual precipitation measurements at stations of different elevation in the Española Basin shows a linear relationship - the higher the elevation, the higher the precipitation. It was also assumed that the percent of precipitation reaching the water table increases with increasing elevation. This assumption is based on the observation that at higher elevations, the temperature and vegetation cover are both less, so the evaporation and transpiration (use of water by plants) are both expected to be lower; thus, more water is available to infiltrate the ground surface. In the numerical model, for every node above the threshold elevation of 6,000 ft (the elevation at which evaporation is greater than precipitation, so no water recharges), the amount of precipitation assumed was based on the linear trends of increasing precipitation and infiltration with elevation.

The third type of boundary condition on the upper boundary of the 1998 model were assigned to nodes that had elevation of less than 6,000 ft and were not in the river channels. These nodes were assigned a no-flow condition, because water is not expected to enter or exit the regional

aquifer in these areas.

The northern and southern lateral model boundary conditions near the rivers are set to allow flow into or out of the model and the water levels are specified values. The values that are specified for these boundary grid nodes are based on the elevation of the water table at the surface for surface grid nodes; for the grid nodes beneath the surface, the value assigned is calculated assuming a hydrostatic pressure gradient. The amount of water flowing in along the northern boundary of the model is initially taken from estimates of water from the San Luis basin to the north (Coon and Kelly, 1984). Along the southern boundary, the amount of water exiting the Española Basin to the south was based on estimates by Kernodle et al. (1995) and Frenzel (1995).

The majority of the remaining boundaries were assigned no-flow boundary conditions:

- The crest of the Sangre de Cristo Mountains on the eastern model edge
- The top of the Sierra de los Valles (east of the Jemez Mountains geothermal field and west of the Pajarito Fault zone) on the western model edge
- Top of the Brazos and Picuris ranges
- The Española Basin basement at the base of the model.

The topographic divides (Sangre de Cristo, northern ranges, and Sierra de los Valles) are assumed to approximate the hydrologic divides. However, the actual location of the groundwater divide on the western edge of the Española Basin is unknown and must be evaluated further. The grid nodes are assigned no-flow boundary conditions. Although some water may flow through the basement, the contrast between the overlying sediments filling the basin and the metamorphic rocks is expected to be big enough that water will not enter the materials below the basement.

There are two components of **hydraulic gradient**: horizontal and vertical. The horizontal hydraulic gradient is determined by the water levels that have been measured in wells throughout the basin. The vertical gradient is determined by measuring the water levels at different depths in the aquifer. The horizontal hydraulic gradients at the Española Basin scale are fairly well known and show that the flow of water is generally from the high areas on the east and west of the basin toward the Rio Grande in the center of the basin. The horizontal gradients for the Pajarito Plateau are shown in Table 2. On the Española Basin scale, vertical upward gradients have been reported in several wells fields near the Rio Grande (Buckman,

lower Los Alamos, and Santa Clara Pueblo, Tesuque Pueblo). On the Pajarito Plateau, vertical gradients have been measured in a number of wells. The measured vertical gradients are shown in Table 3.

The **aquifer properties**, primarily permeability, are assumed to be controlled by the geologic characteristics of the rocks. The Española Basin gradually accumulated sedimentary rocks formed by sediments eroded from surrounding high areas and volcanic rocks erupted from different volcanic centers. The sedimentary rocks generally contain the regional aquifer within the Española Basin. For the regional aquifer model, 20 layers representing different types of rock units (hydrostratigraphic zones) were used (Table 4). In addition, vertically-oriented hydrostratigraphic units representing fault zones were included in the model. Each layer was assigned hydraulic properties based largely on hydrologic data that have been collected and the geologic character of the layer where no data are available.

Aquifer **recharge**, the amount of water entering the aquifer, is a generalized recharge model, assuming that the first order control on recharge rates is elevation. The conceptual model of recharge is that most water recharging the aquifer originates in stream channel bottoms. For major channels in the basin, this is modeled explicitly. However, for most of the model domain, recharge is applied uniformly within any given elevation range ("diffuse" recharge), making no distinction between canyons and mesas. This effectively "spreads" the focused recharge occurring in canyon bottoms over a larger area. This approximation is appropriate for estimating the total amount of water recharging the system in various elevation ranges, for estimating baseflow discharge to rivers, and for estimating hydraulic gradients in the regional aquifer at scales of kilometers.

Groundwater **discharge** to rivers is an extremely important constraint on the regional aquifer model. Surface water flow data from twelve rivers in the basin are used to determine the baseflow. Quantified downstream increases in baseflow are attributed to regional aquifer discharge.

3.5 Regional Aquifer Modeling Calibration and Results

The regional aquifer model has been calibrated in two modes: steady-state and transient. Since 1945, the water levels in the Pajarito Plateau area have declined due to extensive development of the aquifer. The steady-state mode is calibrated using "pre-development" data, prior to 1945. There are pre-development data from 93 wells basin-wide, 34 of which fall within the Pajarito

Plateau sub-model. The transient mode is calibrated using transient drawdown due to pumping in 14 wells. The transient data are available for every year since 1945. The transient simulations were done in 10-year time steps, so the 10-year average pumping rates were derived from the annual pumping data for all the wells in the Pajarito Plateau sub-model.

Both the steady-state Española Basin model and the Pajarito Plateau sub-model provided reasonable simulation of head and flux measurements. The calibrated steady-state model was used for inverse calculations to estimate model parameters. The steady-state Española Basin inverse model was used to estimate 37 model parameters: 3 recharge and 34 permeability. This process suggested that the permeabilities of the two largest hydrostratigraphic units in the basin are well constrained. However, estimates for several smaller units are poorly constrained. The steady state Pajarito Plateau inverse sub-model estimated 20 model parameters: 3 recharge and 17 permeability. The sub-model and basin-scale model results were very similar; the largest discrepancies are for two relatively small hydrostratigraphic units. For one of these, the sub-model estimate was closest to pump test data; for the other, the sub-model estimate was farthest from the pump test data.

The addition of transient observations in the inverse process greatly decreased the uncertainty of estimated parameters. For the sub-model, the transient observations allowed an improved steady-state flux and water level matches. A comparison of the steady-state to the steady-state plus transient estimates shows that the major changes are associated with the permeability of the two potentially important hydrostratigraphic units. The uniform specific storage estimated by the transient inverse model is close to the independent estimates derived from hydraulic testing.

The results of the regional aquifer model are a refined water level map and estimates of flux across the boundaries, as presented in Keating et al. (2000). Vadose zone modeling at TA-54 will be used as inputs into the regional aquifer modeling (e.g., recharge estimates) to determine the fate of contaminants from a source at TA-54, if any, in the regional aquifer.

Table 1: Grid Spacing in Española Basin-scale Model and the Pajarito Plateau Portion of the Model				
Model	**North- South (X)**	**East-West (Y)**	**Vertical (Z)**	**# Nodes**
Española Basin-scale model	1000 m	1055 m	50 m above 1300 m depth	277,951
	1000 m	1055 m	500 m below 1300 m depth	
Pajarito Plateau portion	250 m	264 m	12.5 m above 1550 m elevation	172,741
	250 m	264 m	50 m above 1100 m depth	
	250 m	264 m	500 m below 1100 m depth	

Table 2: Horizontal Gradients on the Pajarito Plateau

Upgradient Well	Water Level Elevation (m)	Down-gradient Well	Water Level Elevation (m)	E-W Distance (m)	Gradient (m/m)
R-25	1836	CdV-15-3	1833	2189	0.02884
CdV-15-3	1833	R-19	1795	4710	0.02149
DT-10	1805	R-22	1747	5195	0.01121
R-15	1785	R-12	1738	3684	0.01283

Table 3: Vertical Gradients on the Pajarito Plateau

Well	Vertical Gradient	Comment
R-19, screen 6	0.08	weakly upward
R-19, screen 7	0.28	weakly downward
R-25, screen 3	1.72	strongly downward
R-25, screen 4	0.86	weakly downward
R-25, screen 5	1.10	downward
R-25, screen 6	0.15	weakly downward
R-25, screen 7	0.13	weakly downward
R-25, screen 8	0.13	weakly downward
CdV-15-3, screen 6	0.02	weakly upward
R-31, screen 3	0.01	nearly neutral
R-31, screen 4	0.01	nearly neutral
R-31, screen 5	0.02	nearly neutral
R-22, screen 2	0.07	nearly neutral
R-22, screen 3	0.14	weakly downward
R-22, screen 4	0.11	weakly downward
R-9/PM-1	0.05	weakly upward
R-9/O-1	0.03	weakly upward
TW-3/O-4	0.05	weakly upward
TW-1/O-1	0.10	weakly downward

Table 4:	**Hydrostratigraphic Units**		
Rock Type	**Hydrostratigraphic Layer**	**Volume (10^{10} m^3)**	**Permeability (m^2)**
Crystalline Rock	Deep Basement (Precambrian	400.8	5.00×10^{-16}
	Fractured Paleozoic/Mesozoic	214.2	
	Paleozoic/Mesozoic	181.7	2.00×10^{-17}
	Cerros del Rio Basalts	0.4	1.00×10^{-15}
	Cerros del Rio Basalts - southern	2.2	1.00×10^{-16}
	Tschicoma Formation	57.1	7.10×10^{-16}
Fault Zones	Pajarito	17.6	2.13×10^{-15}
	Agua Fria	0.1	4.49×10^{-15}
Sedimentary Rocks	Santa Fe Group east	47.4	2.07×10^{-13} horizontal 2.07×10^{-15} Vertical
	Santa Fe Group west	171.2	1.4×10^{-13} horizontal 1.4×10^{-15} Vertical
	Ancha Formation	3.4	1.34×10^{-13} horizontal 1.34×10^{-15} Vertical
	Santa Fe Group north	90.3	1.50×10^{-14}
	Ojo Caliente sandstone	61	2.20×10^{-14}
	Peñasco Embayment	38.5	4.67×10^{-13}
	Santa Fe Group - deep	162.4	1.21×10^{-14}
	Santa Fe Group- near airport	8.2	1.00×10^{-11} horizontal 1.00×10^{-13} Vertical
	Santa Fe Group - Chaquehui Formation	2.6	1.00×10^{-13}
	Puye - fanglomerate	0.4	2.38×10^{-13}
	Puye - totavi lentil	0.5	1.00×10^{-13}
	Bandelier Tuff	0.1	3.95×10^{-14}
Total Model Volume		**1620**	

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ATTACHMENT C

NATURE AND EXTENT OF RELEASES AND PRESENT-DAY RISK ASSESSMENT FOR TECHNICAL AREA 54, MATERIAL DISPOSAL AREA L

NATURE AND EXTENT OF RELEASES AND PRESENT-DAY RISK ASSESSMENT FOR TECHNICAL AREA 54, MATERIAL DISPOSAL AREA L

A Resource Conservation and Recovery Act Facility Investigation was conducted at Technical Area 54, Area L, from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases. The most recent information on the nature and extent of contamination at Material Disposal Area L is summarized in this attachment. The report also addresses the assessment of present-day risks. The information in this attachment is submitted as a portion of the response to the December 21, 2001, letter from James P. Bearzi (Chief, New Mexico Environment Department Hazardous Waste Bureau) to Dr. John C. Browne (Director, Los Alamos National Laboratory) and Mr. David A Gurulé (Area Manager, Department of Energy Los Alamos Area Office).

SWMU 54-006	Material Disposal Area (MDA L) (all subsurface units such as Pit A, SI B,C,D, Shafts 1-28, 29-34)
Administrative Authority NMED	Former Operable Unit OU 1148
Technical Area TA-54	Dates of Operation 1959-1986
Has ER Sampled the Site? Yes	ER Remedial Action Conducted? No
Structure Number N/A	Other Remedial Action Conducted? No

Unit Description

SWMU 54-006 (also called MDA L) is included in Module VIII of LANL's Hazardous Waste Facility Permit. Area L is a 2.5-acre fenced area that includes MDA L, which consists of 1 subsurface disposal pit (pit A); 3 subsurface treatment and disposal impoundments (impoundments B, C, and D); and 34 disposal shafts (shafts 1 through 34). Only impoundments B and D and shafts 1, 13-17, and 19-34 (although no longer in use) are considered active impoundments until RCRA closure is certified and approved. The entire fenced surface area of Area L is an active RCRA-permitted hazardous waste management unit.

Disposal pit A is located in the eastern portion of Area L beneath Dome 54-215. The pit is 200 ft long x 12 ft wide x 12 ft deep. It received chemical waste from the late 1950s until December 1978. Initial waste disposal practices included disposal of uncontainerized chemical wastes and liquids in drums without added sorbents. The pit also was used as an evaporative pit. Pit A was filled with waste to within approximately three feet of the surface between 1964 and 1978, and then was covered with crushed, consolidated tuff.

The three surface impoundments (impoundments B, C, and D) are located northwest of pit A. Impoundment B was excavated in 1978 and is 60 ft long x 18 ft wide x 10 ft deep. It had a capacity of 7,560 ft^3 and operated from January 1979 to June 1985 to evaporate treated salt solutions and electroplating wastes. Impoundment C was closed in 1978. This impoundment, which is 35 ft long x 12 ft wide x 10 ft deep, was used for the same disposal purposes as impoundment B. Impoundment C had a capacity of 2,940 ft^3. Impoundment D is approximately 75 ft long x 18 ft wide x 10 ft deep and had a capacity of 9,450 ft^3. It was used to treat small quantities of lithium hydride by reaction with water. This practice began in 1972 and was discontinued in 1984. Impoundment D later was used as secondary containment for used oil storage tanks (see SWMU 54-021). The capacities of the impoundments were calculated assuming they were filled to within three feet of the surface. All three impoundments are covered with crushed tuff followed by asphalt.

The 34 disposal shafts at MDA L were drilled directly into the subsurface tuff. Shafts 1 through 28 are located south of pit A. Shafts 29 through 34 are located northwest of impoundments B, C and D. Three feet of crushed tuff were placed in the bottom of each shaft to fill cracks and joints. The shafts range from 15 ft to 65 ft deep and vary in diameter from 3 ft to 8 ft. Groups of shafts were constructed as needed. When in use, the shafts were covered with a steel cap that could be opened or removed, depending on design, to allow placement of waste. The operational dates of the shafts vary, but collectively the shafts were operated from February 1975 to December 1985. The shafts were used to

dispose of containerized and bulk liquid chemical wastes. Before 1982, containerized liquids were disposed of without adding absorbents to the containers. Space around the drums was filled with crushed tuff and a 6-in. layer of crushed tuff was placed between each layer of drums. After 1981, uncontainerized waste was no longer disposed of in the shafts. From 1982 to 1985, wastes were accumulated on the site and packaged in drums until a sufficient quantity had accumulated to put the drums in a shaft. When filled, the shafts were covered with a concrete plug, approximately 3 ft thick.

Early disposal practices at MDA L resulted in a subsurface volatile organic vapor plume that extends beneath the facility and beyond its boundary. Several previous investigations have taken place at MDA L. Since 1982, channel sediments have been collected from permanent stations in the main drainages surrounding TA-54 to monitor the potential transport of radionuclides by stormwater run-off. In 1985, NMED issued a compliance order to LANL that required pore-gas characterization at MDAs G and L. Nine boreholes were drilled between 1985 and 1988 to monitor the subsurface VOC plume. Analytical data from the pore-gas monitoring shows that 1,1,1-trichloroethane is the primary plume constituent; it is present to at least 200 ft below the mesa surface; and concentrations vary across the plume. In 1986, additional boreholes were drilled to measure air permeability in the tuff. The data were used to evaluate the nature and extent and fate and transport of subsurface contamination at MDA L.

The ER Project conducted RFI fieldwork at MDA L from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases.

The RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport and, if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment run-off from the four MDAs. Fourteen drainage channels originate near MDA G, and the other three MDAs each have only one significant drainage channel. Sample locations were selected within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for alpha, beta, and gamma radiation. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that had no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape

condition for potential receptor access. Each MDA-related drainage was determined not to be an ecological concern because there was little receptor access. The channel sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

An RFI report for MDAs G, H, and L was issued in 2000 to: (1) document the fieldwork and evaluate the potential human health and ecological risks posed by known and projected releases and exposures; (2) recommend (as necessary) additional investigation at TA-54 to reduce uncertainties associated with potential human health and ecological impacts; and (3) evaluate the need for near- and/or long-term corrective measures to reduce present-day and/or potential future risk. The RFI focused on identifying COPCs and developing a conceptual model for their fate and transport. In identifying COPCs, data of sufficient quality were compared with applicable thresholds (i.e., BVs) for inorganic chemicals, BVs and/or FVs for radionuclides, and instrument DLs for organic chemicals. Where data were not clearly less than the applicable threshold, analytes were retained as COPCs. Information used to develop the conceptual model for MDA L includes both non-ER and ER Project RFI data. RFI fieldwork at MDA L included the collection and analysis of 4 drainage sediment samples, 172 core samples from 16 boreholes, 268 VOC surface flux samples, 239 tritium surface flux samples, and 16 ambient air samples. The sediment samples were analyzed for inorganic chemicals, cyanide, PCBs/pesticides, radionuclides, and tritium. The ambient air samples were analyzed for VOCs. The core samples were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs/pesticides, cyanide, and radionuclides. The RFI data were supplemented by environmental surveillance surface water data, VOC emissions data from passive extraction tests, and quarterly VOC pore-gas monitoring samples. Analytical results showed the presence of tritium at elevated levels in the ambient air flux samples and the subsurface tuff samples and organic chemicals in the subsurface and ambient air samples, which indicated a subsurface release. The primary VOCs identified are 1,1,1-trichloroethane and trichloroethene. Barium, copper, chromium, nickel, uranium, and zinc were detected at concentrations greater than BVs in subsurface tuff samples. The pesticide methoxychlor is present at concentrations below SAL in site sediments.

Evaluation of site data indicates that the known sources of environmental contamination at MDA L are vapor-phase tritium and VOC releases from the subsurface units and releases of metals dissolved in liquid solvents into the tuff below the subsurface units. Environmental transport pathways supported by data analysis are resuspension and dispersion in air and sediment transport in surface water for surface soil and sediment contaminated with methoxychlor (source unknown); diffusion in pore gas and dispersion in air for vapor-phase tritium and VOCs; and transport of dissolved metals, followed by sorption onto minerals and solid phases in tuff.

Present-day risks posed by MDA L to human and ecological receptors were characterized using a human health risk assessment and an ecological screening assessment. The risk assessment presented in the preliminary RFI report concluded that surface contamination at the site posed no unacceptable present-day risk to human health. No radionuclides or

inorganic chemicals were detected in sediment samples collected at the site. Methoxychlor was detected but at concentrations similar to those found to pose no unacceptable present-day risk at MDA G. Results of ambient air risk assessment for VOCs indicated carcinogenic risks that were about equal to or below the lower end of EPA's acceptable risk range. Potential doses from tritium are below those shown to pose an acceptable risk in the MDA G risk assessment. The ecological screening assessment found that chemicals did not have the potential to cause adverse ecological impacts to receptors at MDA L. The results of the present-day risk assessment indicate that no action is necessary to address exposure of on-site workers to VOCs or tritium in air at MDA L. The risks, dose, and hazards associated with exposure to soil contaminants at MDA L were lower than those from exposure to VOCs and tritium in air and were below acceptable limits. The present-day ecological risk screening assessment at MDA L indicated no COPECs.

Quarterly pore-gas sampling of the vapor phase VOC plume at MDA L is ongoing; sampling results are reported in the ER quarterly reports. At the request of NMED, the RFI report for MDA L is being rewritten to incorporate additional recent information on the nature and extent of contamination.

References

RFI Report for Material Disposal Areas G, H, and L at Technical Area -54 LA-UR Number: 00-1140

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 LA-UR Number: No LA-UR

RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) LA-UR Number: 96-0110

Proposed Action Plan Drilling Near Area [MDA] L, TA-54, OU 1148 LA-UR Number: No LA-UR

RFI Work Plan for Operable Unit 1148 LA-UR Number: 92-0855

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
Operator

4/25/02
Date Signed

E. Dennis Martinez
Acting Director
U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
Owner/Operator

4/25/02
Date Signed

ATTACHMENT I

CLOSURE/POST-CLOSURE PLAN
FOR THE TECHNICAL AREA 54
AREA G LANDFILLS
(PIT 29 AND SHAFT 124)

CLOSURE/POST-CLOSURE PLAN
FOR THE TECHNICAL AREA 54
AREA G LANDFILLS
(PIT 29 AND SHAFT 124)

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ATTACHMENT	TITLE
A	MDA G: Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities
B	Geology, Hydrology, and Groundwater Characterization at Technical Area 54, Area G
C	Nature and Extent of Releases and Present-Day Risk Assessment for Technical Area 54, Material Disposal Area G

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
40 CFR	Code of Federal Regulations, Title 40
cm	centimeter(s)
CMS	RCRA Corrective Measures Study
COC	contaminant(s) of concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ET	evapotranspiration
ft	feet (foot)
ft^3	cubic foot/feet
FY	Fiscal Year
LANL	Los Alamos National Laboratory
m	meter(s)
MDA	material disposal area
NMED	New Mexico Environment Department
OLASO	Office of Los Alamos Site Operations
R	regional aquifer
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	solid waste management unit
SWRC	Solid Waste and Regulatory Compliance Group
TA	technical area
TRU	transuranic

LIST OF ABBREVIATIONS/ACRONYMS (Continued)

VOC	volatile organic compound
yd^3	cubic yard(s)

CLOSURE/POST-CLOSURE PLAN FOR THE TECHNICAL AREA 54 AREA G LANDFILLS (PIT 29 AND SHAFT 124)

This closure/post-closure plan describes the activities necessary to achieve closure and post-closure of the Area G landfills at Los Alamos National Laboratory (LANL) Technical Area (TA) 54. The Area G landfills are comprised of two "active units," identified as Pit 29 and Shaft 124, which received hazardous waste after November 19, 1980. Hereinafter, the phrase "Area G landfills" is used to denote these active units. The Area G landfills are also "regulated units," as defined by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 264.90(a)(2), revised June 14, 2000 [6-14-00]. The information provided in this plan is submitted to address the applicable closure and post-closure requirements specified in 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts F and G; and 20.4.1 NMAC § 264.310 [6-14-00].

The Area G landfills are located within the TA-54 Area G waste storage facility, which will continue to operate. The Area G landfills will be closed in place without removing the waste and is co-located with solid waste management units (SWMU) managed under the LANL corrective action program. The closure and post-closure activities for the Area G landfills will be addressed as allowed by the alternative requirements of 20.4.1 NMAC § 264.110(c) to meet closure and post-closure care requirements. Alternative requirements are discussed further in Sections 1.3 and 3.2. Closure of the landfills will ensure that the wastes and/or waste residues that remain in place are stabilized, and will include constructing landfill covers, as described in Section 2.0 of this plan. The covers will minimize the need for further maintenance and be protective of human health. Post-closure care will include monitoring, maintenance, and reporting, as described in Section 4.0 of this plan. These activities will occur in conjunction with and subject to the investigation and potential remediation efforts of the LANL corrective action program, as allowed by the alternative requirements process. Therefore, the final remedy for the Area G landfills will be part of the corrective measure for Area G as a whole when operations cease and will be implemented in accordance with the Corrective Action Chapter of this permit. An aid in demonstrating the proposed corrective action activities that will meet the applicable post-closure requirements for the regulated units at Material Disposal Area (MDA) G is presented in Attachment A (MDA G: Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities) of this plan.

A document titled "Closure and Post-Closure Plans for TA 54-Area G Landfill at Los Alamos National Laboratory" was submitted to the New Mexico Environmental Improvement Division

(precursor to the New Mexico Environment Department [NMED]) in September 1985 (LANL, 1985). This closure/post-closure plan is a revision to the previous plan.

This plan for the Area G landfills is organized as follows:

- General closure information (Section 1.0).
- Specific closure information (Section 2.0).
- General post-closure information (Section 3.0)
- Specific post-closure information (Section 4.0)

Until closure is complete and has been certified in accordance with 20.4.1 NMAC § 264.115 [6-14-00], as discussed in Section 1.7, a copy of the approved closure/post-closure plan and any approved revisions will be on file at LANL's Solid Waste and Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy (DOE) Office of Los Alamos Site Operations (OLASO). Until final closure of the entire LANL facility, a copy of the approved plan will be furnished to the Secretary of the NMED, upon request, in accordance with 20.4.1 NMAC § 264.118(c) [6-14-00].

1.0 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H; and 20.4.1 NMAC § 264.310 [6-14-00], as applicable.

1.1 Partial and Final Closure Activities [20.4.1 NMAC § 264.112(d)]

Partial Resource Conservation and Recovery Act (RCRA) closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. This partial closure will consist of closing the Area G landfills, while leaving the other units at LANL in operation. Partial closure (hereinafter referred to as closure) will be deemed complete when closure in place has been verified, alternative requirements to meet post-closure care requirements have been implemented, the closure certification has been submitted to the NMED, and the NMED has approved the closure.

As described in the proposed General Closure Plan submitted to the NMED in November 2001, final RCRA closure of the entire LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of

assembling documentation on the closure status of each unit, including all previous partial clean closures as well as land-based units that have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED and the NMED has approved the final closure.

1.2 Closure Performance Standard [20.4.1 NMAC § 264.111]

The Area G landfills (Pit 29 and Shaft 124) will be closed to meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G and 20.4.1 NMAC § 264.310 [6-14-00].

To meet the above closure performance standards and the closure requirements in 20.4.1 NMAC § 264.310(a), the planned covers on the specified pit and shaft that comprise the Area G landfills will be designed and constructed to:

- Provide long-term minimization of migration of liquids through the closed units
- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the covers
- Accommodate settling and subsidence so that the integrity of the covers is maintained, and
- Have a permeability that is less than or equal to the permeability of the natural subsoils present.

1.3 Closure Activities and Alternative Requirements

Closure activities for the Area G landfills will be addressed under alternative requirements, pursuant to 20.4.1 NMAC §264.118(b)(4). This allowable option is defined in 20.4.1 NMAC § 264.110(c) when a regulated unit is located among other SWMUs, releases potentially originating from both the regulated unit and the SWMUs have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. At Area G, the pit and shaft identified as the regulated units are in close proximity to (i.e., co-located with) similar disposal units (consolidated as SWMU No. 54-013[b]-99) to be addressed under the LANL

corrective action program. A subsurface volatile organic compound (VOC) vapor-phase plume was detected in the vadose zone and has been monitored at MDA G since the mid-1980s. U.S. Environmental Protection Agency (EPA) guidance for the rule (EPA, 1998) discusses the transfer of the closure and post-closure process to the facility corrective action process (contained in the Corrective Action Chapter of this permit) as an appropriate mechanism to address this situation.

Closure of the Area G landfills will ensure that the existing covers and wastes and/or waste residues that remain in place are stabilized, and will include constructing covers, as described in Section 2.0. The covers will minimize the need for further maintenance and be protective of human health. The covers will be constructed to be consistent with the corrective action process for TA-54, Area G, pending completion of the RCRA Facility Investigation (RFI).

If the RFI indicates that further corrective measures at MDA G (including modification to the covers) are deemed necessary to protect human health and the environment, they will be analyzed, selected, and implemented according to the requirements of the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility Permit and the most current and approved Installation Work Plan for the Environmental Restoration (ER) Project.

1.4 Closure Schedule [20.4.1 NMAC § 264.112(b)(6)]

Written closure plans are required for owners and operators of a hazardous waste management facility, pursuant to 20.4.1 NMAC § 264.112(a)(1). In addition, the plan must be submitted with the permit application and approved by the Secretary of the NMED as part of the permit issuance procedures under the Code of Federal Regulations, Title 40 (40 CFR), Part 124.

In accordance with 20.4.1 NMAC § 264.112(d)(1), written notification must be provided to the Secretary of the NMED at least 60 days prior to the date on which final closure of the landfills is expected to begin. Closure will be conducted in accordance with the schedule presented in Table 1. In the event that the closure of the Area G landfills is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC § 264.113(b) [6-14-00].

1.5 Amendment of the Closure Plan [20.4.1 NMAC § 264.112(c)]

In accordance with 20.4.1 NMAC § 264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan
- There is a change in the expected year of closure
- Unexpected events occur during closure that require modification of the approved closure plan
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC §§ 264.90(f) and/or 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

1.6 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00] to provide a cost estimate, financial assurance mechanism, and liability insurance for closure actions.

1.7 Closure Certification [20.4.1 NMAC § 264.115]

Within 60 days after completion of closure activities for the Area G landfills, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC § 264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both the DOE/OLASO and the SWRC Group.

1.8 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the Area G landfills will be maintained by the DOE or another authorized federal agency for as long as necessary to prohibit public access. The security fence at TA-54 will be maintained to ensure that public access into Area G is prevented.

1.9 Closure Report

Upon completion of the closure activities at the Area G landfills, a closure report will be prepared and, upon request, provided to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section 1.7 of this plan
- A general summary of closure activities
- Any significant variance from the approved activities and the reason for the variance
- A summary of any sampling data associated with closure
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data)
- Storage or disposal location of hazardous/mixed waste resulting from closure activities
- A certification of accuracy of the report.

1.10 Survey Plat [20.4.1 NMAC § 264.116]

LANL intends to meet closure/post-closure requirements by implementing alternative requirements allowable under 20.4.1 NMAC § 264.110(c): leaving waste in place; ensuring waste/waste residues are stabilized; and performing the activities described in Sections 3.0 and 4.0. A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. A survey plat indicating the location and dimensions of Pit 29 and Shaft 124 at MDA G with respect to permanently surveyed benchmarks will be submitted to the local zoning authority (i.e., Los Alamos County) and to the NMED at the time of submission of the certification of closure. The plat will be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority will contain a prominently displayed note, which states the obligation of LANL and DOE to restrict disturbance of the unit in accordance with the applicable regulations in 20.4.1 NMAC, Subpart V, Part 264, Subpart G.

2.0 SPECIFIC CLOSURE INFORMATION

This section provides a general description of TA-54, Area G, and MDA G. It also presents a more detailed description of the Area G regulated units, as defined in 20.4.1 NMAC § 264.90(a)(2), and includes a discussion of the wastes in and the maximum capacities of the specified pit and shaft. In addition, specific closure information for the pit and shaft is presented herein. LANL does not currently intend to reduce the areal extent or the design capacities of the container storage units at Area G during the active life of those units. The most recent estimated annual quantities for the waste storage units at Area G are provided in the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0/0.1/1.0/2.0 (LANL, 2001). A description of the geology, hydrology, and groundwater characterization at TA-54, Area G, is presented in Attachment B of this plan. Attachment C of this plan presents information on the nature and extent of releases at MDA G, as well as a brief assessment of present-day risk.

2.1 TA-54 Description

TA-54 is located on top of Mesita del Buey, an east-west trending mesa that is bordered on the north by Cañada del Buey and on the south by Pajarito Canyon. The elevation at TA-54 is approximately 6,800 feet (ft). TA-54 is used primarily for waste management. It includes four MDAs (one each at Areas G, H, J, and L) (Figure 1), hazardous/mixed waste storage and treatment areas, and numerous supporting offices. The Radioassay and Nondestructive Testing Facility is located in the western part of TA-54 (TA-54 West).

2.2 Area G and MDA G Description

Area G is an approximately 100-acre site in the east-central portion of TA-54. It is surrounded by an 8-ft-high chain-link security fence with razor wire at the top. The fence is inspected weekly and repairs made, if necessary. Access to Area G is controlled with a gate, with entrance to the area restricted to authorized and/or escorted personnel. In 1957, MDA G was developed as a radioactive waste landfill. This waste disposal site was selected due to the favorable hydrogeological characteristics, and is the only currently operating site for solid radioactive waste disposal at LANL. MDA G at Area G occupies approximately 63 acres (Figure 2). Land disposal in Pit 29 and Shaft 124 at MDA G was conducted in the mid-1980s. Pit 29 was designated as SWMU No. 54-018, and Shaft 124 was designated as SWMU No. 54-020. Both have been consolidated as SWMU No. 54-013(b)-99. Disposal of RCRA hazardous waste no longer occurs at MDA G. It is anticipated that radioactive waste disposal operations will continue at MDA G while LANL proceeds to meet its current mission. Area G is also presently used for radioactive and mixed waste storage in surface structures.

Near Area G, Cañada del Buey and Pajarito Canyon are roughly 100 ft below the mesa rim. Runoff to the north of Area G into minor drainages of Cañada del Buey is primarily from sheet flow. As a result of waste management activities, the natural drainage pattern is locally disturbed. Erosion controls at Area G divert water away from MDA G; these include asphalt drainage channels, a weir, riprap-lined channels, berms, silt fences, and culverts.

The following are descriptions of the subsurface pits, shafts, and trenches at MDA G. The descriptions were taken from the "RFI Work Plan for Operable Unit 1148" (LANL, 1992) and the "Closure and Post-Closure Plans for TA 54-Area G Landfill at Los Alamos National Laboratory" (LANL, 1985).

The pits at MDA G were excavated into the Bandelier Tuff. The pits vary in size, and are set back at least 50 ft from the mesa edge. Excavation began at MDA G in 1957, and disposal of radioactive waste began in Pit 1 in 1959. After a pit was filled, it was covered with approximately three ft of consolidated crushed tuff and a nominal four inches of topsoil. Native grasses were seeded in the topsoil. Until 1996, the pits were filled to within approximately three ft of the spill point (i.e., the lowest point along the surface perimeter of the pit). As a result, the cap thickness over most areas of a pit may exceed the approximately 3-ft cover. Only Pit 29 (Figure 2) received hazardous waste after November 19, 1980, making it subject to regulation under RCRA as an active disposal pit. Therefore, this pit is subject to RCRA closure standards and is addressed in this plan.

The shafts at MDA G are typically three to six ft in diameter and up to 65 ft deep. Like the pits, they are set back at least 50 ft from the mesa edge. The shafts are used for disposal of wastes that require special packaging, special handling, or segregation. Disposal of radioactive waste began in Shaft 1 in 1966. Shafts are lined or unlined, depending on the type of waste they contain. Typically, after a shaft was filled with waste to within three ft of the ground surface or it was determined that a shaft would no longer receive waste, it was backfilled with crushed tuff and plugged with approximately 3 ft. of concrete, slightly rounded at the surface to form a dome. Only Shaft 124 (Figure 2) received hazardous waste after November 19, 1980. Hence, it is subject to RCRA closure standards and is addressed in this plan. Until RCRA closure is complete, this shaft is considered an active disposal shaft.

The four disposal trenches as MDA G vary in size from approximately 60 to 260 ft long, 13 ft wide, and 6 to 8 ft deep. The trenches (identified as Trenches A, B, C, and D) were used for retrievable

placement of transuranic (TRU) waste. The wastes placed in the trenches were contained in 30-gallon drums inside concrete casks. Like the pits, after a trench was filled, it was covered with approximately three ft of consolidated crushed tuff and a nominal four inches of topsoil. Native grasses were seeded in the topsoil. The trenches became inactive prior to November 19, 1980, and are therefore subject to the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility Permit, but not closure standards. They are currently included in an investigation of Area G by LANL's ER Project.

Temporary structures and materials have been placed over many of the older disposal sites at MDA G to support ongoing waste management activities. Typically, the structures are sprung-dome facilities on asphalt pads.

2.2.1 Pit 29

Pit 29 is located in the west-central portion of Area G (Figure 2). This pit was used for disposal of solid-form waste from 1984 to 1986. Pit 29 is approximately 600 ft long and 30 ft deep. At its eastern end, it is approximately 70 to 75 ft wide; at its western end, it is approximately 40 ft wide. The pit has a capacity of approximately 45,795 cubic yards (yd^3), and reportedly contains a waste volume of 9,784 yd^3 (LANL, 1990). The waste contents include laboratory waste, glove boxes, plywood boxes, contaminated soil, and decontamination and decommissioning waste (LANL, 1990). The pit may also contain empty waste acid, pesticide, and herbicide containers (LANL, 1985), as well as asbestos and polychlorinated biphenyls-contaminated waste (LANL, 1992). A layer of retrievable TRU waste in cement-filled sections of corrugated pipe is located within a mound of fill material above Pit 29.

Crushed tuff removed during excavation of the pit was used to line the bottom of the pit to fill cracks and joints in the tuff. Equipment was used to place waste in the pit by lifts, and crushed tuff was placed within each lift to fill void spaces. A layer of crushed tuff was also used to separate lifts of waste. When the pit was filled to within approximately 3 ft of the spill point, it was covered with approximately 3 ft of crushed tuff and 4 inches of topsoil.

2.2.2 Shaft 124

Shaft 124 is located in the northeast portion of Area G (Figure 2). This unlined shaft was used from 1984 to 1987. Shaft 124 is 6 ft in diameter. Although there is no recorded depth of this shaft, the surrounding shafts are typically 65 ft deep (LANL, 1992). Assuming a depth of 65 ft, Shaft 124 has a capacity of 1,753 cubic ft (ft^3). The shaft capacity was calculated assuming it was to be filled to within 3 ft of the surface. The shaft was used for disposal of solid radioactive wastes and

approximately one ft^3 of hazardous wastes, including vials and organics (LANL, 1990). It is estimated that this shaft contains a total waste volume of approximately 378 ft^3 (LANL, 1992). When it was determined that Shaft 124 would no longer receive waste, it was backfilled with crushed tuff and the shaft was plugged with approximately 3 ft of concrete, which was slightly rounded at the surface to form a dome.

2.3 Closure Procedures

The Area G landfills (Pit 29 and Shaft 124) will be covered, as described in Sections 2.3.1 and 2.3.2. The wastes and/or waste residues in Pit 29 and Shaft 124 will be closed in place as landfills. No wastes will be removed from Shaft 124 at the end of active operations. At this time, there are no plans to remove waste from Pit 29 during the 30-year post-closure care period. In the event that DOE directives indicate waste retrieval is necessary, this plan will be revised, as described in Section 3.3.

As discussed in Sections 2.3.1 and 2.3.2 below, closure activities will include installation of an evapotranspiration (ET) cover over each regulated unit. ET covers consist of a single, vegetated soil layer constructed to represent an optimum mix of soil texture, soil thickness, and vegetation cover. ET covers consist of a monolithic soil layer designed to enhance soil water storage capacity to retain any infiltrated water until it can be evaporated by solar radiation and transpired by shallow-rooting plants. A schematic of an ET cover is presented in Figure 3.

The vegetated ET cover was developed explicitly for landfills located in arid and semi-arid environments like Los Alamos. The earliest research in this area was conducted at LANL at a test site not far from MDA G.

2.3.1 Pit 29 Closure Procedures

When the pit was filled to within approximately 3 ft of the spill point, it was backfilled with crushed tuff and compacted. The cover was graded to reflect the original ground surface, 4 inches of topsoil was added, and native grasses were seeded in the topsoil.

The following measures will be taken to provide additional stabilization of Pit 29 for closure; however, the actual design details are subject to change as additional planning information is obtained. As currently planned, a nominal 2 meters (m) of clean crushed tuff will be placed over Pit 29 and extend beyond the boundary of the pit. The additional fill will be applied in lifts and compacted. A biological barrier(s) will be incorporated into the design to discourage biotic intrusion.

Topsoil will be placed to a depth of between 15 and 20 centimeters (cm), and a gravel layer may be placed over the topsoil. The surface of the cover will be seeded with a native mix, including grasses and forbes. Fertilizer will be used on the seeded area to eliminate deficiencies in topsoil, and the seeded area will be stabilized. A temporary watering system will be provided and maintained until adequate vegetative growth has been established. Storm water run-on and runoff controls will be installed as part of the cover. The controls will be designed to reduce storm water run-on to the area of the stabilized pit. Controls will also be designed to convey storm water run-off away from the pit towards one of the storm water monitoring stations operating at Area G.

As described above, the backfill will help to stabilize the wastes in the pit and the cover will help to provide long-term minimization of precipitation infiltration. The cover will function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and have a permeability less than or equal to that of the natural surrounding geologic materials, in accordance with 20.4.1 NMAC § 264.310(a). In addition, the cover will provide run-on and runoff control, pursuant to 20.4.1 NMAC § 264.112(b)(5).

2.3.2 Shaft 124 Closure Procedures

When it was determined that the shaft would no longer receive waste, it was backfilled with crushed tuff. The existing cover of Shaft 124 consists of a concrete plug, approximately 3 ft thick, which was slightly rounded at the surface to form a dome. The concrete dome extends approximately 1 to 2 ft above the ground surface. A brass marker was placed during the final pour of seal concrete. Information on the concrete dome includes the wording “Buried Radioactive Wastes,” and identifies the shaft number, the radionuclides buried, total curies, and dates of use (LANL, 1985). The backfill in the shaft helps to stabilize the wastes in the shaft and accommodate settling and subsidence so that the concrete dome’s integrity is maintained, and the existing concrete dome has helped to minimize infiltration of precipitation to the shaft.

The following measures will be taken to provide additional stabilization of Shaft 124 for closure; however, the actual design details are subject to change as additional planning information is obtained. It has been determined that the entire shaft field that includes Shaft 124 will be covered, as discussed in the following. Addressing the entire shaft field will reduce the potential for preferential flow paths and potential infiltration of water. As currently planned, the concrete domes will be removed from all of the shafts and managed appropriately, and clean crushed tuff will be used to fill the voids created by removing the concrete domes. The entire shaft field area will then be compacted. A nominal 2 m of clean crushed tuff will be placed over the entire shaft field and

extend beyond the boundary of the shaft field. The additional fill will be applied in lifts and compacted. A biological barrier(s) will be incorporated into the design to discourage biotic intrusion. Topsoil will be placed to a depth of between 15 and 20 cm, and a gravel layer may be placed over the topsoil. The surface of the cover will be seeded with a native mix, including grasses and forbes. Fertilizer will be used on the seeded area to eliminate deficiencies in topsoil, and the seeded area will be stabilized. A temporary watering system will be provided and maintained until adequate vegetative growth has been established. Storm water run-on and runoff controls will be installed as part of the cover. The controls will be designed to reduce storm water run-on to the area of the shaft field. Controls will also be designed to convey storm water run-off away from the shaft field towards one of the storm water monitoring stations operating at Area G.

The additional backfill will help to stabilize the waste residues in Shaft 124 and the cover will provide long-term minimization of precipitation infiltration. The cover will function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and have a permeability less than or equal to that of the natural surrounding geologic materials, in accordance with 20.4.1 NMAC § 264.310(a). In addition, the cover will provide run-on and runoff control, pursuant to 20.4.1 NMAC § 264.112(b)(5).

3.0 GENERAL POST-CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC §270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H; and 20.4.1 NMAC § 264.310 [6-14-00], as applicable.

3.1 Closure Performance Standard

Post-closure of the Area G landfills (Pit 29 and Shaft 124) will meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and N [6-14-00].

After closure, the measures by which LANL will meet the applicable 20.4.1 NMAC § 264.310(b) requirements (or equivalents thereof) are presented in Sections 4.1 and 4.2 of this plan. Post-closure of the landfills will be accomplished under alternative closure requirements, as allowed by 20.4.1 NMAC § 264.110(c) and as discussed in Section 3.2 below, to meet post-closure care requirements.

3.2 Post-Closure Care and Alternative Requirements

In accordance with 20.4.1 NMAC § 264.117(a)(1), post-closure care for the Area G landfills will begin after completion of closure of the unit and will continue for 30 years. Post-closure care of the regulated units under alternative requirements will begin after closure is complete, as described in Section 2.3 of this plan, and closure is certified by LANL and approved by the NMED. The Secretary of the NMED may shorten the post-closure care period at any time preceding partial closure or during the post-closure period if all disposal units at the facility are closed and it is determined that the reduced period is sufficient to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(i). Alternatively, the Secretary of the NMED may extend the post-closure care period if it is determined that the extended period is necessary to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(ii).

Post-closure activities for the Area G landfills will be addressed under alternative requirements, as allowed by 20.4.1 NMAC § 264.118(b)(4). This allowable option is defined in 20.4.1 NMAC § 264.110(c) when a regulated unit is located among other SWMUs, releases potentially originating from both the regulated unit and the SWMUs have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. At the Area G landfills, the pit and shaft identified as the regulated units are in close proximity to (i.e., co-located with) similar disposal units (SWMUs) to be addressed under the LANL corrective action program. A subsurface VOC vapor-phase plume was detected in the vadose zone and has been monitored at MDA G since the mid-1980s. EPA guidance for the rule (EPA, 1998) discusses the transfer of the post-closure process to the facility corrective action process (contained in the Corrective Action Chapter of this permit) as an appropriate mechanism to address this situation. Therefore, some post-closure procedures for the Area G regulated units will be established as part of the corrective measures to be identified for the ongoing corrective action program at TA-54.

As required by 20.4.1 NMAC § 264.117(a)(1)(i and ii), post-closure care of the Area G landfills will include maintenance, monitoring, and reporting as appropriate and in accordance with the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310. As

described in Section 2.3 of this plan, the closures will include addition of covers. The integrity and effectiveness of the covers will be maintained, including conducting inspections and making necessary repairs to correct the effects of settling, erosion, water damage, or other events.

An RFI is currently ongoing at MDA G. NMED will determine whether a RCRA Corrective Measures Study (CMS) is required, based on the findings of the RFI. Vadose zone monitoring of the Area G landfills will be performed in accordance with the findings of the RFI regarding the current monitoring system. Groundwater monitoring will be developed for TA-54 as an aggregate under the LANL "Hydrogeologic Workplan" (LANL, 1998) and implemented as appropriate by LANL's Groundwater Protection Program, as described in Section 4.1.2.

If further corrective measures at the Area G landfills are deemed necessary to protect human health and the environment (including modification to the covers), they will be analyzed, selected, and implemented during the CMS process according to the requirements of the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility Permit and the most current and approved Installation Work Plan for the ER Project. The selected corrective measure will include alternative requirements for post-closure care of the Area G landfills in a manner that complies with the requirements of 20.4.1 NMAC § 264.110(c)(2), and the selection and implementation must be approved by the NMED as a permit modification.

3.3 Amendment of the Post-Closure Plan

In accordance with 20.4.1 NMAC §264.118(d)(1) [6-14-00], LANL may submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan at any time during the active life of the facility or during the post-closure care period. In accordance with 20.4.1 NMAC §264.118(d)(2) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:

- There are changes in operating plans or facility design that affect the approved post-closure plan
- There is a change in the expected year of final closure, if applicable
- Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan
- LANL requests the Secretary of the NMED to apply alternative requirements (e.g., if corrective action necessitates changes to the closure configuration or the post-closure care requirements) to a regulated unit under 20.4.1 NMAC § 264.90(f) and/or § 264.110(c).

The written notification or request will include a copy of the amended post-closure plan for review or approval by the NMED, in accordance with 20.4.1 NMAC § 264.118(d).

LANL will submit a written request for a permit modification at least 60 days prior to the proposed change in unit design or operation, or no later than 60 days after an occurrence of an unexpected event that affects the post-closure plan. The Secretary of the NMED will approve, disapprove, or modify this plan in accordance with the procedures in 40 CFR, Part 124 and 20.4.1 NMAC, Subpart IX, Part 270. The approved post-closure plan will become a permit condition, in accordance with 20.4.1 NMAC § 270.32.

The Secretary of the NMED may request modifications to the plan under the conditions presented in the bulleted items above. LANL will submit the modified plan no later than 60 days after the Secretary's request. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in 40 CFR, Part 124 and 20.4.1 NMAC, Subpart IX, Part 270.

In accordance with 20.4.1 NMAC § 264.119(c), LANL or a subsequent owner or operator may request a modification to the approved post-closure plan to authorize the removal of hazardous wastes and hazardous waste residues or contaminated soils. If a permit modification to conduct such removal activities is granted, the owner or operator may request that the Secretary of the NMED approve the removal of the post-closure notice filed with the County of Los Alamos, other authorized agencies, or the Secretary of the NMED. Alternatively, the owner or operator may provide an additional post-closure notice indicating the removal of the hazardous waste, with approval from the Secretary of the NMED.

3.4 Post-Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00] to provide a cost estimate, financial assurance mechanisms, and liability insurance for post-closure actions.

3.5 Post-Closure Certification [20.4.1 NMAC § 264.120]

Within 60 days after completion of the established post-closure care period for the Area G landfills, LANL will submit to the Secretary of the NMED, by registered mail, a certification that the post-closure care period for the unit was performed in accordance with the approved post-closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent,

registered professional engineer. Documentation supporting the independent, registered professional engineer's certification will be furnished to the Secretary of the NMED upon request. A copy of the certification and supporting documentation will be maintained by DOE/OLASO. The supporting documentation may include, for example, the following:

- Any significant variance from the approved activities and the reason for the variance
- A summary of all sampling results
- A quality assurance/quality control statement on analytical data validation
- The location of the file of supporting documentation
- Storage or disposal location of hazardous/mixed waste resulting from post-closure activities.

3.6 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the Area G landfills will be under the care of the DOE or another authorized federal agency during the post-closure care period. The security fence at TA-54 will be maintained during that period to prohibit public access into Area G.

3.7 Survey Plat and Post-Closure Requirements [20.4.1 NMAC § 264.116 and § 264.117 through § 264.120]

As stated in Section 1.10, a survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure. No later than 60 days after certification of closure of the Area G landfills, LANL will submit to the County of Los Alamos and other authorized agencies and to the Secretary of the NMED a record of the type, location, and quantity of hazardous wastes disposed of within the unit. For hazardous wastes disposed of before January 12, 1981, LANL will identify the type, location, and quantity of the hazardous wastes to the best of their knowledge and in accordance with any records that have been kept.

Post-closure care pursuant to 20.4.1 NMAC § 264.117 through § 264.120 [6-14-00] will begin after closure of the disposal units. Post-closure notices will be filed with appropriate authorities within 60 days of certification of closure of the first disposal unit and within 60 days of certification of closure of the last disposal unit, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE will file a "Land Use Restriction Notice" or equivalent document with the County of Los Alamos and other authorized agencies. The "Land Use Restriction Notice" will indicate that the land has been used to manage hazardous wastes and that its use is restricted under 20.4.1

NMAC, Subpart V, Part 264, Subpart G regulations. It will also indicate that the survey plat and record of the type, location, and quantity of hazardous wastes disposed of have been filed with the County of Los Alamos and other authorized agencies and with the Secretary of the NMED. LANL will also submit a certification, signed by DOE and LANL, that they have recorded the notation specified in 20.4.1 NMAC § 264.119(b)(1), including a copy of the document in which the notation has been placed, to the Secretary of the NMED.

Within 60 days after completion of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00]. Certification of completion of post-closure care is described in Section 3.5.

4.0 SPECIFIC POST-CLOSURE INFORMATION

Pursuant to 20.4.1 NMAC § 264.118(b), the post-closure portion of this plan identifies the activities that will be conducted after closure of the Area G landfills and the frequency of these activities. Post-closure activities for the Area G landfills will be addressed under alternative requirements, pursuant to 20.4.1 NMAC § 264.118(b)(4). These post-closure activities are described below in Sections 4.1 and 4.2, and include activities that are planned as well as those that may be conducted as a result of the corrective action process.

This section describes these activities, which include monitoring activities and the frequencies at which they will be performed to be consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F, as appropriate, and 20.4.1 NMAC § 264.310 during the post-closure care period, in accordance with 20.4.1 NMAC § 264.118(b)(1). The activities also include maintenance activities and the frequencies at which they will be performed, as required in 20.4.1 NMAC § 264.118(b)(2).

4.1 Monitoring and Frequency

The monitoring activities and the frequencies at which they will be performed, pursuant to 20.4.1 NMAC § 264.118(b)(1), are described to the extent known in the following sections. Monitoring of the vadose zone and groundwater will be conducted as appropriate according to currently existing schedules, pending potential modifications as determined by the RFI/CMS process and/or implementation of LANL's Groundwater Protection Program. The frequency of monitoring for each medium is also discussed.

4.1.1 Vadose Zone

Vadose zone monitoring at MDA G has been ongoing since the mid-1980s. The pore-gas monitoring program has been successful in defining the nature of the vapor plume at MDA G. Figures included in Appendix C of the "Quarterly Technical Report July-September 2001" (ER Project, 2001) visually depict the results for 12 quarters of monitoring at MDA G (Fiscal Year [FY] 99 through FY 01). A 3-dimensional visualization was initiated to evaluate the extent of the VOC plume at MDA G; to date, however, insufficient data exist spatially and over time to show a meaningful 3-dimensional interpretation (ER Project, 2001). It is anticipated that additional monitoring of the available MDA G boreholes will fill this data need.

Although the actual frequency of monitoring is not precisely known at this time, the "RFI Report for Material Disposal Area G at Technical Area 54", which will be submitted to the NMED in 2002, may recommend quarterly pore-gas monitoring for a prescribed period, followed by semi-annual pore-gas monitoring for a 2-year period, and annual pore-gas monitoring thereafter. Monitoring and monitoring frequency of the vadose zone will also be addressed under the remaining portions of the corrective action process (e.g., CMS, Corrective Measures Implementation).

4.1.2 Regional Aquifer Groundwater

Five regional aquifer (R) wells are planned for installation in the vicinity of TA-54. These wells include R-16, R-20, R-21, R-22, and R-23. The five wells are included in or associated with Aggregate 2, the boundaries of which were drawn to encompass the SWMUs at TA-54. Well R-22 was installed in the fall of 2000. Currently, well R-21 is planned for completion in FY 02. The remaining wells (R-16, R-20, and R-23) are also planned for completion in FY 02, contingent upon the approval of additional funding requested in April 2002.

The groundwater analytical strategy being implemented at LANL is described herein. The first step in the strategy is installation of a characterization well, followed by collection of water samples from each well screen upon well completion. For single-completion wells, there is no activity for a 3-month period after borehole sampling while the well equilibrates. For multiple-completion wells, no activity occurs for a 6-month period after borehole sampling while the well equilibrates. The second step is collection of initial characterization samples (i.e., the first sampling round) from each well screen and analysis for a full suite of analytes, provided the yield at any screened interval is a sufficient volume for a full analytical suite. Otherwise, the analyses will be prioritized according to suspected contaminants of concern (COC). For each well screen, if compounds and/or radionuclides are not detected in the first sampling round, they will be deleted from the analyte list

for the second and third sampling rounds unless the compound or radionuclide is a COC. If compounds and/or radionuclides are detected in the first sampling round, the appropriate well screens will be selected for subsequent sampling based on data needs; the plans for subsequent sampling and analysis will be discussed with the NMED. The third step is conducting the second and third sampling and analysis rounds. The final step is collection of the fourth round of samples from each well screen and analysis for a full suite of analytes.

Upon completion of four sampling rounds at each well installed pursuant to the "Hydrogeologic Workplan" (LANL, 1998), the well will be incorporated into LANL's Groundwater Protection Program. These wells will be used to enhance the program by serving as monitoring wells and/or providing information to determine potential future locations for additional monitoring wells. The well data will be entered into the well inventory module of the Water Quality Database. This database will be available to LANL and external stakeholders. Data customers (e.g., regulators, LANL personnel, or other stakeholders) can then examine the information and, if appropriate and necessary, request samples, measurements, or other data to be collected from any well. Under the Groundwater Protection Program, all water sampling, water-level measurements, and other testing will be implemented consistent with laws, regulations, and DOE orders, and in consultation with the data customers.

Consistent with the site characterization and following a determination of the need for monitoring, the detection-type monitoring prescribed in 20.4.1 NMAC § 264.98 will be initiated. Detection is defined in 20.4.1 NMAC § 264.91(a)(1) as statistically significant evidence of contamination, as described in 20.4.1 NMAC § 264.98(f). A monitoring system and compliance period as described in Attachment A consistent with 20.4.1 NMAC §§ 264.96 and 264.97 will be utilized. In accordance with 20.4.1 NMAC § 264.98(f), LANL will determine whether there is statistically significant evidence of contamination for any chemical parameter or hazardous constituent. An appropriate frequency for sample collection and statistical analysis will be proposed to the NMED that will be capable of determining statistically significant evidence of contamination, as required by 20.4.1 NMAC § 264.98(d). Data will be collected that are appropriate for the statistical methodology applied, sufficient in sample size, and utilizing sampling procedures and frequencies of sample collection established by the Groundwater Protection Program to ensure that potential contaminant release(s) from the regulated units can be detected, in accordance with 20.4.1 NMAC § 264.97. For TA-54, the point of compliance is the boundary of Aggregate 2. If a more comprehensive monitoring program is established as described in Attachment A consistent with 20.4.1 NMAC § 264.99 and an increase in contamination is indicated, a program that takes action to address the increase will be

implemented. Descriptions of each proposed activity equivalent to operating unit regulations for groundwater are presented in Attachment A.

4.2 Maintenance and Frequency

Pursuant to 20.4.1 NMAC § 264.118(b)(2), the planned maintenance activities and the frequencies at which they will be performed are discussed in the following sections. Planned maintenance will include inspections at prescribed frequencies and potential resulting maintenance activities consistent with 20.4.1 NMAC § 264.310. The planned maintenance will also ensure the function of the monitoring equipment consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310.

4.2.1 Integrity of Cap/Covers

The covers at the Area G regulated units will be maintained during post-closure to preserve their integrity and effectiveness in accordance with 20.4.1 NMAC § 264.310(b)(1). Inspections will be conducted quarterly, unless changes are necessitated by the outcome of investigations currently being conducted, and repairs will be made to the covers, if necessary, to correct the effects of settling, subsidence, erosion, or other events. Inspection results and subsequent repairs will be noted in the facility record. The final selected corrective measure will be maintained to prevent run-on and runoff from eroding or otherwise damaging the selected measure if waste remains in place, consistent with 20.4.1 NMAC § 264.310(b)(5).

4.2.2 Monitoring Equipment

As discussed in Section 4.1.1, LANL will continue to conduct vadose zone monitoring at MDA G and may modify the existing vadose zone monitoring program based on the results of groundwater transport modeling. Continued vadose zone monitoring will allow early detection of potential contaminant transport toward the regional aquifer. The continued vadose zone monitoring will be conducted in lieu of 20.4.1 NMAC § 264.310(b)(2) and (3) requirements, as allowed by the alternative requirements in 20.4.1 NMAC § 264.110(c). Prior to each sampling event, the protective surface casing of each selected borehole will be inspected to ensure that it has not been damaged. The locking mechanisms at each borehole will be checked to verify that they have not been compromised. Vapor ports will also be inspected to ensure that they are not obstructed and have not degraded or lost their plugs. In addition, vapor port depth tags will be inspected for legibility, as will the identification number on the inside of the borehole. Sampling equipment will also be inspected and tested, as necessary, prior to each sampling event. Over time, the monitoring systems that contain the sampling membranes (e.g., socks) within a borehole may require

replacement. If the borehole is in an area where vehicle traffic might pose a hazard, the guard or bumper posts will be inspected to ensure their integrity is maintained. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

The groundwater monitoring system, discussed in Section 4.1.2, will also be maintained to ensure maximum operating conditions, consistent with 20.4.1 NMAC § 264.310(b)(4). Prior to each sampling event, the protective steel casing and locking mechanism(s) will be inspected to ensure that they have not been compromised. The well identification number on the inside and/or outside of the cover will also be inspected for legibility. In addition, the brass monument on the concrete protective pad, placed around the well casing to ensure long-term structural integrity of the well, will be inspected to verify that the location identification number remains clearly imprinted on the monument. If the well is in an area where vehicle traffic might pose a hazard, the guard or bumper posts will be inspected to ensure their integrity is maintained. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

Surveyed benchmarks used in accordance with 20.4.1 NMAC § 264.309 will be protected and maintained throughout the post-closure period, pursuant to 20.4.1 NMAC § 264.310(b)(6). If a benchmark is in an area where vehicle traffic might pose a hazard, guard or bumper posts will be installed to provide protection. The condition of the surveyed benchmarks will be inspected for legibility and to identify any potential maintenance needs. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

4.3 Reporting

Post-closure care will also include reporting consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310, as appropriate.

As described in Attachment A consistent with 20.4.1 NMAC § 264.98, LANL will notify the Secretary of the NMED if, under the detection monitoring program, it is determined [in accordance with 20.4.1 NMAC § 264.98(f)] that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents at any of the Aggregate 2 monitoring wells. This notification will be provided in writing within seven days of the determination. The notification will indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination.

If a more comprehensive monitoring program is established as described in Attachment A consistent with 20.4.1 NMAC § 264.99, LANL will analyze samples from the Aggregate 2 monitoring wells for all 20.4.1 NMAC, Subpart V, Part 264, Appendix IX constituents at least annually, in accordance with 20.4.1 NMAC § 264.99(g). This analysis will be used to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to the procedures in 20.4.1 NMAC § 264.98(f). If LANL finds Appendix IX constituents in the groundwater that are not identified as monitoring constituents in the permit, LANL may resample within one month and repeat the Appendix IX analysis. If the presence of new constituents is confirmed by the second analysis, LANL will report the concentration of these additional constituents to the Secretary of the NMED within seven days after completion of the second analysis. If LANL decides not to resample, the concentrations of the additional constituents will be reported to the Secretary of the NMED within seven days after completion of the initial analysis. In either event, these constituents will be added to the monitoring list.

If a compliance monitoring program is established in accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and LANL determines, pursuant to 20.4.1 NMAC § 264.99(d), that any concentration limits under 20.4.1 NMAC § 264.94 are being exceeded at any of the Aggregate 2 monitoring wells, notification to the Secretary of the NMED will be submitted in writing within seven days. Pursuant to 20.4.1 NMAC § 264.99(h)(1), the notification will indicate which concentration limits have been exceeded.

If a compliance monitoring program is established in accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and LANL determines, pursuant to 20.4.1 NMAC § 264.99(d), that the groundwater concentration limits are being exceeded at any of the Aggregate 2 monitoring wells, LANL may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the groundwater. In this case, LANL will notify the Secretary of the NMED within seven days that a demonstration will be made, in accordance with 20.4.1 NMAC § 264.99(i).

If a groundwater corrective action program is established pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart F, LANL will report in writing to the Secretary of the NMED on the effectiveness of the program. LANL will submit these reports semiannually, in accordance with 20.4.1 NMAC § 264.100(g).

4.4 Post-Closure Use of Property

In accordance with 20.4.1 NMAC § 264.117(c), post-closure use of property on or in which hazardous waste remains after partial or final closure will not be allowed to disturb the integrity of the final cover or any other components of the containment system, if present. In addition, post-closure use of property will not be allowed to disturb the function of the monitoring systems unless the Secretary of the NMED finds that the disturbance is necessary to the proposed use of the property and will not increase the potential hazard to human health or the environment, or it is necessary to reduce a threat to human health or the environment.

4.5 Post-Closure Care Period Contact Office

As required by 20.4.1 NMAC § 264.118(b)(3), the name, address, and phone number of the office to contact about the Area G landfills during the post-closure care period is:

U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
528 35th Street
Los Alamos, New Mexico
87544
505-667-5105

5.0 REFERENCES

EPA, 1998, "Standards Applicable to Owners and Operators of Closed and Closing Hazardous Waste Management Facilities: Post-Closure Permit Requirement and Closure Process; Final Rule," *Federal Register*, pp. 56710-56735.

ER Project, 2001, "Quarterly Technical Report July-September 2001," LA-UR-01-6148, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002, "RFI Report for Material Disposal Area G at Technical Area 54," in preparation, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2001, "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0/0.1/1.0/2.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998, "Hydrogeologic Workplan," May 1998, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1992, "RFI Work Plan for Operable Unit 1148," LA-UR-92-855, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1990, “Solid Waste Management Units Report,” Volume IV of IV, Los Alamos National Laboratory Report LA-UR-90-3400, revised November 1990, Los Alamos, New Mexico.

LANL, 1985, “Closure and Post-Closure Plans for TA 54-Area G Landfill at Los Alamos National Laboratory,” September 1985, Los Alamos National Laboratory, Los Alamos, New Mexico.

Table 1

Schedule for Closure Activities at Technical Area 54 Area G Landfills

Activity	Maximum Time Required[a]
Let contract request for proposals	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Approval of closure plan	Day 0
Conduct closure activities	Day 10
Submit closure certification to the NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously, may not require the maximum time listed, or may require more time than indicated above. Extensions to the schedule may be requested, as needed.

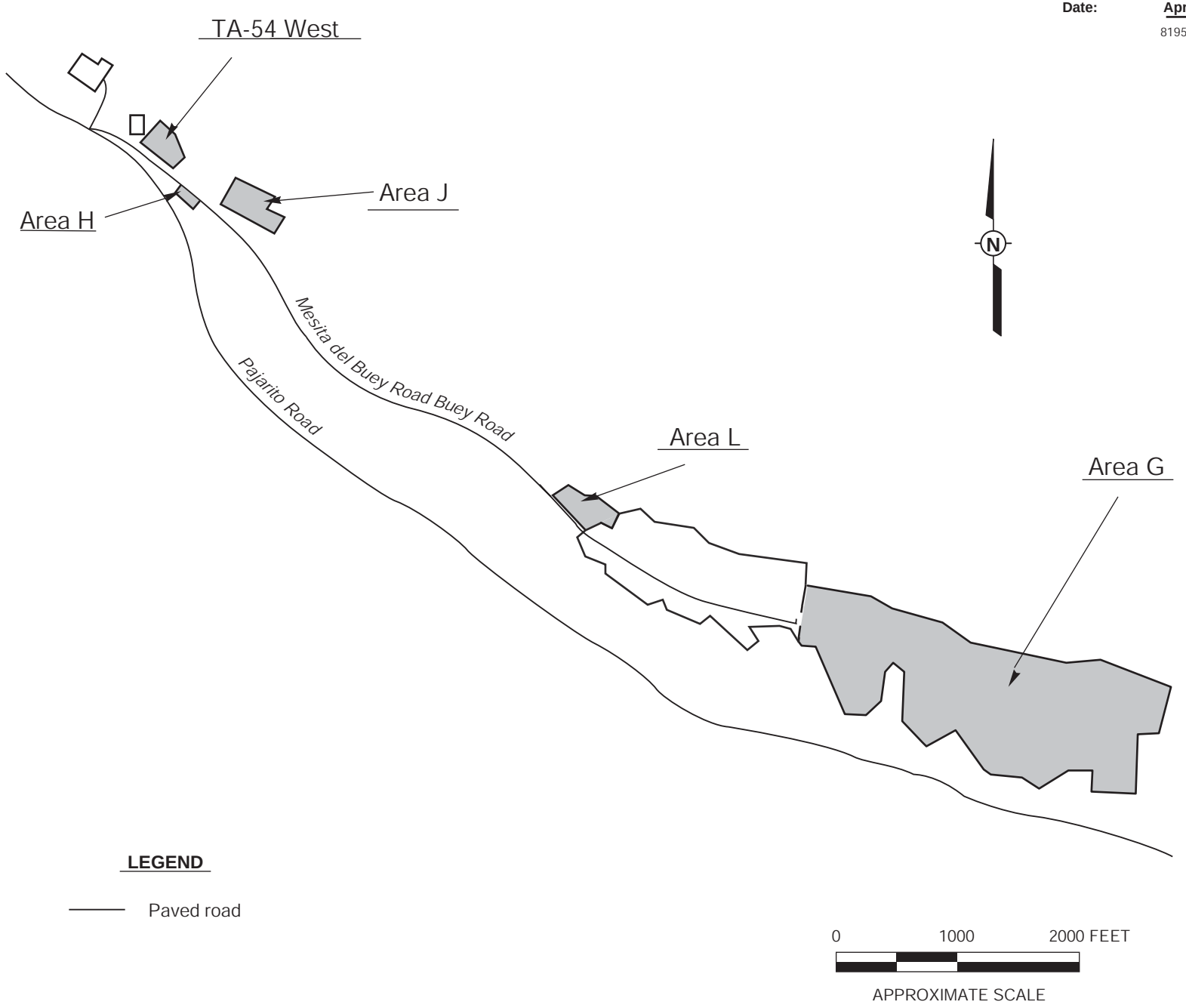


Figure 1
Technical Area (TA) 54 Site Location Map

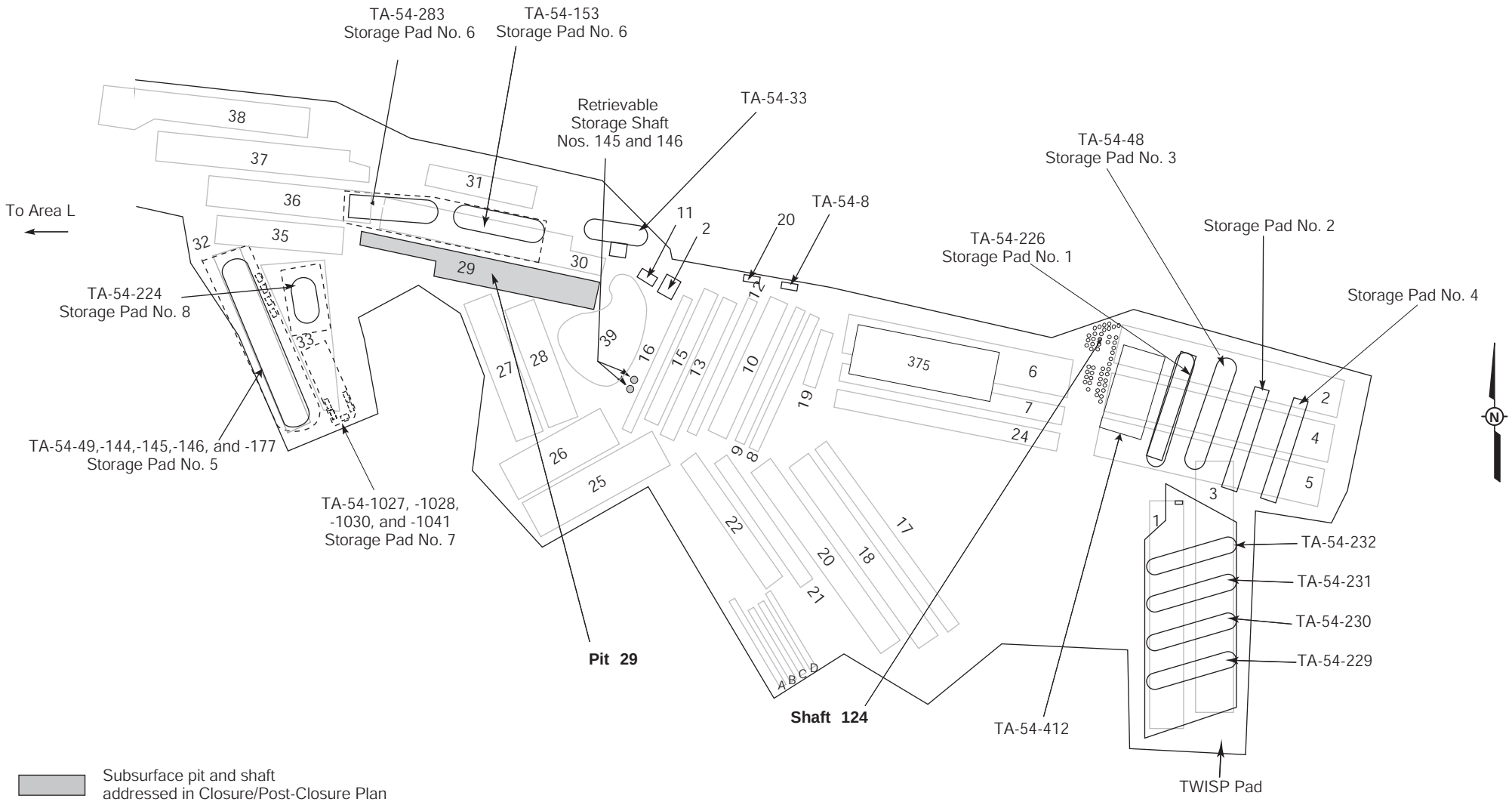
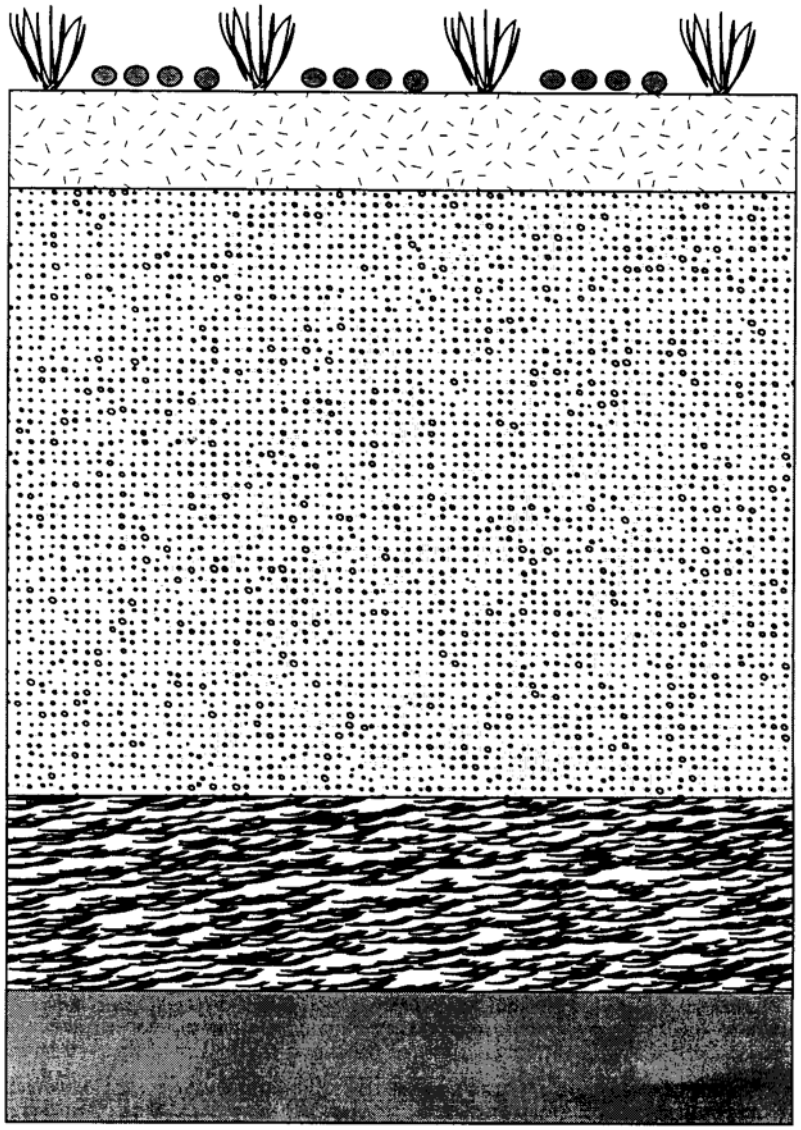


Figure 2

Technical Area (TA) 54, Area G



Not to Scale

Figure 3

Example of an Evapotranspiration Cover

ATTACHMENT A

MDA G

OPERATING UNIT REGULATIONS FOR GROUND WATER/CLOSURE/POST-CLOSURE CARE AND CORRESPONDING HSWA ACTIVITIES

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90	Applicability		
§264.90(a)(1)	Except as provided in paragraph (b) of this section, the regulations in this subpart apply to owners or operators of facilities that treat, store or dispose of hazardous waste. The owner/operator must satisfy the requirements identified in paragraph (a)(2) of this section for all wastes (or constituents thereof) contained in solid waste management units at the facility, regardless of the time at which waste was placed in such units.		
§264.90(a)(2)	All solid waste management units must comply with the requirements in §264.101. A surface impoundment, waste pile, and land treatment unit or landfill that receives hazardous waste after July 26, 1982 (hereinafter referred to as a "regulated unit") must comply with the requirements of §§264.91 through 264.100 in lieu of §264.101 for purposes of detecting, characterizing and responding to releases to the uppermost aquifer. The financial responsibility requirements of §264.101 apply to regulated units.		
§264.90(b)	The owner/operator's regulated unit or units are not subject to regulation for releases into the uppermost aquifer under this subpart if:		
§264.90(b)(1)	The owner/operator is exempted under §264.1; or	NA	NA
§264.90(b)(2)	He operates a unit which the Secretary finds:	NA	NA
§264.90(b)(2)(i)	Is an engineered structure,	NA	NA
§264.90(b)(2)(ii)	Does not receive or contain liquid waste or waste containing free liquids,	NA	NA
§264.90(b)(2)(iii)	Designed and operated to exclude liquid, precipitation, and other run-on and run-off,	NA	NA
§264.90(b)(2)(iv)	Has inner and outer layers of containment enclosing the waste,	NA	NA
§264.90(b)(2)(v)	Has a leak detection system built into each containment layer,	NA	NA
§264.90(b)(2)(vi)	Continuing operation and maintenance of leak detection systems will be provided during active life and during closure/post-closure care periods, and	NA	NA
§264.90(b)(2)(vii)	To reasonable degree of certainty, will not allow hazardous constituents to migrate beyond outer containment layer prior to end of post-closure care period.	NA	NA
§264.90(b)(3)	The Secretary finds, pursuant to §264.280(d), that the treatment zone of a land treatment unit that qualifies as a regulated unit does not contain levels of hazardous constituents that are above background levels of those constituents by an amount that is statistically significant, and if an unsaturated zone monitoring program meeting the requirements of §264.278 has not shown a statistically significant increase in hazardous constituents below the treatment zone during the operating life of the unit. An exemption under this paragraph can only relieve an owner or operator of responsibility to meet the requirements of this subpart during the post-closure care period; or	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(b)(4)	The Secretary finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and the post-closure care period specified under §264.117. This demonstration must be certified by a qualified geologist or geotechnical engineer. In order to provide an adequate margin of safety in the prediction of potential migration of liquid, the owner or operator must base any predictions made under this paragraph on assumptions that maximize the rate of liquid migration.	Should sufficient information support this exemption for a regulated unit in the future, the HSWA activity would be equivalent to that prescribed by the exemption.	
§264.90(b)(5)	He designs and operates a pile in compliance with §264.250(c).	NA	NA
§264.90(c)	The regulations under this subpart apply during the active life of the regulated unit (including the closure period). After closure of the regulated unit, the regulations in this subpart:		NA
§264.90(c)(1)	Do not apply if all waste, waste residues, contaminated containment system components, and contaminated subsurface soils removed or decontaminated at closure;	For MDA G, a CMS report will be developed and will address this issue. If appropriate, the report will include a general description of an excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure is selected, details will be provided in the approved CMI Plan following permit modification.	
§264.90(c)(2)	Apply during post-closure care period if owner/operator is conducting a detection monitoring program under §264.98; or	The probable corrective measure to be implemented at MDA G will include monitoring in the vadose zone beneath MDA G. The LANL hydrogeologic characterization program (as implemented through the LANL Hydrogeologic Workplan) proposes the locations for characterization wells for TA-54 that after four sampling events will be included in LANL Environmental Surveillance Program, and may, if appropriate, be used as repetitive monitoring wells for TA-54 as a whole.	
§264.90(c)(3)	Apply during compliance period under §264.96 if the owner/operator is conducting a compliance monitoring program under §264.99 or a corrective action program under §264.100.	If monitoring indicates a more comprehensive program is needed to adequately comply with ground water protection standards in 264.91 and 264.92, additional characterization and/or well installation will occur, if appropriate.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(d)	Regulations in this subpart may apply to miscellaneous units when necessary to comply with §§264.601-603.	NA	NA
§264.90(e)	The regulations of this subpart apply to all owners and operators subject to the requirements of 40 CFR 270.1(c)(7), when the Bureau issues either a post-closure permit or an enforceable document (as defined in 40 CFR 270.1(c)(7)) at the facility. When the Bureau issues an enforceable document, references in this subpart to "in the permit" mean "in the enforceable document."	CMS and CMI plans and resulting CMS and CMI reports describing activities equivalent to post-closure permit requirements will be "enforceable documents" consistent with 265.121.	
§264.90(f)	The Secretary may replace all or part of the requirements of §§ 264.91 through 264.100 applying to a regulated unit with alternative requirements for groundwater monitoring and corrective action for releases to groundwater set out in the permit (or in an enforceable document) (as defined in 40 CFR 270.1(c)(7)) where the Secretary determines that:	Activities proposed and implemented in the above referenced plans will be effectively equivalent to the cited Subpart F requirements.	
§264.90(f)(1)	The regulated unit is situated among SWMUs or areas of concern (AOC), a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	As the possibility for this situation exists, alternative activities may appropriately replace all or part of the above cited Subpart F requirements.	
§264.90(f)(2)	It is not necessary to apply the groundwater monitoring and corrective action requirements of §§264.91-100 because alternative requirements will protect human health and the environment.	Should the above situation exist, §264.90(f)(1), alternative activities protective of human health and the environment and proposed in lieu of §264.91-264.100 will preclude the need for application of Subpart F requirements.	
§264.91	Required programs		
§264.91(a)	Owner/operators subject to this subpart must conduct a monitoring and response program as follows:		
§264.91(a)(1)	Whenever hazardous constituents under §264.93 from a regulated unit are detected at a compliance point under §264.95, owner/operator must institute a compliance monitoring program under §264.99. Detection is defined as statistically significant evidence of contamination as described in §264.98(f);	If detection is indicated, additional characterization and/or well installation will occur if appropriate - 264.90(c)(3)	
§264.91(a)(2)	Whenever the groundwater protection standard under §264.92 is exceeded, owner/operator must institute a corrective action program under §264.100. Exceedance is defined as statistically significant evidence of increased contamination as described in §264.99(d);	If detection is indicated, concentrations protective of human health and the environment will be established similar to ground water protection standards in §264.92. Actions necessary to correct any exceedances of such concentrations will be taken as necessary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.91(a)(3)	Whenever hazardous constituents under §264.93 from a regulated unit exceed concentration limits under §264.94 in groundwater between the compliance point under §264.95 and the downgradient facility property boundary, owner/operator must institute a corrective action program under §264.100; or	Should established concentration limits be exceeded between the point of compliance and the downgradient boundary, actions to correct such exceedances will be taken as necessary.	
§264.91(a)(4)	In all other cases, owner/operator must institute a detection monitoring program under §264.98.	TA-54 characterization wells will be sampled and analyzed as repetitive monitoring wells as appropriate through the LANL Environmental Surveillance Program.	
§264.91(b)	The Secretary will specify in the facility permit the specific elements of the monitoring and response program. The Secretary may include one or more of the programs identified in paragraph (a) of this section in the facility permit as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs will be required. In deciding whether to require the owner or operator to be prepared to institute a particular program, the Secretary will consider the potential adverse effects on human health and the environment that might occur before final administrative action on a permit modification application to incorporate such a program could be taken.	See above.	
§264.92	The owner/operator must comply with conditions specified in the facility permit that are designed to ensure that hazardous constituents under §264.93 detected in the ground water from a regulated unit do not exceed the concentration limits under §264.94 in the uppermost aquifer underlying the waste management area beyond the point of compliance under §264.95 during the compliance period under §264.96. The Secretary will establish this ground-water protection standard in the facility permit when hazardous constituents have been detected in the ground water.	Should "detection" consistent with the definition in §264.91(a)(1) occur, LANL will comply with concentration limits established through a process similar to that described in §264.94.	
§264.93	Hazardous constituents		
§264.93(a)	The Secretary will specify in the facility permit the hazardous constituents to which the ground-water protection standard of §264.92 applies. Hazardous constituents are constituents identified in appendix VIII of part 261 of this chapter that have been detected in ground water in the uppermost aquifer underlying a regulated unit and that are reasonably expected to be in or derived from waste contained in a regulated unit, unless the Secretary has excluded them under paragraph (b) of this section.	For any of the following information that is not already available or developed, it will be prepared and included in a manner consistent with §264.93 in corresponding corrective action/HSWA activity documents.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)	The Secretary will exclude an Appendix VIII constituent from the list of hazardous constituents specified in the facility permit if he finds that the constituent is not capable of posing a substantial present or potential hazard to human health or the environment. In deciding whether to grant an exemption, the Secretary will consider the following:	Concentration limits established for hazardous constituents following "detection" will not include those incapable of posing a substantial present or potential hazard to human health or the environment considering the following:	
§264.93(b)(1)	Potential adverse effects on groundwater quality, considering:	Potential adverse effects on groundwater quality considering:	
§264.93(b)(1)(i)	Physical and chemical characteristics of waste in the regulated unit, including its potential for migration;	Detailed information on waste inventory and chemical characteristics for Pit 29 and Shaft 124 will be presented in the MDA G RFI Report and CMS Report including potential for migration and site conceptual model.	
§264.93(b)(1)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site specific information for MDA G will be presented in the MDA G RFI Report and MDA G CMS Report.	
§264.93(b)(1)(iii)	Quantity of groundwater and the direction of groundwater flow;	Information regarding quantity and direction of flow of groundwater can be obtained through the LANL Hydrogeologic Work Plan.	
§264.93(b)(1)(iv)	Proximity and withdrawal rates of groundwater users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	
§264.93(b)(1)(v)	Current and future uses of groundwater in the area;	Information regarding current and future users of groundwater in the area will be developed.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(1)(vi)	Existing quality of groundwater, including other sources of contamination and their cumulative impact on groundwater quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Workplan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER site characterization efforts.	
§264.93(b)(1)(vii)	Potential health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA G will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Attachment C
§264.93(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA G will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Attachment C
§264.93(b)(1)(ix)	Persistence and permanence of the potential adverse effects; and	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	
§264.93(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	RFI and CMS Reports for MDA G will be developed and will address this issue.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(2)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA G can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, and will be presented in the MDA G RFI and CMS Reports.	
§264.93(b)(2)(iii)	Quantity and quality of groundwater, and the direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	
§264.93(b)(2)(iv)	Rainfall patterns in the region;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)(v)	Proximity of regulated unit to surface waters;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described, will be developed.	
§264.93(b)(2)(vii)	Existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program multi-sector CWA permit, as well as through ER Project characterization activities.	
§264.93(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)(x)	Persistence and permanence of potential adverse effects.	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility, the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	
§264.94	Concentration limits		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(a)	The Secretary will specify in the facility permit the concentration limits in the groundwater for hazardous constituents established under §264.93. The concentration of a hazardous constituent:	Proposed concentration limits of detected hazardous constituents will be consistent with evaluation of parameters set forth in 264.94. To the extent that information necessary to establish provisions of this section do not already exist, they will be developed. Otherwise this information will be found in the previously identified documents.	
§264.94(a)(1)	Must not exceed background level of that constituent in the groundwater at the time that limit is specified in the permit; or	See above.	
§264.94(a)(2)	For any constituent listed in §264.94, Table 1, must not exceed the respective value given in that table if the background level of the constituent is below the value given in Table 1; or	See above.	
§264.94(a)(3)	Must not exceed an alternate limit established by the Secretary under paragraph (b) of this section.	See above.	
§264.94(b)	The Secretary will establish an alternate concentration limit for a hazardous constituent if he finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In establishing alternate concentration limits, the Secretary will consider the following factors:	See above.	
§264.94(b)(1)	Potential adverse effects on groundwater quality, considering:		
§264.94(b)(1)(i)	Physical and chemical characteristics of the waste in the regulated unit, including its potential for migration;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(b)(1)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization in facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site-specific information for MDA G will be found in the MDA G RFI Report and CMS Report.	
§264.94(b)(1)(iii)	Quantity of groundwater and direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(1)(iv)	Proximity and withdrawal rates of groundwater users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	
§264.94(b)(1)(v)	Current and future uses of groundwater in the area;	Information regarding current and future users of groundwater in the area will be developed.	
§264.94(b)(1)(vi)	Existing quality of groundwater, including other sources of contamination and their cumulative impact on groundwater quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Workplan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER Project site characterization efforts.	
§264.94(b)(1)(vii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA G will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA G will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(1)(ix)	Persistence and permanence of potential adverse effects; and	RFI and CMS Reports for MDA G will be developed and will address this issue.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	
§264.94(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(b)(2)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site-specific information for MDA G will be presented in the MDA G RFI Report and CMS Report.	
§264.94(b)(2)(iii)	Quantity and quality of groundwater and direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	
§264.94(b)(2)(iv)	Patterns of rainfall in the region;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(b)(2)(v)	Proximity of regulated unit to surface waters;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described, will be developed.	
§264.94(b)(2)(vii)	Existing surface water quality, including other sources of contamination and their cumulative impact on surface water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program multi-sector CWA permit, as well as through ER Project characterization activities.	
§264.94(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA G will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA G will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(2)(x)	Persistence and permanence of potential adverse effects.	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	
§264.95	Point of compliance	In establishing a point of compliance, the limits of the waste management area can be delineated by circumscribing an imaginary line around more than one unit. The aggregate approach used in the Hydrogeologic Workplan was intended to be consistent with this concept. As characterization efforts progress, the appropriateness of the aggregate boundary for TA-54 will be assessed.	
§264.95(a)	The Secretary will specify in the facility permit the point of compliance at which the groundwater protection standard of §264.92 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.	See above. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the aggregate that extends down into the uppermost aquifer underlying the regulated units.	
§264.95(b)	The waste management area is the limit projected in horizontal plane of the area on which waste will be placed during active life of regulated unit.	See above.	
§264.95(b)(1)	The waste management area includes horizontal space taken up by any liner, dike, or other barrier designed to contain waste in a regulated unit.	NA	
§264.95(b)(2)	If facility contains more than one regulated unit, the waste management area is described by an imaginary line circumscribing the several regulated units.	See above.	
§264.96	Compliance period		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.96(a)	The Secretary will specify in the facility permit the compliance period during which the ground-water protection standard of §264.92 applies. The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting, and the closure period.)	The implementing document for these alternative activities will specify the period during which concentration limits similar groundwater protection standards and will be equivalent to the remaining active life (including closure period) of the waste management area.	
§264.96(b)	The compliance period begins when the owner/operator initiates a compliance monitoring program meeting requirements of §264.99.	This period will begin upon detection as defined in 264.91, and, if a more comprehensive program is needed to adequately address concentration limits, additional characterization and/or monitoring well installation will occur if appropriate.	
§264.96(c)	If the owner/operator is engaged in a corrective action program at the end of the compliance period specified in paragraph (a) of this section, the compliance period is extended until the owner/operator can demonstrate that the ground-water protection standard of § 264.92 has not been exceeded for a period of three consecutive years.	This period will be established for a period of 3 years if, at the end of the active life and closure period, the concentration limits described above continue to be exceeded.	
§264.97	The owner/operator must comply with following requirements for any groundwater monitoring program developed to satisfy §264.98, §264.99, or §264.100:	Alternative requirements will be met there.	
§264.97(a)	The groundwater monitoring system must consist of sufficient number of wells, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that:	All groundwater monitoring wells will be sufficient in number and placed at appropriate locations and depths in the uppermost aquifer as determined by characterization efforts performed during implementation of the Hydrogeologic Workplan.	
§264.97(a)(1)	Represent the quality of background water that has not been affected by leakage from a regulated unit;	Background wells will be placed in an upgradient locations determined to be unaffected by potential releases from the waste management area.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(a)(1)(i)	A determination of background quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:	Should existing conditions preclude the location of background wells upgradient, other wells will be used. These wells will be capable of determining background quality passing the aggregate boundary. This determination will be made in part by ongoing characterization efforts establishing groundwater gradient, flow directions, potential transport mechanisms, and waste-specific migration characteristics.	
§264.97(a)(1)(i)(A)	Hydrogeologic conditions do not allow the owner/operator to determine what wells are hydraulically upgradient; and	See above.	
§264.97(a)(1)(i)(B)	Sampling at other wells will provide an indication of background groundwater quality that is representative or more representative than that provided by the upgradient wells; and	See above.	
§264.97(a)(2)	Represent the quality of groundwater passing the point of compliance.	The above-mentioned geologic, hydrologic, and waste characteristics will be considered in determining the representativeness of the groundwater passing the downgradient aggregate boundary and the monitoring system's capability of detecting contamination if hazardous waste or hazardous constituents migrate from the aggregate to the uppermost aquifer.	
§264.97(a)(3)	Allow for the detection of contamination when hazardous waste or hazardous constituents have migrated from the waste management area to the uppermost aquifer.	See above.	
§264.97(b)	If a facility contains more than one regulated unit, separate groundwater monitoring systems are not required for each unit provided that provisions for sampling the groundwater in the uppermost aquifer will enable detection and measurement at the compliance point of hazardous constituents from the regulated units that have entered groundwater in the uppermost aquifer.	Consistent with establishing a point of compliance by circumscribing an imaginary line around more than one unit, a groundwater monitoring system capable of detecting and measuring hazardous constituents at the aggregate boundary will meet the intent of this requirement.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(c)	All monitoring wells must be cased in a manner that maintains the integrity of the monitoring-well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.	The integrity of the monitoring well borehole will be maintained by casing in a manner most appropriate for the use and surrounding subsurface environment. Screen materials should be selected based on compatibility with geochemistry and long-term structural integrity. Well casing size should be determined based on the size of purging and equipment necessary to sample the well and the depth of the well. Filter pack material should be inert (i.e., silica sand). Gravel filters are acceptable pending sieve analysis. Annular space should be sealed with materials chemically compatiable with the anticipated contaminants and have a permeability one to two orders of magnitude less than the surrounding formation. A cement and bentonite mixture, bentonite chips, or antishrink cement mixtures can be used in the unsaturated zone and below the frost line. The cap should consist of concrete blending into an apron extending at least three feet from the outer edge of the borehole. Remaining annular space should be sealed with expanding cement. A suitable threaded or flanged cap or compression seal should then be placed and locked. A quarter-inch vent hole pipe will allow gas to escape, and bumper guards should be placed around the well to prevent damage by vehicles.	
§264.97(d)	The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results provide a reliable indication of groundwater quality below the waste management area. At a minimum, the program must include procedures and techniques for:	Groundwater sampling and analysis procedures will be in written form and will address the following:	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(d)(1)	Sample collection;	1) Groundwater level measurements will be determined prior to collection of sample in accordance with a written procedure describing level of accuracy, measurement reference points, required equipment decontamination, and time period measured. 2) Water collection will occur in accordance with a written procedure describing sampling devices and procedures for use and decontamination, well evacuation volumes and procedures, field measurements, and appropriate sample container types.	
§264.97(d)(2)	Sample preservation and shipment;	*SW-846* requirements will be followed to ensure appropriate preservation and temperature controls are utilized.	
§264.97(d)(3)	Analytical procedures; and	*SW-846* or other approved analytical methods, holding times, and approved QA/QC analytical procedures will be used.	
§264.97(d)(4)	Chain-of-Custody control.	Chain-of-custody will include: sample number, time, and date; collector's signature; sample type; well identification; number of containers; parameters to be analyzed; signatures of subsequent handlers; inclusive dates of possession; storage temperature at shipment and receipt; and verification of temperature control upon receipt at analytical laboratory.	
§264.97(e)	The groundwater monitoring program must include sampling and analytical methods appropriate for groundwater sampling and that accurately measure hazardous constituents in groundwater samples.	See above.	
§264.97(f)	The groundwater monitoring program must include determination of the groundwater surface elevation each time the water is sampled.	Groundwater levels will be determined each time water is sampled.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(g)	In detection monitoring or where appropriate in compliance monitoring, data on each hazardous constituent specified in the permit will be collected from background wells and wells at the compliance point(s). The number and kinds of samples collected to establish background shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. Sample size shall be as large as necessary to ensure with reasonable confidence that a contaminant release to ground water from a facility will be detected. The owner or operator will determine an appropriate sampling procedure and interval for each hazardous constituent listed in the facility permit which shall be specified in the unit permit upon approval by the Secretary. The sampling procedure shall be:	Data will be collected that are appropriate for the statistical methodology applied, sufficient in sample size, and utilizing sampling procedures and frequencies of sample collection to ensure that potential contaminant release(s) to groundwater from the waste management unit(s) can be detected.	
§264.97(g)(1)	A sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained, by reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants, or	An adequate number of samples will be collected at appropriate frequencies to ensure representativeness considering aquifer and potential contaminant characteristics. Information such as retardation potential for metals and organics and transport time based on groundwater velocity and constituent mobility will be considered in developing the sampling procedure.	
§264.97(g)(2)	An alternate sampling procedure proposed by the owner/operator and approved by the Secretary.	Should an alternative to the sampling procedure described above be more appropriate, it will be proposed.	
§264.97(h)	Owner/operator will specify one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent which will be specified in the unit permit. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. Where practical quantification limits (pql's) are used in any of the following statistical procedures to comply with §264.97(i)(5), the pql must be proposed by the owner or operator and approved by the Secretary. Use of any of the following statistical methods must be protective of human health and the environment and must comply with the performance standards outlined in paragraph (i) of this section.	One of the statistical methods described in §264.97(h) or an alternative approved by the Secretary will be chosen to evaluate groundwater monitoring data. It is premature at this time to prescribe a specific method until adequate characterization has been performed.	
§264.97(h)(1)	A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(h)(2)	An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.	See above.	
§264.97(h)(3)	A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.	See above.	
§264.97(h)(4)	A control chart approach that gives control limits for each constituent.	See above.	
§264.97(h)(5)	Another statistical test method submitted by the owner or operator and approved by the Secretary.	See above.	
§264.97(i)	Any statistical method chosen under §264.97(h) for specification in the unit permit shall comply with the following performance standards, as appropriate:	The appropriate performance standard used for the statistical method applied will be consistent with those prescribed in §264.97(i).	
§264.97(i)(1)	The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.	See above.	
§264.97(i)(2)	If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experimentwise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts.	See above.	
§264.97(i)(3)	If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be proposed by the owner or operator and approved by the Secretary if he or she finds it to be protective of human health and the environment.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(i)(4)	If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be proposed by the owner or operator and approved by the Secretary if it finds these parameters to be protective of human health and the environment. These parameters will be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.	See above.	
§264.97(i)(5)	The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantification limit (pql) approved by the Secretary under §264.97(h) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.	See above.	
§264.97(i)(6)	If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.	See above.	
§264.97(j)	Ground-water monitoring data collected in accordance with paragraph (g) of this section including actual levels of constituents must be maintained in the facility operating record. The Secretary will specify in the permit when the data must be submitted for review.	Groundwater monitoring data obtained will be maintained in the facility records.	
§264.98	An owner/operator required to establish a detection monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Upon completion of adequate characterization through the Hydrogeologic Workplan, and a determination that monitoring would be appropriate, the detection-type monitoring prescribed in §264.98 would be initiated.	
§264.98(a)	The owner/operator must monitor for indicator parameters (e.g., specific conductance, total organic carbon, or total organic halogen), waste constituents, or reaction products that provide a reliable indication of the presence of hazardous constituents in ground water. The Secretary will specify the parameters or constituents to be monitored in the facility permit, after considering the following factors:	As a result of sampling performed during the four events following well installation under the Hydrogeologic Workplan, indicator parameters, waste constituents, or reaction products will be prescribed that consider the following:	
§264.98(a)(1)	The types, quantities, and concentrations of constituents in wastes managed at the regulated unit;	Waste information has been obtained and reviewed, identifying hazardous constituents, concentrations, and waste volumes during the RFI/CMS process.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(a)(2)	The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;	Further refinement of the hydrogeologic regime at TA-54 and the behavior of hazardous constituents in the unsaturated zone will be developed and reported through the Hydrogeologic Workplan activities and the RFI/CMS process. Substantial information regarding these issues has already been provided in the "Hydrogeologic Assessment of Technical Area 54, Areas G and L", the "Performance Assessment and Composite Analysis for Los Alamos National Laboratory Material Disposal Area G", and the "RFI Report for Material Disposal Areas G, H and L at Technical Area 54".	
§264.98(a)(3)	The detectability of indicator parameters, waste constituents, and reaction products in ground water; and	Based on data collected during the four sampling events following well installation under the Hydrogeologic Workplan, detectability of indicator parameters, waste constituents, and reaction products will be established using *SW-846* or Secretary-approved methodologies and detection limits.	
§264.98(a)(4)	The concentrations or values and coefficients of variation of proposed monitoring parameters or constituents in ground-water background values.	Considerations for establishing concentrations and coefficients of varience of background parameters or constituents include: location of the unit, groundwater flow direction, depth to groundwater, appropriate number and location of background wells, available geologic and hydrologic information, drilling methods, well installation details, and sampling data.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(b)	Owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Should it be determined that a groundwater monitoring system will be necessary, installation of this system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary. Vadose zone investigation including delineation of contaminant movement and potential impact can be used to enhance and/or supplement monitoring efforts as an early detection mechanism.	
§264.98(c)	The owner/operator must conduct ground-water monitoring for each chemical parameter and hazardous constituent specified in the permit pursuant to paragraph (a) of this section in accordance with §264.97(g), and maintain a record of ground-water analytical data as measured and in a form necessary for the determination of statistical significance under §264.97(h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance.	
§264.98(d)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine whether there is statistically significant evidence of contamination for any parameter or hazardous constituent specified in the permit under paragraph (a) of this section in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during detection monitoring.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of contamination as described in §264.98(d).	
§264.98(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the upper-most aquifer will be determined and reevaluated annually.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(f)	The owner/operator must determine whether there is statistically significant evidence of contamination for any chemical parameter of hazardous constituent specified in the permit pursuant to paragraph (a) of this section at a frequency specified under paragraph (d) of this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of contamination exists within a reasonable timeframe.	
§264.98(f)(1)	In determining whether statistically significant evidence of contamination exists, the owner/operator must use the method(s) specified in the permit under §264.97(h). These method(s) must compare data collected at the compliance point(s) to the background ground-water quality data.	See above.	
§264.98(f)(2)	The owner/operator must determine whether there is statistically significant evidence of contamination at each monitoring well as the compliance point within a reasonable period of time after completion of sampling. The facility permit will specify what period of time is reasonable, based on the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of ground-water samples.	See above.	
§264.98(g)	If the owner/operator determines pursuant to paragraph (f) of this section that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she must:	If statistically significant evidence of contamination for established chemical parameters or hazardous constituents exists, notification will be made and ground water wells will be sampled for Appendix IX constituents. If present and confirmed with a second analysis within the timeframes described in §264.98(g), these constituents will be used in a more comprehensive monitoring program.	
§264.98(g)(1)	Notify the Secretary of this finding in writing within seven days. The notification must indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination;	See above.	
§264.98(g)(2)	Immediately sample the ground water in all monitoring wells and determine whether constituents in the list of Appendix IX of part 264 are present, and if so, in what concentration.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(3)	For any Appendix IX compounds found in the analysis pursuant to paragraph (g)(2) of this section, resample within one month and repeat the analysis for those compounds detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If groundwater is not resampled for the compounds found pursuant to paragraph (g)(2) of this section, the hazardous constituents found during this initial Appendix IX analysis will form the basis for compliance monitoring.	See above.	
§264.98(g)(4)	Within 90 days, submit to the Secretary an application for a permit modification to establish a compliance monitoring program meeting the requirements of §264.99. The application must include the following information:	Within 90 days, a request for modification of an enforceable document will be submitted to establish a more comprehensive monitoring program. It will include:	
§264.98(g)(4)(i)	An identification of the concentration or any Appendix IX constituent detected in the ground water at each monitoring well at the compliance point;	Appendix IX constituents and associated concentrations confirmed in downgradient aggregate boundary wells;	
§264.98(g)(4)(ii)	Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of §264.99;	Any proposed modifications/enhancements to the existing groundwater monitoring system if necessary:	
§264.98(g)(4)(iii)	Any proposed additions or changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical methods used at the facility necessary to meet the requirements of §264.99;	Any proposed changes to monitoring frequency, sampling and analysis procedures or statistical methods, if necessary to address provisions of the more comprehensive monitoring program.	
§264.98(g)(4)(iv)	For each hazardous constituent detected at the compliance point, a proposed concentration limit under §264.94(a)(1) or (2), or a notice of intent to seek an alternate concentration limit under §264.94(b); and	For hazardous constituents detected (as defined in §264.91(a)(1)), either background concentrations, maximum concentration limits or alternate concentration limits (ACLs) (or the intent to demonstrate ACLs) will be proposed.	
§264.98(g)(5)	Within 180 days, submit to the Secretary:	Within the specified time frame of 180 days, unless an alternative approach is more appropriate, submit to the Secretary the following:	
§264.98(g)(5)(i)	All data necessary to justify an alternate concentration limit sought under §264.94(b); and	Consideration of geologic and hydrologic conditions, waste inventory, receptor location(s), travel time, and degradation mechanisms may be included in the justification.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(5)(ii)	An engineering feasibility plan for a corrective action program necessary to meet the requirement of §264.100, unless:	A feasibility plan for a groundwater corrective action program will be developed during the CMS/CMI process unless:	
§264.98(g)(5)(ii)(A)	All hazardous constituents identified under paragraph (g)(2) of this section are listed in Table 1 of §264.94 and their concentrations do not exceed the respective values given in that Table; or	Concentrations of hazardous constituents are not greater than MCLs; or	
§264.98(g)(5)(ii)(B)	The owner or operator has sought an alternate concentration limit under §264.94(b) for every hazardous constituent identified under paragraph (g)(2) of this section.	An ACL demonstration has been submitted for all constituents found.	
§264.98(g)(6)	If the owner/operator determines that, pursuant to paragraph (f) of this section, there is a statistically significant difference for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he/she demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. The owner/operator may make a demonstration under this paragraph in addition to, or in lieu of, submitting a permit modification application under paragraph (g)(4) of this section; however, owner/operator is not relieved of the requirement to submit a permit modification application within the time specified in paragraph (g)(4) of this section unless the demonstration made under this paragraph successfully shows that a source other than a regulated unit caused the increase, or that the increase resulted from error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.98(g)(6) and monitoring will continue.	
§264.98(g)(6)(i)	Notify the Secretary in writing within seven days of determining statistically significant evidence of contamination at the compliance point that he intends to make a demonstration under this paragraph;	See above.	
§264.98(g)(6)(ii)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation;	See above.	
§264.98(g)(6)(iii)	Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the detection monitoring program facility; and	See above.	
§264.98(g)(6)(iv)	Continue to monitor in accordance with the detection monitoring program established under this section.	See above.	
§264.98(h)	If the owner/operator determines that the detection monitoring program no longer satisfies the requirements of this section, he/she must within 90 days submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99	An owner/operator required to establish a compliance monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituents be "detected" (consistent with §264.91(a)(1)) resulting in the subsequent development of concentration limits consistent with §264.93 and §264.94, a more comprehensive monitoring program will be established that determines compliance with these limits. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	
§264.99(a)	The owner/operator must monitor the ground water to determine whether regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above.	
§264.99(a)(1)	A list of the hazardous constituents identified under §264.93;	See above.	
§264.99(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above.	
§264.99(a)(3)	The compliance point under §264.95;	See above.	
§264.99(a)(4)	The compliance period under §264.96.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(b)	The owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Installation of a more comprehensive monitoring system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary.	
§264.99(c)	The Secretary will specify the sampling procedures and statistical methods appropriate for the constituents and the facility, consistent with §264.97 (g) and (h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance using appropriate sampling procedures and statistical methods.	
§264.99(c)(1)	The owner/operator must conduct a sampling program for each chemical parameter or hazardous constituent in accordance with §264.97(g).	See above.	
§264.99(c)(2)	The owner/operator must record ground-water analytical data as measured and in form necessary for the determination of statistical significance under §264.97(h) for the compliance period of the facility.	See above.	
§264.99(d)	The owner/operator must determine whether there is statistically significant evidence of increased contamination for any chemical parameter or hazardous constituent specified in the permit, pursuant to paragraph (a) of this section, at a frequency specified under paragraph (f) under this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of increased contamination exists within a reasonable timeframe.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(d)(1)	In determining whether statistically significant evidence of increased contamination exists, owner/operator must use the method(s) specified in the permit under §264.97(h). The methods(s) must compare data collected at the compliance point(s) to a concentration limit developed in accordance with §264.94.	See above.	
§264.99(d)(2)	The owner/operator must determine whether there is statistically significant evidence of increased contamination at each monitoring well at the compliance point within a reasonable time period after completion of sampling. The Secretary will specify that time period in the facility permit, after considering the complexity of the statistical test and the availability of analytical laboratories to perform the analysis of ground-water samples.	See above.	
§264.99(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the uppermost aquifer will be determined and reevaluated annually.	
§264.99(f)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine statistically significant evidence of increased contamination in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during the compliance period of the facility.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of increased contamination as described in §264.99(f).	
§264.99(g)	The owner/operator must analyze samples from all monitoring wells at the compliance point for all constituents contained in Appendix IX of part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to procedures in §264.98(f). If the owner/operator finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the owner/operator may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the owner/operator must report the concentration of these additional constituents to the Secretary within seven days after the completion of the second analysis and add them to the monitoring list. If the owner/operator chooses not to resample, then he or she must report the concentrations of these additional constituents to the Secretary within seven days after completion of the initial analysis and add them to the monitoring list.	If annual sampling for all Appendix IX constituents indicates new constituents that are not already addressed statistically exceed background, and resampling within one month confirms this, the Secretary will be notified and the new constituents will be added to the monitoring list.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(h)	If the owner/operator determines pursuant to paragraph (d) of this section that any concentration limits under §264.94 are being exceeded at any monitoring well at the point of compliance, must:	If it has been determined that a statistically significant increase in contamination due to an exceedance of the previously established concentration limits has occurred at the downgradient aggregate boundary, the Secretary will be notified and a modification to the enforceable document requested to establish a corrective action program. It will include the actions necessary to correct the increase in contamination and a plan for a groundwater monitoring program to demonstrate the effectiveness of the action. An analysis of applicable remedial technologies will be performed through the CMS process, and the capabilities of the existing groundwater monitoring system will be assessed. Modifications/enhancements to the existing system will be proposed if necessary.	
§264.99(h)(1)	Notify the Secretary of finding in writing within seven days. The notification must indicate what concentration limits have been exceeded.	See above.	
§264.99(h)(2)	Submit to the Secretary an application for a permit modification to establish a corrective action program meeting the requirements of §264.100 within 180 days, or within 90 days if an engineering feasibility study has been previously submitted to the Secretary under §264.98(h)(5). The application must at a minimum include the following information:	See above.	
§264.99(h)(2)(i)	A detailed description of corrective actions that will achieve compliance with the ground-water protection standard specified in the permit under paragraph (a) of this section; and	See above.	
§264.99(h)(2)(ii)	A plan for a ground-water monitoring program that will demonstrate the effectiveness of the corrective action. Such a ground-water monitoring program may be based on a compliance monitoring program developed to meet the requirements of this section.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(i)	If the owner/operator determines, pursuant to paragraph (d) of this section, that the ground-water concentration limits under this section are being exceeded at any monitoring well at the point of compliance, may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. In making a demonstration under this paragraph, the owner/operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.99(i) and monitoring will continue.	
§264.99(i)(1)	Notify the Secretary in writing within seven days that he intends to make a demonstration under this paragraph;	See above.	
§264.99(i)(2)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the standard to be exceeded or that the apparent noncompliance with the standards resulted from error in sampling, analysis, or evaluation;	See above.	
§264.99(i)(3)	Within 90 days, submit an application for a permit modification to the Secretary to make any appropriate changes to the compliance monitoring program at the facility; and	See above.	
§264.99(i)(4)	Continue to monitor in accord with the compliance monitoring program established under this section.	See above.	
§264.99(j)	If the owner/operator determines that the compliance monitoring program no longer satisfies the requirements of this section, must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	
§264.100	An owner/operator required to establish a corrective action program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituent concentration levels be exceeded, a program that takes action to address the statistically significant increase identified will be established. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(a)	Owner/operator must take corrective action to ensure that regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above.	
§264.100(a)(1)	A list of the hazardous constituents identified under §264.93;	See above.	
§264.100(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above.	
§264.100(a)(3)	The compliance point under §264.95; and	See above.	
§264.100(a)(4)	The compliance period under §264.96.	See above.	
§264.100(b)	The owner/operator must implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance point by removing the hazardous waste constituents or treating them in place. The permit will specify the specific measures that will be taken.	A program will be implemented to prevent hazardous constituent concentration exceedances at the downgradient aggregate boundary that considers: contaminant distribution and mobility, additional characterization and/or monitoring needs (including vadose zone investigation), source term removal, and applicable remedial techniques.	
§264.100(c)	The owner/operator must begin corrective action within a reasonable time period after the ground-water protection standard is exceeded. The Secretary will specify that time period in the facility permit. If a facility permit includes a corrective action program in addition to a compliance monitoring program, the permit will specify when the corrective action will begin and such a requirement will operate in lieu of §264.99(i)(2).	Corrective action will begin within a reasonable time period after hazardous constituent concentration limits have been exceeded and will be conducted pursuant to the requirements established in the above-referenced corrective action program.	
§264.100(d)	In conjunction with a corrective action program, owner/operator must establish and implement a ground-water monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under §264.99 and must be as effective as that program in determining compliance with the ground-water protection standard under §264.92 and in determining the success of a corrective action program under paragraph (e) of this section, where appropriate.	A groundwater monitoring program to demonstrate the effectiveness of the corrective action will be established and implemented. It will be based on considerations identified in the corrective action program and capable of detecting statistically significant exceedances in previously established hazardous constituent concentration limits. Additional monitoring wells may be installed and sampled if necessary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(e)	In addition to the other requirements of this section, owner/operator must conduct a corrective action program to remove or treat in place any hazardous constituents under §264.93 that exceed concentration limits under §264.94 in groundwater:	The corrective action will also address hazardous constituents that exceed the concentration limits between the downgradient aggregate boundary and the downgradient property boundary, and off-site. Removal or in situ treatment of such constituents will occur in a reasonable time period, and, if off site, where necessary to protect human health and the environment. Corrective action can cease once limits are no longer exceeded.	
§264.100(e)(1)	Between the compliance point under §264.95 and the downgradient property boundary; and	See above.	
§264.100(e)(2)	Beyond the facility boundary, where necessary to protect human health and the environment, owner/operator demonstrates to the satisfaction of the Secretary that, despite the owner's or operator's best efforts, the owner or operator was unable to obtain the necessary permission to undertake such action. The owner/operator is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis.	See above.	
§264.100(e)(3)	Corrective action measures under this paragraph must be initiated and completed within a reasonable period of time considering the extent of contamination.	See above.	
§264.100(e)(4)	Corrective action measures under this paragraph may be terminated once the concentration of hazardous constituents under §264.93 is reduced to levels below their respective concentration limits under §264.94.	See above.	
§264.100(f)	The owner/operator must continue corrective action measures during the compliance period to the extent necessary to ensure that the ground-water protection standard is not exceeded. If the owner or operator is conducting corrective action at the end of the compliance period, he must continue that corrective action for as long as necessary to achieve compliance with the ground-water protection standard. Owner/operator may terminate corrective action measures taken beyond the period equal to the active life of the waste management area (including the closure period) if he can demonstrate, based on data from the ground-water monitoring program under paragraph (d) of this section, that the ground-water protection standard of §264.92 has not been exceeded for a period of three consecutive years.	Corrective action measures will continue until hazardous constituent concentration limits are no longer exceeded during the period equivalent to the remaining active life of the waste management area (including closure period). If corrective action is still occurring at the end of this period, it will continue until concentration limits are no longer exceeded for 3 consecutive years.	
§264.100(g)	The owner/operator must report in writing to the Secretary on the effectiveness of the corrective action program. The owner/operator must submit these reports semi-annually.	Semi-annual reports on the effectiveness of the corrective action will be provided to the Secretary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(h)	The owner/operator determines that the corrective action program no longer satisfies the requirements of this section, he must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if it is determined that this program is no longer appropriate.	
§264.110(a)	Sections 264.111 through 264.115 apply to owners/operators of all hazardous waste management facilities.		Sections 1.0 and 2.0
§264.110(b)	Sections 264.116 through 264.120 apply to the owners/operators of:		Sections 3.0 and 4.0
§264.110(b)(1)	All hazardous waste disposal facilities;		Sections 3.0 and 4.0
§264.110(b)(2)	Waste piles and surface impoundments from which the owner/operator intends to remove wastes at closure . . .;		
§264.110(b)(3)	Tank systems that are required . . . to meet the requirements for landfills; and		
§264.110(b)(4)	Containment buildings that are required . . . To meet closure requirements for landfills.		
§264.110(c)	The Secretary may replace all or part of the requirements of this subpart (and the unit-specific standards referenced in §264.111(c) applying to a regulated unit), with alternative requirements set out in a permit or enforceable document, where the Secretary determines that:	The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the closure and post-closure care requirements of 264.111 - 264.120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet closure/post-closure care requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA G once they are approved .	Sections 1.0, 2.0, 3.0, and 4.0
§264.110(c)(1)	The regulated unit is situated among SWMUs or AOCs, a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	MDA G meets the criteria for alternative requirements because the existing land-based units (Pit 29 and Shaft 124) are situated among SWMUs, a release has occurred, and the origin of the release is uncertain.	Sections 1.0 and 3.0, Attachment C
§264.110(c)(2)	It is not necessary to apply the closure requirements of this subpart (and those referenced herein) because the alternative requirements will protect human health and the environment and will satisfy the closure performance standard of §264.111(a) and (b).	The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet applicable closure and post-closure care requirements of §264.111 - 264.120; details will be provided in the CMI Plan.	Sections 1.0 and 3.0

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.111	Closure Performance Standard: Owner/operator must close the facility in a manner that:	For MDA G, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Section 1.2
§264.111(a)	Minimizes the need for further maintenance; and	For MDA G, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Sections 1.0, 2.0, and 3.0
§264.111(b)	Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.	For MDA G, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Sections 1.0, 2.0, and 3.0
§264.111(c)	Complies with the closure requirements of this subpart, including . . . the requirements of . . . 264.310 . . .	See 264.310 regulatory requirement in this table.	
§264.112(a)(1)	Owner/operator of a hazardous waste management facility must have a written closure plan. . . . The plan must be submitted with the permit application . . . and approved by the Secretary as part of the permit issuance procedures . . . In accordance with 270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit.	A closure plan for MDA G is included in this submittal. The closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the closure requirements of 264.111-264.115. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet the closure requirements.	Sections 1.0 and 2.0
§264.112(a)(2)	The Secretary's approval of the plan must ensure that the approved closure plan is consistent with 264.111 through 264.115 and the applicable requirements of Subpart F of this Part, . . . 264.310 . . .. Until final closure is completed and certified in accordance with 264.115, a copy of the approved plan and all approved revisions must be furnished to the Secretary upon request, including requests by mail.	NA	Introduction
§264.112(b)	Closure plan must identify steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least:	NA	Section 1.0
§264.112(b)(1)	A description of how each hazardous waste management unit at the facility will be closed in accordance with §264.111;	NA	Section 2.3

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(2)	A description of how final closure of the facility will be conducted in accordance with §264.111. The description must identify the maximum extent of the operations which will be unclosed during the active life of the facility; and	NA	Section 1.1
§264.112(b)(3)	An estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the type(s) of the off-site hazardous waste management units to be used, if applicable; and	NA	Sections 2.2 and 2.3
§264.112(b)(4)	A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard; and	NA	Section 2.3
§264.112(b)(5)	A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control; and	NA	Section 2.3
§264.112(b)(6)	A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover must be included.)	NA	Section 1.4
§264.112(b)(7)	For facilities that use trust funds to establish financial assurance under §264.143 or §264.145 and that are expected to close prior to the expiration of the permit, an estimate of the expected year of final closure.	NA	Section 1.6

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(8)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d), either the alternative requirements applying to the regulated unit, or a reference to the enforceable document containing those alternative requirements.	The closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet closure requirements. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet closure requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA G once they are approved.	Section 1.3
§264.112(c)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan in accordance with the applicable procedures in Parts 124 and 270. The written notification or request must include a copy of the amended closure plan for review or approval by the Secretary.	NA	Section 1.5
§264.112(c)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the closure plan at any time prior to the notification of partial or final closure of the facility.	NA	Section 1.5
§264.112(c)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:	NA	Section 1.5
§264.112(c)(2)(i)	Changes in operating plans or facility design affect the closure plan, or	NA	Section 1.5
§264.112(c)(2)(ii)	There is a change in the expected year of closure, if applicable, or	NA	Section 1.5
§264.112(c)(2)(iii)	In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan.	NA	Section 1.5
§264.112(c)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or § 264.140(d).	NA	Section 1.5

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(c)(3)	The owner/operator must submit a written request for a permit modification including a copy of the amended closure plan for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the owner or operator must request a permit modification no later than 30 days after the unexpected event. . . . . the Secretary will approve, disapprove, or modify this amended plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit issued.	NA	Section 1.5
§264.112(c)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.112(c)(2). The owner/operator must submit the modified plan within 60 days of the Secretary's request, or within 30 days if the change in facility conditions occurs during partial or final closure. Any modifications requested by the Secretary will be approved in accordance with the procedures in parts 124 and 270.	NA	Section 1.5
§264.112(d)	Notification of partial closure and final closure.		
§264.112(d)(1)	Owner/operator must notify the Secretary in writing at least 60 days prior to the date on which he expects to begin closure of a surface impoundment, waste pile, land treatment or landfill unit, or final closure of a facility with such a unit. . . .	NA	Section 1.4
§264.112(d)(2)	The date when it "expects to begin closure" must be either:		
§264.112(d)(2)(i)	No later than 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional hazardous wastes, no later than one year after the date on which the unit received the most recent volume of hazardous wastes. If the owner/operator of a hazardous waste management unit can demonstrate to the Secretary that the hazardous waste management unit or facility has the capacity to receive additional hazardous wastes and it has taken all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit; or	NA	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(d)(2)(ii)	For units meeting the requirements of §264.113(d), no later than 30 days after the date on which the hazardous waste management unit receives the known final volume of non-hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional non-hazardous wastes, no later than one year after the date on which the unit received the most recent volume of non-hazardous wastes. If the owner/operator can demonstrate to the Secretary that the hazardous waste management unit has the capacity to receive additional non-hazardous wastes and it has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit.	NA	
§264.112(d)(3)	If the facility's permit is terminated, or if the facility is otherwise ordered, by judicial decree or final order under section 3008 of RCRA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the owner/operator must close the facility in accordance with the deadlines established in §264.113.	NA	
§264.112(e)	Nothing in this section shall preclude the owner/operator from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure.	NA	NA
§264.113	Closure; Time allowed for closure		
§264.113(a)	Within 90 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner/operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at a hazardous waste management unit or facility, the owner/operator must treat, remove from the unit or facility, or dispose of on-site, all hazardous wastes in accordance with the approved closure plan. The Secretary may approve a longer period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	NA	NA
§264.113(a)(1)(i)	The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; or	NA	NA
§264.113(a)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	NA	NA
§264.113(a)(1)(ii)(B)	There is a reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	NA	NA
§264.113(a)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(a)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements.	NA	NA
§264.113(b)	The owner/operator must complete partial and final closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner or operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at the hazardous waste management unit or facility. The Secretary may approve an extension to the closure period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	NA	NA
§264.113(b)(1)(i)	The partial or final closure activities will, of necessity, take longer than 180 days to complete; or	NA	NA
§264.113(b)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	NA	NA
§264.113(b)(1)(ii)(B)	There is reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	NA	NA
§264.113(b)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	NA	NA
§264.113(b)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit or facility, including compliance with all applicable permit requirements.	NA	NA
§264.113(c)	The demonstrations referred to in paragraphs (a)(1) and (b)(1) of this section must be made as follows:		
§264.113(c)(1)	The demonstrations in paragraph (a)(1) of this section must be made at least 30 days prior to the expiration of the 90-day period in paragraph (a) of this section; and	NA	NA
§264.113(c)(2)	The demonstration in paragraph (b)(1) of this section must be made at least 30 days prior to the expiration of the 180-day period in paragraph (b) of this section, unless the owner/operator is otherwise subject to the deadlines in paragraph (d) of this section.	NA	NA
§264.113(d)	The Secretary may allow an owner/operator to receive only non-hazardous wastes in a landfill, land treatment, or surface impoundment unit after the final receipt of hazardous wastes at that unit if:	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(d)(1)	The owner or operator requests a permit modification in compliance with all applicable requirements in parts 270 and 124 of this title and in the permit modification request demonstrates that:	NA	NA
§264.113(d)(1)(i)	The unit has the existing design capacity as indicated on the part A application to receive non-hazardous wastes; and	NA	NA
§264.113(d)(1)(ii)	There is a reasonable likelihood that the owner or operator or another person will receive non-hazardous wastes in the unit within one year after the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(1)(iii)	The non-hazardous wastes will not be incompatible with any remaining wastes in the unit, or with the facility design and operating requirements of the unit or facility under this part; and	NA	NA
§264.113(d)(1)(iv)	Closure of the hazardous waste management unit would be incompatible with continued operation of the unit or facility; and	NA	NA
§264.113(d)(1)(v)	The owner or operator is operating and will continue to operate in compliance with all applicable permit requirements; and	NA	NA
§264.113(d)(2)	The request to modify the permit includes an amended waste analysis plan, ground-water monitoring and response program, human exposure assessment required under RCRA section 3019, and closure and post-closure plans, and updated cost estimates and demonstrations of financial assurance for closure and post-closure care as necessary and appropriate, to reflect any changes due to the presence of hazardous constituents in the non-hazardous wastes, and changes in closure activities, including the expected year of closure if applicable under § 264.112(b)(7), as a result of the receipt of non-hazardous wastes following the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(3)	The request to modify the permit includes revisions, as necessary and appropriate, to affected conditions of the permit to account for the receipt of non-hazardous wastes following receipt of the final volume of hazardous wastes; and	NA	NA
§264.113(d)(4)	The request to modify the permit and the demonstrations referred to in paragraphs (d)(1) and (d)(2) of this section are submitted to the Secretary no later than 120 days prior to the date on which the owner/operator of the facility receives the known final volume of hazardous wastes at the unit, or no later than 90 days after the effective date of this rule in the state in which the unit is located, whichever is later.	NA	NA
§264.113(e)	Requirements for the owner/operator of a hazardous waste surface impoundment that is not in compliance with the liner and leachate collection system requirements.	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.114	During the partial and final closure periods, all contaminated equipment, structures and soils must be properly disposed of or decontaminated unless otherwise specified in §§ 264.197, 264.228, 264.258, 264.280 or § 264.310. By removing any hazardous wastes or hazardous constituents during partial and final closure, the owner/operator may become a generator of hazardous waste and must handle that waste in accordance with all applicable requirements of part 262 of this chapter.	NA	NA
§264.115	Within 60 days of completion of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill unit, and within 60 days of the completion of final closure, the owner/operator must submit to the Secretary, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for closure under §264.143(i).	NA	Section 1.7
§264.116	No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary, a survey plat indicating the location and dimensions of landfills cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable Subpart G regulations.	NA	Section 1.10
§264.117	Post-closure care and use of property		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(a)(1)	Post-closure care for each hazardous waste management unit subject to the requirements of §§ 264.117 through 264.120 must begin after completion of closure of the unit and continue for 30 years after that date and must consist of at least the following:	A post-closure plan for MDA G is included in this submittal. The post-closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	Section 3.2
§264.117(a)(1)(i)	Monitoring and reporting in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	Sections 4.1 and 4.3
§264.117(a)(1)(ii)	Maintenance and monitoring of waste containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part.	See above.	Sections 4.1 and 4.2
§264.117(a)(2)	Any time preceding partial closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period for a particular unit, the Secretary may, in accordance with the permit modification procedures in parts 124 and 270:		
§264.117(a)(2)(i)	Shorten the post-closure care period applicable to the hazardous waste management unit, or facility, if all disposal units have been closed, if he finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or ground-water monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit or facility is secure); or	NA	Section 3.2
§264.117(a)(2)(ii)	Extend the post-closure care period applicable to the hazardous waste management unit or facility if he finds that the extended period is necessary to protect human health and the environment (e.g., leachate or ground-water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment).	NA	Section 3.2

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(b)	The Secretary may require, at partial and final closure, continuation of any of the security requirements of §264.14 during part or all of the post-closure period when:	NA	Section 3.6
§264.117(b)(1)	Hazardous wastes may remain exposed after completion of partial or final closure; or	NA	Section 3.6
§264.117(b)(2)	Access by the public or domestic livestock may pose a hazard to human health.	NA	Section 3.6
§264.117(c)	Post-closure use of property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the facility's monitoring systems, unless the Secretary finds that the disturbance:	NA	Section 4.4
§264.117(c)(1)	Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or	NA	Section 4.4
§264.117(c)(2)	Is necessary to reduce a threat to human health or the environment.	NA	Section 4.4
§264.117(d)	All post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in §264.118.	The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	Section 3.2
§264.118	Post-Closure Plan, Amendment of Plan		
§264.118(a)	The owner/operator of a hazardous waste disposal unit must have a written post-closure plan. . . . The plan must be submitted with the permit application, . . . , and approved by the Secretary as part of the permit issuance procedures under Part 124 of this chapter. In accordance with §270.32 of this chapter, the approved post-closure plan will become a condition of any RCRA permit issued.	A post-closure plan for MDA G is included in this submittal. The post-closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	Introduction, Sections 3.0 and 4.0
§264.118(b)	For each hazardous waste management unit subject to the requirements of this section, the post-closure plan must identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least:	See above.	Section 4.0

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(b)(1)	A description of the planned monitoring activities and frequencies at which they will be performed to comply with subparts F, K, L, M, N, and X of this part during the post-closure care period; and	See above.	Section 4.1
§264.118(b)(2)	A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure:	See above.	Section 4.2
§264.118(b)(2)(i)	The integrity of the cap and final cover or other containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	See above.	Section 4.2.1
§264.118(b)(2)(ii)	The function of the monitoring equipment in accordance with the requirements of subparts, F, K, L, M, N, and X of this part; and	See above.	Section 4.2.2
§264.118(b)(3)	The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure care period.		Section 4.5
§264.118(b)(4)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §§264.90(f), 264.110(c), and/or §§264.140(d), either the alternative requirements that apply to the regulated unit, or a reference to the enforceable document containing those requirements.		Section 3.2
§264.118(c)	Until final closure of the facility, a copy of the approved post-closure plan must be furnished to the Secretary upon request, including request by mail. After final closure has been certified, the person or office specified in §264.188(b)(3) must keep the approved post-closure plan during the remainder of the post-closure period.		Introduction
§264.118(d)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan in accordance with the applicable requirements in parts 124 and 270. The written notification or request must include a copy of the amended post-closure plan for review or approval by the Secretary.		Section 3.3
§264.118(d)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period.		Section 3.3
§264.118(d)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:		Section 3.3
§264.118(d)(2)(i)	Changes in operating plans or facility design affect the approved post-closure plan, or		Section 3.3
§264.118(d)(2)(ii)	There is a change in the expected year of final closure, if applicable, or		Section 3.3
§264.118(d)(2)(iii)	Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan.		Section 3.3
§264.118(d)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d).		Section 3.3

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(d)(3)	The owner/operator must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan. An owner/operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to submit a contingent post-closure plan under § 264.228(c)(1)(ii) and §264.258(c)(1)(ii) must submit a post-closure plan to the Secretary no later than 90 days after the date that the owner or operator or the Secretary determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §264.310. The Secretary will approve, disapprove or modify this plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved post-closure plan will become a permit condition.		Section 3.3
§264.118(d)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.118(d)(2). The owner/operator must submit the modified plan no later than 60 days after the Secretary's request, or no later than 90 days if the unit is a surface impoundment or waste pile not previously required to prepare a contingent post-closure plan. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in parts 124 and 270.		Section 3.3
§264.119(a)	No later than 60 days after certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the owner/operator must identify the type, location, and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records it has kept.		Section 3.7
§264.119(b)	Within 60 days of certification of closure of the first hazardous waste disposal unit and within 60 days of certification of closure of the last hazardous waste disposal unit, the owner/operator must:		Section 3.7
§264.119(b)(1)	Record, in accordance with State law, a notation on the deed to the facility property -- or on some other instrument which is normally examined during title search -- that will in perpetuity notify any potential purchaser of the property that:		Section 3.7
§264.119(b)(1)(i)	The land has been used to manage hazardous wastes; and		Section 3.7
§264.119(b)(1)(ii)	Its use is restricted under 40 CFR subpart G regulations; and		Section 3.7

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.119(b)(1)(iii)	The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the facility required by §264.116 and §264.119(a) have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Secretary; and		Section 3.7
§264.119(b)(2)	Submit a certification, signed by the owner/operator, that he has recorded the notation specified in paragraph (b)(1) of this section, including a copy of the document in which the notation has been placed, to the Secretary.		Section 3.7
§264.119(c)	If the owner/operator or any subsequent owner/operator of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes and hazardous waste residues, the liner, if any, or contaminated soils, it must request a modification to the post-closure permit in accordance with the applicable requirements in parts 124 and 270. The owner/operator must demonstrate that the removal of hazardous wastes will satisfy the criteria of §264.117(c). By removing hazardous waste, the owner/operator may become a generator of hazardous waste and must manage it in accordance with all applicable requirements of this chapter. If it is granted a permit modification or otherwise granted approval to conduct such removal activities, the owner/operator may request that the Secretary approve either:		Section 3.3
§264.119(c)(1)	The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or		Section 3.3
§264.119(c)(2)	The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.		Section 3.3
§264.120	No later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the owner/operator must submit to the Secretary, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification must be signed by the owner/operator and an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for post-closure care under §264.145(i).		Section 3.5

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310	Closure and post-closure care for landfills.	A post-closure plan for MDA G is included in this submittal. The post-closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	
§264.310(a)	At final closure of the landfill or upon closure of any cell, the owner/operator must cover the landfill or cell with a final cover designed and constructed to:	See above.	Section 2.3
§264.310(a)(1)	Provide long-term minimization of migration of liquids through the closed landfill;	See above.	Section 2.3
§264.310(a)(2)	Function with minimum maintenance;		Section 2.3
§264.310(a)(3)	Promote drainage and minimize erosion or abrasion of the cover;		Section 2.3
§264.310(a)(4)	Accommodate settling and subsidence so that the cover's integrity is maintained; and		Section 2.3
§264.310(a)(5)	Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	See above.	Section 2.3
§264.310(b)	After final closure, the owner/operator must comply with all post-closure requirements contained in §264.117 through §264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under §264.117). The owner/operator must:	See above.	Section 4.0
§264.310(b)(1)	Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;	See above.	Sections 3.2 and 4.2.1
§264.310(b)(2)	Continue to operate the leachate collection and removal system until leachate is no longer detected;	See above.	Section 4.2.2
§264.310(b)(3)	Maintain and monitor the leak detection system in accordance with § 264.301(c)(3)(iv) and (4) and §264.303(c), and comply with all other applicable leak detection system requirements of this part;	See above.	Sections 4.1 and 4.2
§264.310(b)(4)	Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of subpart F of this part;	See above.	Sections 4.1 and 4.2
§264.310(b)(5)	Prevent run-on and run-off from eroding or otherwise damaging the final cover; and	See above.	Sections 3.2 and 4.2
§264.310(b)(6)	Protect and maintain surveyed benchmarks used in complying with §264.309.	See above.	Section 4.2.2

ATTACHMENT B

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA G

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA G

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LIST OF ABBREVIATIONS/ACRONYMS

bgs	below ground surface
CA	composite analysis
cm	centimeter(s)
cm^2	square centimeters
cm/hr	centimeters per hour
cm/sec	centimeters per second
cm/yr	centimeters per year
DQO	Data Quality Objective
EP	Extraction Procedure
ER	Environmental Restoration
FEHM	Finite Element Heat and Mass
ft	feet (foot)
ft/d	feet per day
ft/yr	feet per year
FY	Fiscal Year
HE	high explosives
in.	inch(es)
in./yr	inches per year
LANL	Los Alamos National Laboratory
m	meter(s)
MCL	maximum concentration level
MDA	material disposal area
µg/L	micrograms per liter
mg/L	milligrams per liter

LIST OF ABBREVIATIONS/ACRONYMS (Continued)

mm	millimeter(s)
mm/yr	millimeters per year
NMED	New Mexico Environment Department
PA	performance assessment
pCi/L	picocuries per liter
R	regional aquifer
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
TA	technical area
VOC	volatile organic compound

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA G

1.0 GEOLOGY AND HYDROLOGY AT TECHNICAL AREA 54, AREA G

Numerous investigations of the geology and hydrology at Technical Area (TA) 54 have been conducted at Los Alamos National Laboratory (LANL). The following sections describe the extensive studies conducted at TA-54 in the past, and present information on future characterization activities and hydrologic modeling. LANL's TA-54, Area G, is located on Mesita del Buey, an east-west trending mesa bordered on the north by Cañada del Buey and on the south by Pajarito Canyon.

1.1 Geology and Stratigraphy

The following information on the geology and stratigraphy at TA-54 was obtained from borehole core logs. Unit 2 of the Tshirege Member of the Bandelier Tuff is at the surface of Mesita del Buey. This moderately welded ash-flow tuff forms nearly vertical cliffs on the sides of mesas, and at Area G is approximately 39 feet (ft) thick. A series of thin, discontinuous surge beds mark the base of Unit 2. Tshirege Member Unit 1v underlies Unit 2. This vapor-phase altered cooling unit forms sloping outcrops, and is further divided into Units 1vu and 1vc. Unit 1vu is a poorly welded ash-flow tuff. At TA-54, the thickness of Unit 1vu ranges from about 90 ft near Material Disposal Area (MDA) H to about 46 ft near MDA G. Unit 1vc is a moderately to poorly welded ash-flow tuff and ranges from 49 ft thick at the western end of Mesita del Buey to 23-26 ft thick at the eastern end. At the base of Unit 1v is Tshirege Member Unit 1g, which is a vitric, pumiceous, nonwelded ash-flow tuff. This unit is about 150 ft thick at MDA H, and thins to about 49 ft thick at the eastern end of MDA G. A distinctive pumice-poor surge deposit forms the base of Unit 1g. Beneath Unit 1g is the Tsankawi Pumice Bed, which is a thin (about 3-ft-thick) bed of gravel-sized pumice at Area L and about 2 ft thick at the eastern terminus. It is the basal air fall deposit of the Tshirege Member. The Cerro Toledo interval is stratigraphically beneath the Tsankawi Pumice Bed; it separates the Tshirege and Otowi Members of the Bandelier Tuff, and averages about 40 ft thick at Area L. The Otowi Member is a massive, nonwelded, pumice-rich ash-flow tuff. At Area L, it ranges from about 64 to 109 ft thick. At the base of the Otowi Member is the Guaje Pumice Bed. At Area L, this basal air fall deposit averages about 9 ft thick. Beneath the Guaje Pumice Bed are the Cerros del Rio basalts. It is inferred that these basalts exist beneath Mesita del Buey, based on borehole data at Area L, and the thickness beneath TA-54 was extrapolated to be between 262 and 492 ft. Although the

depth to and thickness of the Puye Formation beneath the Cerros del Rio basalts at TA-54 were not determined as a result of borehole investigations, they were encountered beneath the basalts at a water-supply well in Pajarito Canyon, approximately one mile west of Mesita del Buey.

1.2 Soils

Mesa-top soils at TA-54 form from weathering of the Tshirege Member of the Bandelier Tuff and from aeolian deposits. These soils are primarily Hackroy sandy loams that typically range from a brown sandy loam in the top 8 centimeters (cm) to a reddish brown from 8 to 30 cm in depth. Where present, the native soils are thickest near the mesa's center and thinner near the edges. Generally, the mesa surface soils are thin and poorly developed. Near the surface, their texture is sandy; beneath the surface, they exhibit a more clay-like texture. Permeability rates range from 5 to 15 cm per hour (cm/hr) in the top layers down to 0.15 to 0.50 cm/hr in the lower layers. In addition to Hackroy sandy loams, soil types at TA-54 include Nyjack loam, Totavi gravelly loamy sand, Hackroy-Rock outcrop complex, Servilleta loam, Penistaja sandy loam, and Prieta silt loam (Nyhan et al., 1978).

1.3 Surface Water

Mesita del Buey is one of the drier mesas at LANL and there are no streams on the mesa. Surface water flows only as storm water and snowmelt runoff. South of Mesita del Buey, Pajarito Canyon is one of the wetter canyons at LANL; north of Mesita del Buey, Cañada del Buey is one of the driest. Streams in these canyons are intermittent.

1.4 Perched Water

To meet a May 7, 1985 Compliance Order/Schedule, test wells were installed in the canyons north and south of TA-54 to determine if perched water existed within canyon alluvium, to determine if perched water extended beneath Mesita del Buey, and to sample/monitor perched water, if present (IT Corporation, 1987). In 1985, three test wells were installed in a tributary to Cañada del Buey; they include CDBO-1 (to a depth of 15 ft), CDBO-2 (30 ft), and CDBO-3 (20 ft); test well CDBO-4 (to a depth of 21 ft) was installed further to the east in Cañada del Buey. All 4 wells were dry; however, they were completed as observation wells to monitor the alluvium for possible water in the future (Purtymun, 1995). The 1985 investigation indicated that the alluvium in Cañada del Buey contained no perched water (Devaurs and Purtymun, 1985).

Three test wells were also installed in Pajarito Canyon in 1985; they are PCO-1, PCO-2, and PCO-3 (Purtymun, 1995). These 3 wells are sampled for radionuclides, metals, general inorganics, and organics. Sampling results are compiled annually in environmental surveillance reports and submitted to the New Mexico Environment Department (NMED). To ensure that the alluvial aquifer in Pajarito Canyon did not extend northward beneath Mesita del Buey, 4 test holes were drilled in the canyon floor north of the intermittent stream channel in 1985 (Devaurs and Purtymun, 1985). These 4 test holes, designated PCM-1, PCM-2, PCM-3, and PCM-4, were dry. They were completed for use as moisture-access holes (Purtymun, 1995). It was concluded that perched water in Pajarito Canyon is confined to the alluvium in the stream channel and does not extend to the flank of the canyon (Purtymun, 1995). As stated in the "Hydrogeologic Workplan" (LANL, 1998), no perched groundwater has been identified beneath Mesita del Buey.

In addition to the seven test holes drilled in Pajarito Canyon in 1985, two test holes were drilled in 1950 as part of a water-supply study (Griggs, 1964; Purtymun, 1975). These holes are identified as T-5 and T-6; they were drilled to depths of 263 ft and 300 ft, respectively, and completely penetrated the Bandelier Tuff beneath the floor of Pajarito Canyon. No water was encountered. The same holes were dry when measured in 1985 (Devaurs and Purtymun, 1985).

Two mesa-top test holes at Area G were drilled to depths that were equivalent to up to 40 ft beneath the base of the alluvium in Pajarito Canyon, and three mesa-top test holes at Area L were drilled to depths that were equivalent to up to 48 ft beneath the Pajarito Canyon allluvium. None of these test holes encountered perched water (IT Corporation, 1987).

Five observation wells were installed in Cañada del Buey, mostly up-gradient from Area L, as part of a 1992 investigation for a proposed sanitary wastewater treatment plant. These wells, installed to study the effect of effluent release on the environment in the canyon, are CDBO-5, CDBO-6, CDBO-7, CDBO-8, and CDBO-9. In addition, two moisture-access holes (CDBM-1 and CDBM-2) were drilled north of Area L in 1992. Perched water was encountered in the canyon alluvium at wells CDBO-6 and CDBO-7. It was determined that the perched water at these locations is likely only the result of operational discharges from well PM-4 (Purtymun, 1995).

1.5 Vadose Zone

A summary of the hydrogeology of Areas G and L and additional data and discussions relevant to the potential for migration of hazardous waste from MDAs G and L is presented in the "Hydrogeologic Assessment of Technical Area 54, Areas G and L, Los Alamos National Laboratory" (IT Corporation, 1987). The assessment was prepared in response to a May 7, 1985 Compliance Order/Schedule issued to LANL by the New Mexico Environmental Improvement Division. The Order mandated specific tests and investigations be performed at Areas G and L to obtain information on the hydrologic characteristics of the waste disposal areas relevant to the potential for hazardous waste or hazardous constituent migration into the groundwater. The discussion that follows is extracted from the assessment (IT Corporation, 1987) prepared using numerous reports by Bendix Field Engineering Corporation and LANL on the results of individual tests or groups of tests.

In late 1985 and 1986, an investigation was initiated to fulfill the testing requirements of the Order, which included characterizing the vadose zone in and around MDA G. Eighteen (18) boreholes were drilled to a depth ranging from 60 to 145 ft into the Bandelier Tuff from the top of Mesita del Buey. Nearly 1,700 ft of core was obtained from 16 of these holes. Hydrologic testing and geophysical logging were performed in the boreholes, and selected core samples were analyzed for numerous parameters. A number of boreholes were completed for pore-gas sampling, neutron moisture monitoring, and psychrometer installation. As discussed in Section 1.4, holes were also drilled in Cañada del Buey and Pajarito Canyon, adjacent to Mesita del Buey, to investigate possible alluvial aquifers.

To provide a quantitative analysis of moisture movement in the Bandelier Tuff, vadose zone characterization studies were conducted at Areas G and L. The quantitative analyses would help to determine the likelihood of contaminant migration from Areas G and L through the vadose zone and into groundwater beneath the sites. To quantify moisture movement in the tuff, a two-tiered approach was utilized. First, hydrologic characteristics of the tuff and hydraulic head were measured to calculate seepage velocity and rates of moisture flux. Second, the moisture content of the tuff was measured after precipitation events to determine changes in moisture content with depth.

Hydrologic testing was performed in the boreholes and on borehole core samples in the laboratory to allow calculation of seepage velocity and moisture flux rates in the tuff. Intrinsic

permeability was measured in boreholes through air injection and vacuum tests. Laboratory tests included the Dynamic Method to measure gas-water relative permeability, and gas injection with correction for slippage. Intrinsic permeability ranged from about 10^{-8} to 10^{-9} square centimeters (cm^2) for fractured and unfractured intervals. Similar results were obtained from a water injection test performed to verify the results of the air injection tests. Vacuum tests performed in the same boreholes yielded slightly lower permeability values; however, they also averaged in the 10^{-8} to 10^{-9} cm^2 range. In the laboratory tests, intrinsic permeability yielded values in the low 10^{-9} cm^2 range. Because discontinuities that occur in the rock intersected by the borehole are not typically present in laboratory-tested cores, lower intrinsic permeability values are expected for laboratory tests.

Laboratory measurements were conducted for gravimetric moisture content, soil-moisture characteristic curves, and unsaturated hydraulic conductivity of borehole tuff samples. The gravimetric moisture content generally ranged from 2 to 4%, with isolated intervals that ranged up to 10 to 28%. Soil moisture characteristic curves were determined for 20 tuff samples, and moisture content was determined for capillary pressures in the range of -0.03 to -0.34 bar. Attempts to measure moisture contents at lower capillary pressures were not successful because samples disaggregated. Hence, moisture characteristic curves could only be determined for volumetric moisture contents above 22%, which is considerably higher than the values observed from testing core samples of field measurements. From the characteristic curve data, it was concluded that moisture retention values of the tuff are extremely high, and ranged up to 80% (60% volumetric moisture). The moisture retention value of 80% indicates that no liquid transport can occur at moisture content below this value. Because all of the moisture content measurements for the tuff were significantly below 80%, it was concluded that capillary transport of liquids does not contribute to moisture movement and vapor transport is clearly the major mechanism of water transport. Unsaturated flow is not likely to be a major factor in liquid transport at these moisture content levels.

This conclusion was supported by actual measurements of moisture content in the tuff at depth. Neutron logging was performed every two weeks at one borehole each in Areas G and L for approximately eight months. In addition, neutron logging was performed daily for a period after three major precipitation events. Moisture profiles measured with neutron logging showed the upper 10 to 20 ft of tuff to be affected by precipitation events and subject to seasonal

fluctuations. However, below 20 ft, the moisture content is extremely low and in the range of the gravimetric moisture values (2 to 4%).

The 1986 moisture profiles were consistent with moisture measurements conducted previously on the Bandelier Tuff. Neutron-moisture data of the tuff at various locations at LANL were measured between 1960 and 1980 (Abeele et al., 1981). Those data showed that moisture conditions ranged from 10 to 40% by volume in the upper 10 to 15 ft of tuff, and that below 15 ft, moisture rarely exceeded 5 to 10%. In addition, those data showed that in the uppermost four meters of disturbed areas at Area G, significant seasonal fluctuations in moisture content exist. Those findings are consistent with the 1986 data. Overall, the moisture data reported in Abeele et al. (1981) and in the hydrogeological assessment (IT Corporation, 1987) are consistent and show the following:

- Throughout the area, moisture content of the tuff is low (typically between 2 to 5% with intervals ranging up to 10 to 28%)
- In the upper 10 to 20 ft of tuff, seasonal variation of moisture content occurs; however, below ~20 ft, seasonal variations are not measurable
- Precipitation from monitored autumn storms does not infiltrate below ~10 ft.

From these studies, the following conclusions were made: 1) the tuff is not saturated and is in fact very dry; and 2) moisture from precipitation does not infiltrate to a significant depth. Therefore, meteoric water infiltration is not a viable process for transport of hazardous waste or hazardous constituents through the vadose zone at Areas G and L.

Thermocouple psychrometers were installed at numerous depths in one borehole each in Areas G and L to measure capillary potential. The psychrometer data were highly variable, but indicated that soil moisture tensions ranged from 1 to 15 bars. Moisture flux calculations were performed using measured hydraulic conductivity values for the tuff and hydraulic head data from the psychrometers to determine maximum rates of moisture movement in the tuff. For Area G, a calculated maximum downward flux of 0.491 ft per year (ft/yr) and a maximum upward flux of 0.041 ft/yr were calculated using average measured hydraulic conductivity. Because only hydraulic conductivity values at higher percentages of saturation than those actually observed in the field were available, the calculated flux rates very likely overestimate the moisture flux values. Because hydraulic conductivity in the vadose zone typically increases with increases in

percent saturation, the measured hydraulic conductivity values are greater than the actual field conditions. If calculated (rather than measured) hydraulic conductivity values are used, lower flux rate values (by approximately an order of magnitude) are predicted. The moisture flux values, though highly conservative, show that very long periods of time would be required for water and contaminants to move by unsaturated flow from the MDAs to the groundwater. In summary, there is no evidence to suggest that saturation of the tuff and subsequent transport of contaminants by saturated flow is likely.

Based on the data collected in the 1985/1986 investigation, the following conclusions were made regarding the hydrologic characterization of the vadose zone and potential aqueous phase migration of contaminants:

- The Bandelier Tuff is characterized by very low moisture content (typically in the range of 2 to 5%). This value is well below the porosity; thus, moisture movement by unsaturated flow processes predominate over saturated flow.

- The tuff has high moisture retention properties and is very porous, averaging 50% porosity.

- Intrinsic permeability tests (both field and laboratory) indicate average permeability of the tuff to be 10^{-8} to 10^{-9} cm^2.

- Permeability tests conducted in the field do not indicate increased permeability in zones adjacent to fractures in boreholes. Aperture, trace, and degree of fracture filling is variable, however, and permeability along fractures may vary significantly.

- The tuff's unsaturated hydraulic conductivity was determined to be approximately 10^{-8} centimeters per second at approximately 20 to 40% moisture content, determined by measured effective permeability and using van Genuchten's model. Actual moisture conditions and unsaturated hydraulic conductivity are likely lower than these values.

- Due to the low moisture content in the tuff and the low degree of consolidation within the sampled tuff, soil-characteristic curves for intact cores could not be determined for the range of moisture/tension conditions present in the field.

- Soil water tension measured by thermocouple psychrometers range from 1 to 15 bars. Monthly averages typically ranged from 2 to 7 bars.

- Seasonal variation of moisture occurs in the upper 10 to 15 ft of the vadose zone, as indicated by neutron measurements of vadose zone moisture. Below 15 ft, moisture content does not appear to change with time. Neutron measurements of moisture following precipitation events indicate the maximum depth of wetting to be approximately 10 ft. At a depth of 22 ft, no influence of precipitation on moisture content was observed; moisture is assumed to be returned to the surface by evapotranspiration.

- The maximum flux rate using average measured hydraulic conductivity at Area G ranged from a downward rate of 0.491 ft/yr to a maximum upward rate of 0.041 ft/yr. These moisture flux values show that very long periods of time would be required for water and contaminants to move by unsaturated flow.

Chemical characterization of the Bandelier Tuff vadose zone was also conducted at Areas G and L to fulfill the requirements of the May 7, 1985 Compliance Order. The data were obtained from core sample analysis and pore-gas sampling and analysis. A total of 70 core samples were collected from seven boreholes at Areas G and L (Devaurs, 1985). All cores except two had Extraction Procedure (EP) Toxic metals below detection limit concentrations, which are well below EP Toxicity concentrations. The Area G core sample that exceeded detection limits was collected from the zero- to ten-ft depth interval and had a detectable EP concentration of barium; however, the concentration was below the EP regulatory limit. No EP Toxic metals were detected in any boreholes at Area G below a depth of 20 ft. At Area G, no volatile organic compounds (VOC) were detected in core samples. It was noted that the lower detection limit for most of the VOCs was in the parts per million range, which did not allow detection for possible trace concentrations present.

Twenty-three sampling ports were installed in seven boreholes to allow collection of pore-gas at various depths (Devaurs and Bell, 1986). The pore-gas samples were collected by pumping air from the sampling port through charcoal adsorption tubes. The volatile organics were then extracted from the charcoal for analysis. The analytical results indicated that VOCs in the pore gas were present in part per billion concentrations in Area G.

The core analyses and the pore-gas data suggested that volatile organic constituents from the wastes disposed of at MDA G have migrated into the tuff. It was determined that, based on the vadose zone characterization studies, vapor diffusion is the predominant mechanism for migration.

As noted in the hydrogeologic assessment prepared in 1987 (IT Corporation), the regional aquifer was encountered at a depth of approximately 875 ft just west of Areas G and L. Calculations using the hydraulic gradient of the Tesuque Formation (0.015) predicted depths to the regional aquifer beneath Area G as 850 ft.

Water samples collected from the wells in Pajarito Canyon (described in Section 1.4) were analyzed for VOCs, selected metals, and radionuclides. No VOCs were detected in these

samples, and metal and radionuclide concentrations were found to be below drinking water standards. It was concluded that there appears to be no discernable effect on water quality in Pajarito Canyon from disposal operations at Area G.

Based on the hydrogeologic investigations performed at Mesita del Buey in 1985 and 1986 and on other previous work, several specific conclusions were reached regarding the characteristics of Areas G and L and the potential for contaminant migration from the waste disposal units there. These conclusions are:

- The stratigraphy of the Bandelier Tuff at Areas G and L is similar to that throughout the western portion of the Pajarito Plateau.
- Vertical and near-vertical cooling fractures are common in the tuff at Mesita del Buey.
- No major fault zones are known to exist at or near Areas G and L that could serve as conduits from the shallow subsurface to the regional groundwater.
- Together, the very low moisture content in the tuff, the empirical determination that moisture from precipitation does not infiltrate below a depth of 10 to 22 ft, and the very low calculated flux rates all suggest that aqueous transport of contaminants is not a viable mechanism for contaminant migration at Areas G and L.
- Based on the results of core and pore-gas analyses, volatile organic constituents have migrated (predominantly in the vapor phase) from the MDAs into the tuff.
- Based on the presence of volatile organic vapors at depths of up to 100 ft at Area L, core and pore-gas data support vapor phase migration as the dominant transport mechanism at TA-54.
- No perched water bodies that could be connected hydraulically to the regional aquifer were detected beneath Areas G and L.
- No perched water was detected in Cañada del Buey. Perched water in Pajarito Canyon is confined to the alluvium within the canyon and does not extend vertically or horizontally into the Bandelier Tuff that forms Mesita del Buey.
- There is no evidence of liquid migration from Areas G and L into the alluvial perched water in Pajarito Canyon.

Hydrogeologic conditions at TA-54 were also investigated as part of the performance assessment (PA) and composite analysis (CA) for the low-level radioactive waste disposal facility at MDA G. The following discussion summarizes the hydrogeologic conditions reported in the “Performance Assessment and Composite Analysis for Los Alamos National Laboratory

Material Disposal Area G" (LANL, 1997), which presents the most recent vadose zone information available. Overall, the report was generally in agreement with previous investigations and stated that when combined with the semiarid climate, the Bandelier Tuff is typically very dry and that the volumetric moisture content averages about 5%, although it is quite variable depending on location. Moisture variations due to near-surface climatic influences, influences of fractures, and textural differences between tuff units and interbeds are suggested by routine moisture measurements taken from boreholes at numerous locations around MDA G. Evaporation and transpiration from the mesa's surface (i.e., evapotranspiration) remove much of the moisture from precipitation absorbed by the tuff. This investigation also found that evapotranspiration is effective to depths of 1 to 2 meters (m) (3 to 7 ft), where plant roots are abundant. In addition to the near-surface drying, evaporation appears to occur along the sides of the mesa and in fractures and surge beds, which are layers within the mesa that appear to allow air flow. The relative absence of moisture nearly eliminates the possibility that contaminants will be transported through the tuff to the regional aquifer (LANL, 1997).

The PA/CA was supported by a fairly complete set of data and observations to characterize the uppermost 60 m (200 ft) of the Tshirege Member of the Bandelier Tuff beneath MDA G. Unit 2 of the Bandelier Tuff is the caprock that forms the top of Mesita del Buey. This unit is extensively fractured as a result of contraction upon post-depositional cooling. The cooling-joint fractures, which are mostly vertical, generally dissipate at the bottom of Unit 2, which at Area G is about 12 m (39 ft) thick. Mean spacing between fractures is about 1 m (3.3 ft), and fracture widths range from less than 1 millimeter (mm) to 13 mm (<0.03 to 0.51 inches [in.]) with a median of 3 mm (0.12 in.). Typically, fractures are filled with smectite clays to a depth of about 3 m (10 ft). Smectite clays (e.g., montmorillonite) are known for their tendency to swell when water is present and for their ability to strongly bind certain elements. Both of these properties have implications for transport of contaminants in fractures (LANL, 1997). Typically, fractures in Unit 2 do not extend into Unit 1vu. Only the more prominent cooling fractures originating in Unit 2 continue into the more welded upper section of Unit 1vu; however, they die out in the less consolidated lower section.

The degree of welding and devitrification are two properties of the tuff that influence fluid flow. In welded, devitrified tuff, there are several competing effects that determine moisture content and fluid flux. Welded tuffs tend to be more fractured than non-welded tuffs. Although water

moves slowly through an unsaturated tuff matrix, it can move relatively rapidly through fractures only if nearly saturated conditions exist (LANL, 1997). As indicated by modeling studies, moisture is absorbed into the matrix when fractures disappear at contacts between stratigraphic subunits, when fracture fills are encountered, or when coatings are interrupted. Because fractures are open to the passage of both air and water, they can have both wetting and drying effects, depending on the relative abundance of water in the fractures and matrix (LANL, 1997).

As a rule, the Tshirege Member of the Bandelier Tuff is very dry and does not readily transmit moisture. Most of the pore spaces in the tuff are small enough to be of capillary size and have a strong tendency to hold water against gravity by surface-tension forces. Moisture content is generally more variable near the top of the mesa than in the central portions as a result of variations in temperature, humidity, and evapotranspiration. Vegetation is very effective at removing moisture near the surface by transpiration. During the summer rainy season when rainfall is highest, near-surface moisture content is variable due to the effects of higher rates of evaporation and of transpiration by vegetation, which flourishes during this time (LANL, 1997).

For the PA/CA, a great deal of information was needed to first conceptualize and then model moisture flow and contaminant transport in the vadose zone. The necessary information included the basic properties of the tuff (e.g., porosity, density, fracture patterns, and mineralogy); these can be measured accurately. It also included the complicated relationships describing how fluids move through the tuff (e.g., moisture content, matric suction, and hydraulic conductivity), which are more difficult to establish with a great deal of certainty in a matrix with very low moisture content. A number of field, laboratory, and analytical studies were performed to support the development of conceptual and mathematical models for flow and transport in the vadose zone (LANL, 1997).

Characteristic curves are relationships used to model unsaturated liquid flow through rock, and include moisture retention and hydraulic conductivity curves. The moisture retention of a material is controlled by the relationship between the suction within the matrix and the water content for a porous material. Hydraulic conductivity is the rate at which water can travel through a rock or soil sample under the influence of gravity. Generally, rocks and soils have higher hydraulic conductivities when more moisture is present, with the maximum hydraulic conductivity occurring when the material is fully saturated with water. This condition is the saturated hydraulic conductivity. Texture has a large impact on moisture retention and hydraulic

conductivity as well, where low surface area materials (e.g., sand) have a higher hydraulic conductivity than high surface area materials (e.g., clays).

The volumetric moisture content for the units beneath MDA G range between 2 and 14% by volume, and the unsaturated hydraulic conductivity curves prepared for the PA/CA are very steep at such low moisture contents. This indicates that for a unit increase in water, there is a large increase in hydraulic conductivity. For example, in Unit 2 the unsaturated hydraulic conductivity changes from 10^{-12} cm per second (cm/sec) at 3% volumetric moisture content to 10^{-10} cm/sec at approximately 5% volumetric moisture content. This also illustrates the effects of the physical characteristics discussed above. The slopes of the conductivity curves generally level out when the moisture content reaches 7% and indicate that the hydraulic conductivity remains relatively constant over a wide range of moisture content (between 10 and 30%). The conductivity curves steepen again when the moisture content exceeded 34%; however, the high moisture contents were obtained under experimental conditions and are not expected *in situ* except under very localized conditions (LANL, 1997).

The rate of moisture movement beneath Mesita del Buey is perhaps the most important parameter in modeling the subsurface transport of contaminants (LANL, 1997). Moisture movement largely controls the minimum time required for contaminants to potentially be transported from MDA G through the vadose zone into the regional aquifer. The moisture movement through the undisturbed vadose zone is complex and is further complicated at MDA G by man-made disturbances associated with waste management activities.

Three moisture-content zones are consistently shown within the subsurface at MDA G (LANL, 1997). The volumetric moisture content in the top few meters varies between about 3 and 12% and reflects the seasonal effects of precipitation and evapotranspiration. Between mid-mesa depths of about 8 and 23 m (25 and 75 ft), volumetric moisture content is quite low, from 0.5 to 2%. Below 25 m (80 ft), moisture content increases to between 9 and 19%. The mid-mesa dry zone occurs consistently near the surge beds at the base of Unit 2 of the Tshirege Member. Based on unsaturated hydraulic conductivity estimates, estimates of flux rates through the low moisture content region are negligible (LANL, 1997). Water-pressure profiles estimated beneath the mesa, using hydraulic properties from cores, suggest that moisture moves toward the base of Unit 2 from above and below. These observations are consistent with a hypothesis

that the mesa is dried out to a significant extent by evaporation and air movement along surge beds and fractures that are prevalent near this horizon (LANL, 1997).

Different rates of moisture movement corresponding to the three moisture-content zones are inferred by several independent analyses. Although the analyses invoke simplifying assumptions, they provide consistent qualitative evidence of variable rates of moisture movement within and across Mesita del Buey (LANL, 1997). The inferred zones include:

- A near-surface zone with an apparent rate of moisture movement on the order of several mm per year (mm/yr);
- An intermediate zone through the mid-depths of the mesa with rates of moisture movement on the order of tenths or hundredths of mm/yr; and
- A deeper zone in which the apparent rate of moisture movement may be several centimeters per year (cm/yr).

The analyses corroborating the apparent variable rates of moisture movement include natural tracer analyses, unit hydraulic gradient assumption, moisture profile analysis, and vapor flux studies. Details of these studies are presented in Section 2.1.5.6 of the PA/CA (LANL, 1997) and are summarized below.

Natural tracers used to infer information about moisture in the vadose zone include chloride, ^{18}O, and ^{2}H (deuterium). These constituents are present in precipitation in relatively constant amounts and, thus, are present in vadose-zone pore water, which is derived from precipitation. Results of the chloride tracer analysis showed the near-surface and deep-mesa fluxes are high relative to the mid-mesa flux. In the shallow and deep zones, the inferred flux rates are on the order of 2 to 3 mm/yr (0.08 to 0.1 in. per year [in./yr]). In the intermediate zone, the inferred flux rates are between 0.03 to 0.8 mm/yr (0.001 to 0.03 in./yr). The steep slope on the cumulative water/cumulative chloride plot for the mid-mesa region indicates that cumulative chloride increases faster than cumulative water (i.e., water is being lost from the system at that location). Estimated chloride accumulation ages also suggest that water movement through Mesita del Buey is very slow (LANL, 1997).

The naturally occurring stable isotopes of oxygen and hydrogen (^{18}O and ^{2}H) are useful indicators of evaporation. The results of the stable isotope study were compared to the chloride profiles to test the deep evaporation hypothesis. It was concluded that surface evaporation

effects are limited to the shallowest 1 to 2 m (3.3 to 6.6 ft), and that at depths of 5 m (16 ft) and deeper, there is strong evidence that there is an evaporative sink at intermediate depths in the mesa (LANL, 1997).

The average van Genuchten parameters may be used to estimate rates of moisture movement through the stratigraphic units using the unit hydraulic gradient assumption. Different rates are necessary to match the moisture conditions measured in the various units of the Bandelier Tuff. It was found that near the surface, the best fit to the field moisture data to a depth of approximately 5 m (15 ft) corresponds to a moisture movement rate between 0.01 and 10 mm/yr (0.0004 and 0.4 in./yr). In Unit 2 and Unit 1vu, the apparent moisture movement rate that matches the field moisture data is between 0 and 0.1 mm/yr (0 and 0.004 in./yr). In Units 1vc and 1g, a moisture movement rate of 1 mm/yr (0.04 in./yr) best matches the field data. The Tsankawi-Cerro Toledo and Otowi Member stratigraphic layers match field moisture data with a much larger apparent moisture movement rate on the order of 10 mm/yr (0.4 in./yr). These estimated rates support the hypothesis that moisture movement is not steady state, or that significant changes in movement of moisture occur at depths (LANL, 1997). One explanation that accounts for the results of this analysis is that water may be removed at intermediate depths by evaporation and vapor-phase diffusion.

The unit-gradient approximation was also used to identify depths within Mesita del Buey where moisture may be lost to evaporation or vapor-phase diffusion (LANL, 1997). A moisture profile analysis was performed, and the rates of moisture movement calculated as the gradient of moisture were plotted, as was the gradient of the vertical flux. The results suggest a downward flux and a source of moisture to depths of about 7 m (23 ft). Below this, to depths near 28 m (92 ft), the average vertical flux is small but downward and the source is very small. The average local flux in this low-moisture zone is -0.017 mm/yr (-0.0007 in./yr) and the average moisture source is -0.0013 mm/yr (-0.005 in./yr). A moisture peak at 30 m (100 ft) occurs at the vapor-phase notch (the base of Unit 1vc). Overall, the average rate of moisture movement near the surface is about 10 mm/yr (0.4 in./yr), with a large standard deviation suggesting high variability. The average rate of moisture movement through the middle depths of the mesa is very small, and in the vapor-phase notch portion is relatively large (0.73 mm/yr). Although increased moisture at the vapor-phase notch at MDA G may be interpreted as a moisture source from the relatively wet canyons, this hypothesis does not explain high moisture content values (10 to

20% volumetric) observed at the vapor-phase notch at other locations across the Laboratory where the notch is not coincident with a canyon bottom or other moisture source.

Another study to understand the potential influence of water moving within and out of the mesa in the vapor phase was conducted by analyzing the vapor flux through the mesa (LANL, 1997). Analyses were performed on neutron-probe moisture measurements from several boreholes at MDA G. The results of the study indicated that water moves predominantly in the vapor phase at depths between 12 and 23 m (40 and 75 ft). The results also indicate that a fairly wide region within the mesa is dominated by vapor-flux and that this region corresponds to the region of low liquid flux, discussed above. The vapor-flux analysis also suggests that vapor flux dominates the rate of moisture movement in regions of the mesa where volumetric moisture is below 5%, and the magnitude of the vapor flux in the low moisture region of the mesa is about 1 mm/yr (0.04 in./yr). In addition, there is no apparent direction associated with the vapor movement; instead, vapor appears to move in different directions throughout the dry region (LANL, 1997).

Water-balance components through covers resembling the operational pit cover used at MDA G have been measured during studies of test plots at LANL. The data show that 87% of precipitation is lost to evapotranspiration, approximately 6% remains as infiltration below the root zone, and the remainder is retained in the surface soil. The data also indicate that moisture movement through a conventional vegetated crushed-tuff cover was greatest in the late winter and early spring when snowmelt occurred and evapotranspiration was low because vegetation was not active (LANL, 1997). In 1973, volumetric moisture measurements were made in holes augered into the covers over Pits 1 and 2 at MDA G. These pits were covered in 1961 and 1963, respectively. The measured volumetric moisture content was quite variable, with measurements of 12% and 17% by volume in Pit 1 and 4% and 8% by volume in Pit 2. Peak water concentrations occurred at depths of 2 m (6.6 ft) and decreased between 2 and 3 m (6.6 and 10 ft). The variation was tentatively attributed to differences in soil conductivity of surface slope (LANL, 1997). Using the unit-gradient assumption, these moisture measurements indicate infiltration rates between several mm/yr and several cm/yr within the covers at Pits 1 and 2.

The moisture content within Pit 37, which was open for several years, was measured periodically over a three-year period in the 1990s to better understand infiltration through disposal units at MDA G. This pit, while open, was expected to have moisture contents in

excess of most of the covered pits at MDA G, since it was open longer than the average disposal pit. The pits are assumed to have, while open, higher infiltration rates than the surrounding mesa top, due to the lack of vegetation (transpiration). A maximum moisture content of about 11% by volume was measured at Pit 37, with a mean moisture content of approximately 8%. Using the unit approximation, the average rate of moisture movement through Pit 37 is 5 mm/yr (0.2 in./yr) at the average (mean) pit moisture content (LANL, 1997).

In 1976, horizontal boreholes were drilled approximately 1 m (3.3 ft) beneath a pit at MDA G that was closed in 1966. Moisture measurements at the same boreholes were made in 1992 with a neutron probe. The volumetric moisture content values beneath the pit were in the range of 1 to 4%, and were generally 1 to 2% higher beneath the pit than moisture content values away from the pit. These data suggest that pit excavation has a small effect on moisture contents beneath the pits (LANL, 1997).

1.6 Groundwater

The depth to groundwater at Area G is approximately 885 ft (LANL, 2002). Additional information on groundwater at TA-54 is provided in the "Characterization Well R-22 Completion Report" (LANL, 2002); the "Supplement to Quarterly Technical Report April-June 2001" (ER Project, 2001); and the "Quarterly Technical Report October-December 2001" (ER Project, 2002). The following are summaries of the information in those reports.

Well R-22 is located on Mesita del Buey, east of TA-54, and was funded and installed by LANL's Environmental Restoration (ER) Project. This well is one of the 11 regional aquifer (R) wells drilled to date as part of the "Hydrogeologic Workplan" (LANL, 1998) in support of the "Groundwater Protection Management Program Plan" (LANL, 1996). Well R-22 is the first of five planned regional aquifer wells at or in the vicinity of TA-54. This well was designed primarily to provide water-quality and water-level data for potential intermediate-depth perched zones and for the regional aquifer downgradient of TA-54. In addition, it was designed to collect geologic, hydrologic, and geochemical data that will contribute to the understanding of the vadose zone and regional aquifer in this area of LANL. Although the location of well R-22 was originally proposed for installation in Pajarito Canyon, just south of Mesita del Buey, its final location was changed to the mesa top in order to be in closer proximity to and more directly downgradient of TA-54 and to be better suited for a future monitoring well.

Well R-22 was drilled to a total depth of 1,489 ft in 2000. A multiscreen well containing five screened intervals that can be sampled individually was installed. In descending order, the geologic units encountered during drilling consisted of ash flows of the Tshirege and Otowi Members of the Bandelier Tuff (including the basal Guaje Pumice Bed); lavas, cinder units, interflow units, and subflow deposits of the Cerros del Rio volcanic field; an upper sequence of fanglomerate deposits of the Puye Formation; an older basalt; and a lower sequence of fanglomerate deposits of the Puye Formation. Depths and elevations of the contacts between these units are shown in the "Characterization Well R-22 Completion Report" (LANL, 2002). Notable differences between the predicted and as-found stratigraphy at this well was the greater thickness of the Cerros del Rio volcanic sequence, the absence of Puye Formation axial river gravels, and the absence of Santa Fe Group sediments within the drilled depth.

Two potential perched zones and one regional zone of saturation were originally predicted at well R-22. Two zones that could potentially support perched water were predicted at a depth of 148 ft in the Cerros del Rio basalt and at a depth of 487 ft in the Puye Formation. The regional water table was anticipated to be at a depth of 922 ft in the Puye Formation at the well R-22 location. No water was encountered, however, until the drillers first noted water at a depth of approximately 890 to 900 ft. After 30 minutes, the water-level depth was measured at 883.05 ft. The water is believed to be associated with the regional zone of saturation because the regional water table was projected to be at a similar depth, no obvious perching horizon was encountered, and saturation continued to the total depth drilled.

Both a direction and a rate are required to characterize groundwater movement. Although the data from this single well do not allow a determination of horizontal flow direction, vertical direction can be evaluated by analysis of head distribution along the borehole. In addition, the hydraulic properties of the saturated materials (determined from analysis of field testing data) provide a general idea of potential flow rate. During drilling, hydraulic heads obtained during testing clearly indicated a downward vertical gradient at well R-22. The downward vertical gradient at well R-22 was supported after testing by a piezometric profile constructed using a pressure-measurement system.

Field tests at depth targeting for screened intervals were performed during drilling to determine hydraulic properties at well R-22. The five screened intervals were distributed through the zone of saturation. Hydraulic conductivities ranged from 0.27 ft/day (ft/d) to 2.32 ft/d at four screened

intervals, based on straddle-packer/slug-injection tests performed.

Extensive borehole geophysical data were collected during drilling. Borehole video and natural gamma radiation surveys were conducted, and a suite of borehole geophysical logs was obtained. The surveys were conducted in cased hole from the surface to a depth of 1,330 ft. Below 1,330 ft, the surveys were conducted in open hole. Geophysical logging in open hole included caliper, resistivity, natural gamma radiation, spontaneous potential, lithodensity, magnetic resonance, borehole color video, epithermal neutron, neutron porosity, and spectral natural radiation. Volumetric water content beyond the casing in the vadose zone was measured using a Compensated Neutron Tool as a means to evaluate moist/porous zones and to estimate porosity in the saturated zone. Overall and spectral natural gamma ray activity was measured using a Hostile Natural Gamma Spectroscopy tool as a means to evaluate geology and lithology and the presence of clay versus sand. As a means to characterize mineralogy, lithology, and water content of the formation, concentrations of hydrogen, silicon, calcium, sulfur, iron, potassium, titanium, and gadolinium were measured using an Elemental Capture Spectroscopy tool. To measure bulk density and photoelectric effect as a means to estimate total porosity and characterize lithology, a Litho-Density Tool was used. Calibrated gross gamma ray readings were recorded to match the depth of the logging runs. The log results indicated that at the time of logging, a well-water level of 995 ft below ground surface (bgs) was recorded and that the probable regional groundwater level was 886 ft bgs. The log results also showed increased vadose zone moisture content (an average of 5%) in the intervals between 50 and 180 ft bgs, and 10% or greater between 350 and 715 ft bgs. In addition, in the interval from 1,405 to 1,478 ft (the total log depth), log data indicated an increased saturated zone porosity (greater than 40%) corresponding to the Lower Puye Formation. Clearly defined stratigraphic/lithologic boundaries were also indicated from the spectral gamma and geochemical logs.

During drilling, samples of groundwater were collected from depths of 883 ft and 1,489 ft. The potential contaminants of concern at the well R-22 location include VOCs, perchloric acid, tritium, and other radionuclides (LANL, 2002). The samples were analyzed for major anions, VOCs, semivolatile organic compounds, high explosives (HE), radionuclides, and stable isotopes. Samples collected for major anions analysis were filtered; nonfiltered samples were collected for the remainder of the analyses. Due to the presence of drilling fluids, the borehole water samples are not representative of groundwater.

While the following compounds are not subject to regulation under the hazardous waste program, data are provided herein for informational purposes only. Upper zone borehole water showed concentrations of bicarbonate (120 milligrams per liter [mg/L]), chloride (21 mg/L), fluoride (1.19 mg/L), oxalate (1.05 mg/L), and sulfate (19.9 mg/L). Oxalate may be produced by the breakdown of one of the drilling fluids used, and can occur naturally at very low concentrations in groundwater and surface water around LANL and elsewhere (Broxton et al., 2001).

Methylene chloride was also detected at a level above the instrument detection limit but less than the practical quantitation limit. This chemical is used in analytical laboratories for extraction during gas chromatography/mass spectrometry analyses and may provide a source of laboratory contamination. Concentrations of bromide, phosphate, and perchlorate were less than detection. Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) was detected at a concentration of 90 micrograms per liter (µg/L). Based on similar chemical structures between RDX and one of the drilling fluids used, this result is believed to be a false positive. The HE compound 2-A-4,6-DNT was also detected above the instrument detection limit but below the practical quantitation limit. The U.S. Environmental Protection Agency *SW-846* Method 8330, which uses high-performance liquid chromatography, is susceptible to false positives for HE compounds and degradation products. Consequently, an alternative and more accurate analytical method using diode array was used when the analytical laboratory reran the sample; the results using this analytical method showed that HE compounds and degradation products were less than detection (0.25 µg/L). A further discussion about the investigation of false positives for HE compounds and associated degradation products is presented in Section 13.2 of the "Characterization Well R-22 Completion Report" (LANL, 2002). During characterization in the completed well, additional groundwater samples will be collected to evaluate the presence or absence of HE compounds at well R-22. Acetone at a concentration of 0.820 mg/L was detected at the regional water table during drilling at well R-22. An investigation was conducted to determine the source of this organic compound, which may be present due to oxidation of one of the drilling fluids that contains isopropyl alcohol. Based on this investigation, the mass spectra from the initial analysis demonstrated high concentrations of isopropyl alcohol in the injection water used during drilling at well R-22. The isopropyl alcohol had in fact been misidentified as acetone by the analytical laboratory.

As previously mentioned, the following compounds are not subject to regulation under the hazardous waste program; however, data are provided herein for informational purposes only. Tritium was present at an activity of 109 picocuries per liter (pCi/L); this screening value suggests that the age of the tritium is less than 60 years old. More recent sampling shows lower tritium levels. During the first round of groundwater sampling in March 2001, tritium levels ranged from 2 to 77 pCi/L. During the second round of sampling in June 2001, tritium levels continued to decrease and ranged from 1 to 14 pCi/L. (The Drinking Water maximum concentration level [MCL] for tritium is 20,000 pCi/L.) Activities of americium-241, plutonium-238, plutonium-239/-240, and strontium-90 were less than detection. Activities of uranium-234, uranium-235, and uranium-238 were at levels of 1.48, 0.126, and 1.41 pCi/L, respectively. Nitrogen isotopes were analyzed for the water sample collected at 1,489 ft to evaluate the source(s) of nitrate at well R-22. The $\delta^{15}N(NO_3)$ value was +9.6 permil, which suggests that the water sample is enriched with nitrogen-15.

The Cerros del Rio lavas at well R-22 were nearly three times thicker than predicted (983 ft vs. 339 ft). The most significant hydrogeologic impact of this thick set of lavas is that the regional water table is within these lavas rather than within Puye Formation fanglomerates. Therefore, all flow and transport within the upper ~300 ft of the regional aquifer is within basaltic fractures and interflow rubble rather than through Puye Formation pore spaces. This difference in stratigraphy implies different flow rates and pathways, and the lavas provide an environment in which certain constituents (e.g., ferrous iron) can influence water chemistry.

Several features contribute to the peculiarities of the as-drilled stratigraphy at well R-22. It is believed that the exceptional thickness of the Cerros del Rio lavas and cinder indicate fill within a paleocanyon. The absence of axial river gravels at the base of the Cerros del Rio volcanics suggests that the paleocanyon was not a through-going drainage ancestral to the modern Rio Grande. Because cuttings were not returned from some key intervals beneath the Cerros del Rio lavas, it is possible that axial river gravels may have been present within 5 ft of the base of the lavas but were not sampled. Therefore, the orientation of the paleocanyon (east-west vs. north-south) is uncertain.

The first round of groundwater sampling at well R-22 was conducted in March 2001 and the available data were reported in the supplement to the “Quarterly Technical Report April-June 2001” (ER Project, 2001). As noted in that supplement, because of a delay in analytical

services, the $^{15}N/^{14}N$ isotopic suite was not available and would be reported at a later date. In addition, the supplement noted that because of an ongoing focused validation effort by the contract analytical laboratories, HE data were not available for reporting. No organics were found to exceed Drinking Water MCLs or NMED Groundwater Standards.

As indicated in the "Quarterly Technical Report October-December 2001" (ER Project, 2002), the second round of sampling at well R-22 was completed in June 2001. The data reported include field parameters and organic, inorganic, and radiological constituents. Because of analytical laboratory backlog, stable isotopes of nitrogen ($^{15}N/^{14}N$) were not available for inclusion in that report. In addition, because of an ongoing focused validation effort by the contract analytical laboratories, HE data were not available for reporting. Lead was found in Screen 3 (1,273 ft in depth) at a concentration of 19.7 µg/L. The Drinking Water MCL for lead is 15 µg/L; the NMED Groundwater Standard of 50 µg/L was not exceeded. No organics were found to exceed Drinking Water MCLs or NMED Groundwater Standards.

The third groundwater sampling round for well R-22 was conducted in November 2001; results of this sampling effort will be included in a quarterly report once the data are validated. The fourth groundwater sampling round was scheduled for March 2002, and the results will be provided in a subsequent quarterly report upon completion of data validation.

2.0 HYDROGEOLOGIC WORKPLAN CHARACTERIZATION ACTIVITIES

Pursuant to U.S. Department of Energy Order 5400.1, the LANL "Groundwater Protection Management Plan" was developed in 1995, which identified the need for site-wide hydrogeologic characterization. In the same year, NMED denied LANL's previously submitted groundwater monitoring waiver demonstrations. In a letter dated August 17, 1995, the NMED requested that LANL prepare a "Hydrogeologic Workplan." Hence, LANL began developing the "Hydrogeologic Workplan" (LANL, 1998) that, upon implementation, would collect data on the hydrogeologic setting. These data would be useful for making decisions regarding monitoring and environmental restoration using the Data Quality Objective (DQO) process. The workplan was approved by the NMED in March 1998.

The primary purpose of the "Hydrogeologic Workplan" is to gain an understanding of the hydrogeologic setting that is adequate to design a detection monitoring network capable of detecting water quality threats to the regional aquifer. As stated in the Executive Summary of

the workplan, the expected outcomes of implementing the plan's activities are:

- A "refined understanding of the hydrogeologic framework at the Laboratory, including recharge areas, hydraulic interconnections, flow paths, and flow rates, synthesized by modeling simulations;

- Information sufficient either to design and implement a detection monitoring program that meets applicable requirements and/or to demonstrate that groundwater monitoring requirements can be waived; and

- Defined areas of existing or potential groundwater contamination, and the potential pathways of contaminant transport from the surface to the regional aquifer, with predictions of directions and rates of movement and risk based on modeling simulations."

A series of decisions established in the plan were intended to focus data collection activities on information important to a better understanding of the hydrologic regime as well as monitoring design. Areas with the highest potential for contaminant impacts are where hydrogeologic data collection is more focused. The potential pathways and rates of contaminant migration can be determined using the resulting data and analyses. One workplan objective is to identify areas of groundwater contamination. Determining the extent of contamination and risk posed by that contamination is conducted by LANL's ER Project because investigation of contaminant plumes is not within the scope of the "Hydrogeologic Workplan" (LANL, 1998).

The "Hydrogeologic Workplan" provides for an iterative process of gaining understanding from each activity, especially from installed wells. This iterative process is then used in guiding the succeeding DQOs and the location and data collection of subsequent wells. Although the interpretive process is not as highly visible as data collection, it is equally as important as the well installation and data collection. A primary tool used to interpret data collected from drilling and testing in the wells is numerical modeling. When sufficient new data and data interpretation have been accomplished to change the conceptual understanding, the iteration process is conducted. The data collection and modeling reached a level of maturity in Fiscal Year (FY) 01 to allow iteration of the DQOs. The FY 01 DQO iteration process began with a comprehensive evaluation of all groundwater-related data collected, analyzed, and interpreted in the program at that time. This process resulted in a determination of what is known and what data are required to complete the scope of the workplan. The comprehensive evaluation and the FY 01 DQO process iteration resulted in proposed amendments to the scope of the workplan (LANL, 2001).

Initially, 32 regional aquifer wells were proposed in the "Hydrogeologic Workplan". As of April

2002, 11 R wells have been installed. LANL's Groundwater Integration Team worked together to determine which of the remaining wells and other studies are still necessary to complete the scope of the workplan, and added new studies as appropriate to provide the data. The current proposed amendments to the "Hydrogeologic Workplan" scope include installing 15 more R wells, and eliminating 6 R wells. The proposed scope also includes 13 field-based activities, 11 analytical activities, and three project management activities.

In the "Hydrogeologic Workplan", the activities proposed to characterize the hydrogeologic setting beneath LANL and to enhance LANL's groundwater monitoring program are summarized by "aggregates". The aggregate boundaries were drawn to focus discussions and attention on specific areas of LANL that collectively contain numerous sources of potential contamination. However, the hydrogeologic characterization activities relevant to a particular aggregate are proposed within as well as outside the aggregate boundaries.

Aggregate 2, located in the east-central portion of LANL, is bounded on the north by Cañada del Buey, on the south by Pajarito Canyon, on the west by TAs 18 and 51, and on the east by the LANL boundary. Essentially, the boundary of Aggregate 2 was drawn to encompass the solid waste management units associated with TA-54. It includes Cañada del Buey, the middle reach of Pajarito Canyon, and Mesita del Buey, where TA-54 is located.

In the initial workplan, one R well (well R-16) was planned for installation in Cañada del Buey east of the Aggregate 2 boundary. The purpose of this proposed well was to provide stratigraphic and hydrologic control off site near the Rio Grande and to provide an off-site detection monitoring point downgradient of LANL activities. In addition, two R wells (well R-20 and well R-22) in Pajarito Canyon were proposed for Aggregate 2 to identify the presence of intermediate perched zones, measure the thickness of the zones, and analyze for the presence of contaminants within the zones that could indicate actively occurring contaminant transport. As noted in Section 1.6, well R-22 was installed in 2000 on the mesa top just east of the TA-54 disposal areas. The location of this well was changed from its original siting in Pajarito Canyon to determine if perched zones are present beneath Mesita del Buey and to better understand the hydrogeologic conditions just east of the disposal areas at TA-54. Other proposed R wells for Pajarito Canyon included wells R-17, R-18, and R-19, which would provide information about sources in other aggregates upgradient of Aggregate 2; they are not discussed further in this attachment. Also in the initial workplan, one R well (R-21) was proposed for installation on

Mesita del Buey near MDA L. The purpose of this proposed well is to evaluate and monitor hydrologic and geochemical conditions in the regional aquifer beneath MDA L. Data from well R-21 will be compared to data from well R-20, just northwest of Aggregate 2, to evaluate migration of organic contaminants, potential pathway behavior, and potential contaminant movement toward supply well PM-2. Recently, it was determined that an additional well (well R-23) be included in Aggregate 2. Well R-23 is proposed to be located in Potrillo Canyon, approximately 3,700 ft south of Area G. This well will provide water-quality and water-level data for potential intermediate perched zones and the regional aquifer. It will also provide data that may be used to calibrate the potential for a southeasterly groundwater flow direction, evaluate recharge, and determine the presence of perched zones and the influence of the regional aquifer in the area of a hydrologic sink. It should be noted that the locations of the four additional R wells associated with Aggregate 2 (wells R-16, R-20, R-21, and R-23) are subject to change as the DQO iteration process continues.

3.0 REGIONAL AQUIFER HYDROLOGIC MODELING

A hydrologic model for the Pajarito Plateau beneath LANL is an important tool for protecting groundwater that could potentially be impacted by past Laboratory operations. The purpose of modeling the regional aquifer is two-fold. First, the model can be used to synthesize hydrologic, geochemical, and geologic data relevant to the regional aquifer. Second, the model can be used to predict flow directions and velocities as well as technically defensible estimates of uncertainty in the predictions.

A numerical groundwater model for the Pajarito Plateau beneath LANL was developed in 1998 and has been refined continuously as new groundwater data are collected. From the detailed technical descriptions of the modeling efforts, a simplified description is presented in the following. The simplified description addresses the purpose of modeling, why the model code was selected, the elements of the conceptual model, and modeling calibration and results.

3.1 Introduction

In the dictionary, a "model" is defined as a "small representation of a planned or existing object". A numerical groundwater model has flow equations that represent the physical processes of water flowing through the subsurface. From the earth's surface, groundwater movement cannot be observed directly; therefore, numerical groundwater modeling is used as a tool to understand groundwater flow. In a simple sandy aquifer, it is possible to derive groundwater flow directions

and velocities using water level data, pump test data, and pencil-and-paper calculations. In a geologically complex aquifer such as that which exists beneath the Laboratory, however, is it not feasible to derive flow directions and velocities from hydrologic data without the assistance of a computer model. In addition, models are useful in that they provide a range of plausible answers, using the available hydrologic data set and understanding of the varied character of the aquifer.

Development of a numerical groundwater model for the regional aquifer beneath the Laboratory was initiated in 1998 and has been continuously refined as new groundwater data are collected. The description presented herein of the modeling efforts has been greatly simplified from the detailed technical descriptions of the modeling efforts found in the reports in Keating et al. (1998, 1999, 2000, and 2001). The following sections describe the model code, conceptual model, flow model development, calibration, and sensitivity analyses. Accordingly, LANL intends to use groundwater models to aid in many decisions, such as where monitoring wells are best placed and what additional data are needed.

3.2 Purpose of Modeling

A hydrologic model for the Pajarito Plateau beneath the Laboratory is an important tool for protecting groundwater that could be impacted by past Laboratory operations. The purpose of modeling the regional aquifer is two-fold: (1) to synthesize hydrologic, geochemical, and geologic data relevant to the regional aquifer; and (2) to predict flow directions and velocities, along with technically defensible estimates of uncertainty in those predictions.

There are at least three modes of groundwater beneath the Pajarito Plateau: (1) groundwater in alluvium in some canyons; (2) perched intermediate groundwater (groundwater above a less permeable layer that is separated from the underlying groundwater by an unsaturated zone at intermediate depths (150-400 ft); and (3) the regional aquifer, which is separated from the upper groundwater by hundreds of ft of tuff, basalts, and volcanic sediments in the western

portion of the Laboratory, with the vadose zone becoming thinner to the east. The regional aquifer beneath the Pajarito Plateau provides the community and Laboratory water supply.

Hydrologic models have two parts that work together: the conceptual model and the numeric model. The conceptual model is the synthesis of all the known geologic and hydrologic data, which provides the estimated input parameters for the numeric model. The numeric model uses mathematical equations to translate the rock and water properties to numbers. A model is "calibrated" when the numbers that result from the numeric model match reasonably well to actual observations (e.g., water levels in wells). The process of calibrating a model involves revising the conceptual and numeric models consistent with the known data until there is reasonable match between model outputs and observed data. After calibration, the regional aquifer model is used for sensitivity analyses. Sensitivity analyses are a tool to evaluate the uncertainty of the model by testing how much each of the inputs affects the outcome of the model. Those inputs that have a big effect on the model outcome are considered "sensitive" and the input values should be based on appropriate site-specific data. Those inputs that do not affect model outcomes are "insensitive" and are not as important to site-specific data.

3.3 Model Code Selection

The numeric model is the computer code that runs calculations with the input parameters provided. The numeric model selected by the Laboratory is the Finite Element Heat and Mass (FEHM) computer code. It was developed at the Laboratory for the High-Level Radioactive Waste Repository Program. It simulates the flow of water and air and the transport of heat or substances in water through saturated or partially saturated rock. It can simulate flow or transport in either 2-dimensions or 3-dimensions. It was selected because it has been rigorously tested and certified for use in radioactive waste disposal and because its capabilities match the specific investigation needs at the Laboratory. For example, FEHM can be used for both unsaturated and saturated flow modeling, both of which are important at the Laboratory. This computer code is publicly available from LANL.

At the outset of the modeling effort, the decision was made to develop a regional-scale model of the Española Basin. Modeling the Española Basin was selected as a platform for the Pajarito Plateau model as it would incorporate all the existing hydrogeologic information and aquifer stress data in terms of water supply wells and streams. The large areal extent of an Española Basin model also allowed use of simulated data for boundary conditions that were needed for the Pajarito Plateau model. Obtaining distant, but accurate, boundary conditions improves the

overall accuracy and reliability of the model.

The Pajarito Plateau-scale model grid was developed using the Octree Mesh Refinement methods to embed a high-resolution zone within the relatively coarse Española Basin grid. The grid is better suited to capture site-scale flow and transport processes in areas of interest, while allowing boundary conditions from the Española Basin-scale model to be applicable without adversely affecting the computation time or the computer memory required to run the model. The smaller-scale model uses calculated values of head and flux from the large model to define boundary conditions in the smaller-scale model. The grid spacing in the Pajarito Plateau portion of the model is finer grid spacing than the Española Basin-scale model (Table 1).

3.4 Conceptual Model of Flow

The conceptual model that is the basis of the regional aquifer modeling efforts extends throughout the Española Basin. Elements of the conceptual model are the **boundaries** of the model, the **hydraulic gradient**, **aquifer properties**, **recharge**, and **discharge**.

The **boundaries** of the model are based on the physical boundaries of the regional aquifer within the Española Basin. The basement rocks and surrounding uplifts and mountains that define the Española Basin also define the aquifer boundaries in the model. In the model, the aquifer boundaries are areas where there is expected to be little flow because the aquifer material does not extend beyond the boundary. The exception is the La Bajada Fault, which forms the southern boundary of the model area. Others (Kernodle et al., 1995) have estimated the flow across the La Bajada fault. The Española Basin is a low area bounded by high areas:

- Sangre de Cristo Mountains on the east
- Nacimento uplift to the west
- La Bajada Fault on the south
- To the north, the Brazos uplift and Picuris Range
- Lower boundary is the basement rocks of the Española Basin, which are metamorphic rocks that can also be seen in the Sangre de Cristo Mountains
- The upper boundary is the water table of the regional aquifer.

Of the boundary conditions, the upper boundary is considered the most important because that is where all the recharge occurs. The other boundaries represent hydrologic divides, where little water enters or exits the basin. The upper boundary surface is the water table of the

regional aquifer. The grid nodes on the upper boundary surface are assigned one of three kinds of boundary conditions. The first kind of boundary condition is for nodes that occur in one of the major rivers (Rio Grande or Rio Chama). The boundary condition for the nodes in the rivers allows water to either flow into or out of the river, depending on if the water table is higher than (water flows out of the aquifer into the river) or lower than (water flows out of the river and into the aquifer) the river. The elevation of the river grid nodes was set at the elevation of the river.

The second kind of boundary condition for the upper model boundary is the higher elevation where recharge occurs. These grid nodes are set to allow a specific amount of water into the regional aquifer. The amount of water at each grid node was calculated based on the elevation of the land surface. This approach was taken because a graph of actual precipitation measurements at stations of different elevation in the Española Basin shows a linear relationship - the higher the elevation, the higher the precipitation. It was also assumed that the percent of precipitation reaching the water table increases with increasing elevation. This assumption is based on the observation that at higher elevations, the temperature and vegetation cover are both less, so the evaporation and transpiration (use of water by plants) are both expected to be lower; thus, more water is available to infiltrate the ground surface. In the numerical model, for every node above the threshold elevation of 6,000 ft (the elevation at which evaporation is greater than precipitation, so no water recharges), the amount of precipitation assumed was based on the linear trends of increasing precipitation and infiltration with elevation.

The third type of boundary condition on the upper boundary of the 1998 model were assigned to nodes that had elevation of less than 6,000 ft and were not in the river channels. These nodes were assigned a no-flow condition, because water is not expected to enter or exit the regional aquifer in these areas.

The northern and southern lateral model boundary conditions near the rivers are set to allow flow into or out of the model and the water levels are specified values. The values that are specified for these boundary grid nodes are based on the elevation of the water table at the surface for surface grid nodes; for the grid nodes beneath the surface, the value assigned is calculated assuming a hydrostatic pressure gradient. The amount of water flowing in along the northern boundary of the model is initially taken from estimates of water from the San Luis basin

to the north (Coon and Kelly, 1984). Along the southern boundary, the amount of water exiting the Española Basin to the south was based on estimates by Kernodle et al. (1995) and Frenzel (1995).

The majority of the remaining boundaries were assigned no-flow boundary conditions:

- The crest of the Sangre de Cristo Mountains on the eastern model edge
- The top of the Sierra de los Valles (east of the Jemez Mountains geothermal field and west of the Pajarito Fault zone) on the western model edge
- Top of the Brazos and Picuris ranges
- The Española Basin basement at the base of the model.

The topographic divides (Sangre de Cristo, northern ranges, and Sierra de los Valles) are assumed to approximate the hydrologic divides. However, the actual location of the groundwater divide on the western edge of the Española Basin is unknown and must be evaluated further. The grid nodes are assigned no-flow boundary conditions. Although some water may flow through the basement, the contrast between the overlying sediments filling the basin and the metamorphic rocks is expected to be big enough that water will not enter the materials below the basement.

There are two components of **hydraulic gradient**: horizontal and vertical. The horizontal hydraulic gradient is determined by the water levels that have been measured in wells throughout the basin. The vertical gradient is determined by measuring the water levels at different depths in the aquifer. The horizontal hydraulic gradients at the Española Basin scale are fairly well known and show that the flow of water is generally from the high areas on the east and west of the basin toward the Rio Grande in the center of the basin. The horizontal gradients for the Pajarito Plateau are shown in Table 2. On the Española Basin scale, vertical upward gradients have been reported in several wells fields near the Rio Grande (Buckman, lower Los Alamos, and Santa Clara Pueblo, Tesuque Pueblo). On the Pajarito Plateau, vertical gradients have been measured in a number of wells. The measured vertical gradients are shown in Table 3.

The **aquifer properties**, primarily permeability, are assumed to be controlled by the geologic characteristics of the rocks. The Española Basin gradually accumulated sedimentary rocks formed by sediments eroded from surrounding high areas and volcanic rocks erupted from different volcanic centers. The sedimentary rocks generally contain the regional aquifer within

the Española Basin. For the regional aquifer model, 20 layers representing different types of rock units (hydrostratigraphic zones) were used (Table 4). In addition, vertically-oriented hydrostratigraphic units representing fault zones were included in the model. Each layer was assigned hydraulic properties based largely on hydrologic data that have been collected and the geologic character of the layer where no data are available.

Aquifer **recharge**, the amount of water entering the aquifer, is a generalized recharge model, assuming that the first order control on recharge rates is elevation. The conceptual model of recharge is that most water recharging the aquifer originates in stream channel bottoms. For major channels in the basin, this is modeled explicitly. However, for most of the model domain, recharge is applied uniformly within any given elevation range ("diffuse" recharge), making no distinction between canyons and mesas. This effectively "spreads" the focused recharge occurring in canyon bottoms over a larger area. This approximation is appropriate for estimating the total amount of water recharging the system in various elevation ranges, for estimating baseflow discharge to rivers, and for estimating hydraulic gradients in the regional aquifer at scales of kilometers.

Groundwater **discharge** to rivers is an extremely important constraint on the regional aquifer model. Surface water flow data from twelve rivers in the basin are used to determine the baseflow. Quantified downstream increases in baseflow are attributed to regional aquifer discharge.

3.5 Regional Aquifer Modeling Calibration and Results

The regional aquifer model has been calibrated in two modes: steady-state and transient. Since 1945, the water levels in the Pajarito Plateau area have declined due to extensive development of the aquifer. The steady-state mode is calibrated using "pre-development" data, prior to 1945. There are pre-development data from 93 wells basin-wide, 34 of which fall within the Pajarito Plateau sub-model. The transient mode is calibrated using transient drawdown due to pumping in 14 wells. The transient data are available for every year since 1945. The transient simulations were done in 10-year time steps, so the 10-year average pumping rates were derived from the annual pumping data for all the wells in the Pajarito Plateau sub-model.

Both the steady-state Española Basin model and the Pajarito Plateau sub-model provided reasonable simulation of head and flux measurements. The calibrated steady-state model was

used for inverse calculations to estimate model parameters. The steady-state Española Basin inverse model was used to estimate 37 model parameters: 3 recharge and 34 permeability. This process suggested that the permeabilities of the two largest hydrostratigraphic units in the basin are well constrained. However, estimates for several smaller units are poorly constrained. The steady state Pajarito Plateau inverse sub-model estimated 20 model parameters: 3 recharge and 17 permeability. The sub-model and basin-scale model results were very similar; the largest discrepancies are for two relatively small hydrostratigraphic units. For one of these, the sub-model estimate was closest to pump test data; for the other, the sub-model estimate was farthest from the pump test data.

The addition of transient observations in the inverse process greatly decreased the uncertainty of estimated parameters. For the sub-model, the transient observations allowed an improved steady-state flux and water level matches. A comparison of the steady-state to the steady-state plus transient estimates shows that the major changes are associated with the permeability of the two potentially important hydrostratigraphic units. The uniform specific storage estimated by the transient inverse model is close to the independent estimates derived from hydraulic testing.

The results of the regional aquifer model are a refined water level map and estimates of flux across the boundaries, as presented in Keating et al. (2000). Vadose zone modeling at TA-54 will be used as inputs into the regional aquifer modeling (e.g., recharge estimates) to determine the fate of contaminants from a source at TA-54, if any, in the regional aquifer.

Table 1: Grid Spacing in Española Basin-scale Model and the Pajarito Plateau Portion of the Model				
Model	**North- South (X)**	**East-West (Y)**	**Vertical (Z)**	**# Nodes**
Española Basin-scale model	1000 m	1055 m	50 m above 1300 m depth	277,951
	1000 m	1055 m	500 m below 1300 m depth	
Pajarito Plateau portion	250 m	264 m	12.5 m above 1550 m elevation	172,741
	250 m	264 m	50 m above 1100 m depth	
	250 m	264 m	500 m below 1100 m depth	

Table 2: Horizontal Gradients on the Pajarito Plateau

Upgradient Well	Water Level Elevation (m)	Down-gradient Well	Water Level Elevation (m)	E-W Distance (m)	Gradient (m/m)
R-25	1836	CdV-15-3	1833	2189	0.02884
CdV-15-3	1833	R-19	1795	4710	0.02149
DT-10	1805	R-22	1747	5195	0.01121
R-15	1785	R-12	1738	3684	0.01283

Table 3: Vertical Gradients on the Pajarito Plateau

Well	Vertical Gradient	Comment
R-19, screen 6	0.08	weakly upward
R-19, screen 7	0.28	weakly downward
R-25, screen 3	1.72	strongly downward
R-25, screen 4	0.86	weakly downward
R-25, screen 5	1.10	downward
R-25, screen 6	0.15	weakly downward
R-25, screen 7	0.13	weakly downward
R-25, screen 8	0.13	weakly downward
CdV-15-3, screen 6	0.02	weakly upward
R-31, screen 3	0.01	nearly neutral
R-31, screen 4	0.01	nearly neutral
R-31, screen 5	0.02	nearly neutral
R-22, screen 2	0.07	nearly neutral
R-22, screen 3	0.14	weakly downward
R-22, screen 4	0.11	weakly downward
R-9/PM-1	0.05	weakly upward
R-9/O-1	0.03	weakly upward
TW-3/O-4	0.05	weakly upward
TW-1/O-1	0.10	weakly downward

Table 4:	**Hydrostratigraphic Units**		
Rock Type	**Hydrostratigraphic Layer**	**Volume (10^{10} m^3)**	**Permeability (m^2)**
Crystalline Rock	Deep Basement (Precambrian	400.8	5.00×10^{-16}
	Fractured Paleozoic/Mesozoic	214.2	
	Paleozoic/Mesozoic	181.7	2.00×10^{-17}
	Cerros del Rio Basalts	0.4	1.00×10^{-15}
	Cerros del Rio Basalts - southern	2.2	1.00×10^{-16}
	Tschicoma Formation	57.1	7.10×10^{-16}
Fault Zones	Pajarito	17.6	2.13×10^{-15}
	Agua Fria	0.1	4.49×10^{-15}
Sedimentary Rocks	Santa Fe Group east	47.4	2.07×10^{-13} horizontal 2.07×10^{-15} Vertical
	Santa Fe Group west	171.2	1.4×10^{-13} horizontal 1.4×10^{-15} Vertical
	Ancha Formation	3.4	1.34×10^{-13} horizontal 1.34×10^{-15} Vertical
	Santa Fe Group north	90.3	1.50×10^{-14}
	Ojo Caliente sandstone	61	2.20×10^{-14}
	Peñasco Embayment	38.5	4.67×10^{-13}
	Santa Fe Group - deep	162.4	1.21×10^{-14}
	Santa Fe Group- near airport	8.2	1.00×10^{-11} horizontal 1.00×10^{-13} Vertical
	Santa Fe Group - Chaquehui Formation	2.6	1.00×10^{-13}
	Puye - fanglomerate	0.4	2.38×10^{-13}
	Puye - totavi lentil	0.5	1.00×10^{-13}
	Bandelier Tuff	0.1	3.95×10^{-14}
Total Model Volume		**1620**	

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ATTACHMENT C

NATURE AND EXTENT OF RELEASES AND PRESENT-DAY RISK ASSESSMENT FOR TECHNICAL AREA 54, MATERIAL DISPOSAL AREA G

NATURE AND EXTENT OF RELEASES AND PRESENT-DAY RISK ASSESSMENT FOR TECHNICAL AREA 54, MATERIAL DISPOSAL AREA L

A Resource Conservation and Recovery Act Facility Investigation was conducted at Technical Area 54, Area L, from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases. The most recent information on the nature and extent of contamination at Material Disposal Area L is summarized in this attachment. The report also addresses the assessment of present-day risks. The information in this attachment is submitted as a portion of the response to the December 21, 2001, letter from James P. Bearzi (Chief, New Mexico Environment Department Hazardous Waste Bureau) to Dr. John C. Browne (Director, Los Alamos National Laboratory) and Mr. David A Gurulé (Area Manager, Department of Energy Los Alamos Area Office).

SWMU 54-006	Material Disposal Area (MDA L) (all subsurface units such as Pit A, SI B,C,D, Shafts 1-28, 29-34)
Administrative Authority NMED	Former Operable Unit OU 1148
Technical Area TA-54	Dates of Operation 1959-1986
Has ER Sampled the Site? Yes	ER Remedial Action Conducted? No
Structure Number N/A	Other Remedial Action Conducted? No

Unit Description

SWMU 54-006 (also called MDA L) is included in Module VIII of LANL's Hazardous Waste Facility Permit. Area L is a 2.5-acre fenced area that includes MDA L, which consists of 1 subsurface disposal pit (pit A); 3 subsurface treatment and disposal impoundments (impoundments B, C, and D); and 34 disposal shafts (shafts 1 through 34). Only impoundments B and D and shafts 1, 13-17, and 19-34 (although no longer in use) are considered active impoundments until RCRA closure is certified and approved. The entire fenced surface area of Area L is an active RCRA-permitted hazardous waste management unit.

Disposal pit A is located in the eastern portion of Area L beneath Dome 54-215. The pit is 200 ft long x 12 ft wide x 12 ft deep. It received chemical waste from the late 1950s until December 1978. Initial waste disposal practices included disposal of uncontainerized chemical wastes and liquids in drums without added sorbents. The pit also was used as an evaporative pit. Pit A was filled with waste to within approximately three feet of the surface between 1964 and 1978, and then was covered with crushed, consolidated tuff.

The three surface impoundments (impoundments B, C, and D) are located northwest of pit A. Impoundment B was excavated in 1978 and is 60 ft long x 18 ft wide x 10 ft deep. It had a capacity of 7,560 ft^3 and operated from January 1979 to June 1985 to evaporate treated salt solutions and electroplating wastes. Impoundment C was closed in 1978. This impoundment, which is 35 ft long x 12 ft wide x 10 ft deep, was used for the same disposal purposes as impoundment B. Impoundment C had a capacity of 2,940 ft^3. Impoundment D is approximately 75 ft long x 18 ft wide x 10 ft deep and had a capacity of 9,450 ft^3. It was used to treat small quantities of lithium hydride by reaction with water. This practice began in 1972 and was discontinued in 1984. Impoundment D later was used as secondary containment for used oil storage tanks (see SWMU 54-021). The capacities of the impoundments were calculated assuming they were filled to within three feet of the surface. All three impoundments are covered with crushed tuff followed by asphalt.

The 34 disposal shafts at MDA L were drilled directly into the subsurface tuff. Shafts 1 through 28 are located south of pit A. Shafts 29 through 34 are located northwest of impoundments B, C and D. Three feet of crushed tuff were placed in the bottom of each shaft to fill cracks and joints. The shafts range from 15 ft to 65 ft deep and vary in diameter from 3 ft to 8 ft. Groups of shafts were constructed as needed. When in use, the shafts were covered with a steel cap that could be opened or removed, depending on design, to allow placement of waste. The operational dates of the shafts vary, but collectively the shafts were operated from February 1975 to December 1985. The shafts were used to

dispose of containerized and bulk liquid chemical wastes. Before 1982, containerized liquids were disposed of without adding absorbents to the containers. Space around the drums was filled with crushed tuff and a 6-in. layer of crushed tuff was placed between each layer of drums. After 1981, uncontainerized waste was no longer disposed of in the shafts. From 1982 to 1985, wastes were accumulated on the site and packaged in drums until a sufficient quantity had accumulated to put the drums in a shaft. When filled, the shafts were covered with a concrete plug, approximately 3 ft thick.

Early disposal practices at MDA L resulted in a subsurface volatile organic vapor plume that extends beneath the facility and beyond its boundary. Several previous investigations have taken place at MDA L. Since 1982, channel sediments have been collected from permanent stations in the main drainages surrounding TA-54 to monitor the potential transport of radionuclides by stormwater run-off. In 1985, NMED issued a compliance order to LANL that required pore-gas characterization at MDAs G and L. Nine boreholes were drilled between 1985 and 1988 to monitor the subsurface VOC plume. Analytical data from the pore-gas monitoring shows that 1,1,1-trichloroethane is the primary plume constituent; it is present to at least 200 ft below the mesa surface; and concentrations vary across the plume. In 1986, additional boreholes were drilled to measure air permeability in the tuff. The data were used to evaluate the nature and extent and fate and transport of subsurface contamination at MDA L.

The ER Project conducted RFI fieldwork at MDA L from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases.

The RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport and, if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment run-off from the four MDAs. Fourteen drainage channels originate near MDA G, and the other three MDAs each have only one significant drainage channel. Sample locations were selected within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for alpha, beta, and gamma radiation. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that had no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape

condition for potential receptor access. Each MDA-related drainage was determined not to be an ecological concern because there was little receptor access. The channel sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

An RFI report for MDAs G, H, and L was issued in 2000 to: (1) document the fieldwork and evaluate the potential human health and ecological risks posed by known and projected releases and exposures; (2) recommend (as necessary) additional investigation at TA-54 to reduce uncertainties associated with potential human health and ecological impacts; and (3) evaluate the need for near- and/or long-term corrective measures to reduce present-day and/or potential future risk. The RFI focused on identifying COPCs and developing a conceptual model for their fate and transport. In identifying COPCs, data of sufficient quality were compared with applicable thresholds (i.e., BVs) for inorganic chemicals, BVs and/or FVs for radionuclides, and instrument DLs for organic chemicals. Where data were not clearly less than the applicable threshold, analytes were retained as COPCs. Information used to develop the conceptual model for MDA L includes both non-ER and ER Project RFI data. RFI fieldwork at MDA L included the collection and analysis of 4 drainage sediment samples, 172 core samples from 16 boreholes, 268 VOC surface flux samples, 239 tritium surface flux samples, and 16 ambient air samples. The sediment samples were analyzed for inorganic chemicals, cyanide, PCBs/pesticides, radionuclides, and tritium. The ambient air samples were analyzed for VOCs. The core samples were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs/pesticides, cyanide, and radionuclides. The RFI data were supplemented by environmental surveillance surface water data, VOC emissions data from passive extraction tests, and quarterly VOC pore-gas monitoring samples. Analytical results showed the presence of tritium at elevated levels in the ambient air flux samples and the subsurface tuff samples and organic chemicals in the subsurface and ambient air samples, which indicated a subsurface release. The primary VOCs identified are 1,1,1-trichloroethane and trichloroethene. Barium, copper, chromium, nickel, uranium, and zinc were detected at concentrations greater than BVs in subsurface tuff samples. The pesticide methoxychlor is present at concentrations below SAL in site sediments.

Evaluation of site data indicates that the known sources of environmental contamination at MDA L are vapor-phase tritium and VOC releases from the subsurface units and releases of metals dissolved in liquid solvents into the tuff below the subsurface units. Environmental transport pathways supported by data analysis are resuspension and dispersion in air and sediment transport in surface water for surface soil and sediment contaminated with methoxychlor (source unknown); diffusion in pore gas and dispersion in air for vapor-phase tritium and VOCs; and transport of dissolved metals, followed by sorption onto minerals and solid phases in tuff.

Present-day risks posed by MDA L to human and ecological receptors were characterized using a human health risk assessment and an ecological screening assessment. The risk assessment presented in the preliminary RFI report concluded that surface contamination at the site posed no unacceptable present-day risk to human health. No radionuclides or

inorganic chemicals were detected in sediment samples collected at the site. Methoxychlor was detected but at concentrations similar to those found to pose no unacceptable present-day risk at MDA G. Results of ambient air risk assessment for VOCs indicated carcinogenic risks that were about equal to or below the lower end of EPA's acceptable risk range. Potential doses from tritium are below those shown to pose an acceptable risk in the MDA G risk assessment. The ecological screening assessment found that chemicals did not have the potential to cause adverse ecological impacts to receptors at MDA L. The results of the present-day risk assessment indicate that no action is necessary to address exposure of on-site workers to VOCs or tritium in air at MDA L. The risks, dose, and hazards associated with exposure to soil contaminants at MDA L were lower than those from exposure to VOCs and tritium in air and were below acceptable limits. The present-day ecological risk screening assessment at MDA L indicated no COPECs.

Quarterly pore-gas sampling of the vapor phase VOC plume at MDA L is ongoing; sampling results are reported in the ER quarterly reports. At the request of NMED, the RFI report for MDA L is being rewritten to incorporate additional recent information on the nature and extent of contamination.

References

RFI Report for Material Disposal Areas G, H, and L at Technical Area -54 LA-UR Number: 00-1140

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 LA-UR Number: No LA-UR

RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) LA-UR Number: 96-0110

Proposed Action Plan Drilling Near Area [MDA] L, TA-54, OU 1148 LA-UR Number: No LA-UR

RFI Work Plan for Operable Unit 1148 LA-UR Number: 92-0855

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
Operator

4/25/02
Date Signed

E. Dennis Martinez
Acting Director
U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
Owner/Operator

4/25/02
Date Signed

ATTACHMENT J

COMPLIANCE DEMONSTRATION WITH 40 CFR 264, SUBPARTS G AND F UNDER CORRECTIVE ACTION PROCEDURES FOR MATERIAL DISPOSAL AREA H AT TECHNICAL AREA 54

Compliance Demonstration with 40 CFR Part 264, Subparts G and F under Corrective Action Procedures for Material Disposal Area H at Technical Area 54

LA-UR-02-2174
April 2002

Prepared by:
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Introduction

This section of the TA-54 closure and post-closure care plans was prepared in accordance with the December 21, 2001, New Mexico Environment Department Hazardous Waste Bureau (NMED-HWB) letter (HWB-LANL-99-050) "Determination of Incompleteness for: ... 4) Closure Plan for Technical Area 54, Material Disposal Area H, (Revision 1), March 1998, and the March 20, 2002 NMED-HWB letter (HWB-Facility-99-050) "Closure and Post-Closure Plan Requirements, Technical Area 54, Material Disposal Area H." The information provided below includes discussion of the applicability of alternative mechanisms and corrective action to address groundwater monitoring, closure and post-closure care requirements at MDA H, and a brief description of MDA H with a summary of investigation and remediation activities completed to date as requested by the NMED-HWB.

In accordance with the December 21, 2001 NMED-HWB letter, compliance with closure and post-closure care requirements in 40 CFR Part 264, Subparts F and G for MDA H may be demonstrated under 40 CFR 264.101 corrective action procedures. This approach is based on 40 CFR §§ 264.90(f), 264.110(c), 264.112(b)(8), and 264.118(b)(4) which state that the Secretary may replace all or part of the requirements of §§ 264.91 through 264.100 (Subpart F) and the requirements of Subpart G with alternative requirements for groundwater monitoring and corrective action for releases to groundwater and closure/post-closure care requirements set out in a permit or enforceable document where the Secretary determines that: 1) a regulated unit (shaft 9 at MDA H) is situated among solid waste management units (SWMUs) (shafts 1-8 at MDA H), a release has occurred, and both the regulated unit and one or more of the SWMUs are likely to have contributed to the release (documented in the MDA H RFI Report); and 2) it is not necessary to apply the groundwater monitoring and corrective action requirements of 40 CFR §§ 264.91 through 264.100 (Subpart F) or the closure and post-closure care requirements (Subpart G) because alternative requirements will protect human health and the environment and will satisfy the closure performance standard of § 264.111(a) and (b). EPA promulgated the alternative requirements rule in 1998 (adopted by NMED in 2000), to reduce the confusion and inefficiency caused by the application of two different regulatory requirements – closure/post-closure care for regulated units and corrective action for SWMUs that are collocated. The rule allows for the integration of cleanup requirements for a regulated unit into the requirements for SWMUs developed under approved remediation authorities protective of human health and the environment. The procedures established in Part 264, Subparts F and G were not designed to address the complexity and variety of issues involved in remediation of complex sites, while the corrective action process provides flexibility to the regulator to decide on remedies that reflect the conditions and complexities of different facilities while meeting the substantive groundwater monitoring, closure and post-closure care requirements of Part 264, Subparts F and G.

For MDA H, the specific means of compliance with the substantive requirements of Part 264, Subparts F and G have not yet been determined but they will be defined in future corrective action documents including the MDA H Corrective Measures Study (CMS) report currently under preparation, and the subsequent Corrective Measure Implementation (CMI) plan for MDA H. A "crosswalk" demonstrating how planned corrective actions to be implemented at MDA H will be compliant with applicable groundwater monitoring, closure and post-closure requirements and the document(s) where compliance is and/or will be documented is provided as Attachment A. As the corrective action process continues at MDA H, the specific means for ensuring compliance with substantive requirements of Part 264, Subparts G and F will be documented in updated versions of the "crosswalk" to be provided as an attachment to the future corrective action documents.

Waste Management Area Description

Material Disposal Area (MDA) H, designated Solid Waste Management Unit (SWMU) 54-004, is a 0.3-acre site on Mesita del Buey consisting of nine shafts used from 1960 to 1986 for the disposal of LANL-classified waste such as weapon-component mock-up shapes, detonators, papers, and tritium-contaminated items. Much of the classified waste was nonhazardous; however, scraps and shapes were contaminated with depleted uranium, fuel elements, residual plutonium, and HE. Each shaft is 6 ft in diameter and 60 ft deep. The shafts were capped when waste came to within 6 ft of the surface. Shafts 1 through 8 are capped with 3 ft of crushed tuff followed by 3-ft-thick concrete caps; shaft 9 is capped solely by a 6-ft-thick layer of concrete. The surface area of MDA H has been reseeded.

Pre-RFI Investigations

Tritiated water was encountered at a depth of 40 ft in shaft 8 in 1969 during a LANL-wide effort to determine the background value for tritium in tuff. To determine the extent of tritium at MDA H, the investigation was expanded to include sampling and analysis of air and soil in and around the disposal shafts. The highest tritium concentrations were measured around shaft 8. Additional soil and flora samples were collected in 1973 and analyzed for tritium. Plants growing in the area were found to have concentrations of tritium 3 orders of magnitude higher than species in uncontaminated areas. Surface soils near the shafts had measured concentrations of tritium two to three times the concentration measured in background samples outside the area. Data from the historic tritium investigation were used to support the conceptual model for fate and transport of tritium at MDA H.

RFI Results – Nature and Extent of Contamination

The RFI report for sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than on individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport, and if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling, based on their potential for having collected sediment run-off from the four MDAs. Fourteen drainage channels originate near MDA G; the other three MDAs each have only one significant drainage channel. Sample locations were selected within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for radioactivity. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL inorganic chemicals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that have no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape condition for potential receptor access. The drainage channels associated with each MDA were determined not to be of ecological concern because there was little receptor access.

The sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

The preliminary RFI report for MDAs G, H, and L was issued by the ER Project in 2000, based on the RFI fieldwork conducted in 1994 and 1995, supplemented by other historic TA-54 and LANL environmental-surveillance data. The purpose of the 2000 RFI was to determine contaminant nature and extent in air, surface water, channel sediments, and subsurface media. The RFI focused on identifying COPCs and developing a conceptual model for their fate and transport. In identifying COPCs, data of sufficient quality were compared with applicable thresholds (i.e., BVs for inorganic chemicals, BVs and/or FVs for radionuclides, and instrument detection limits for organic chemicals). When data were not clearly less than the applicable threshold, analytes were retained as COPCs. Information used to develop the site conceptual model includes both non-ER Project and ER Project RFI data. With the exception of source characterization, much of the information needed to develop the conceptual model for MDA H was available from sources outside the ER Project. The RFI for MDA H included collecting additional field data, integrating newly obtained data with available information, and using the integrated data to identify COPCs and develop a site conceptual model. In January 2000, NMED, DOE, and LANL formed the MDA High Performing Team (HPT) to work on the TA-54 RFI report. In September 2000, the HPT were directed to expedite implementation of a corrective measure alternative at one MDA. The HPT selected MDA H and narrowed the scope of its effort to accommodate the change. The RFI for MDA H subsequently was separated from the RFI reports for MDAs G and L to expedite the evaluation and implementation of a corrective measure at MDA H. The ER Project reissued the RFI report for just MDA H in May 2001.

The RFI fieldwork included the collection of 4 storm drainage sediment samples and 33 core samples from 4 boreholes. Channel sediment samples were analyzed for inorganic chemicals, cyanides, PCBs, pesticides, tritium, and radionuclides. Core samples were analyzed for TAL metals, cyanide, VOCs, SVOCs, PCBs, pesticides, tritium, and radionuclides. Background comparisons (inorganic chemicals and radionuclides) and data evaluations (organic chemicals) identified methoxychlor and tritium in channel sediments and copper, selenium, several organic chemicals, and tritium in subsurface tuff as COPCs. None of the VOCs or inorganic chemicals was detected above its SALs. The maximum reported tritium concentration of 777,000 pCi/mL at a depth of 52.5 ft bgs is equivalent to approximately 1543 pCi/g based on the sample soil moisture of 0.2%. This concentration is an order of magnitude greater than the SAL of 880 pCi/g. The maximum concentration of tritium at 10 ft bgs was 5890 pCi/mL, which is equivalent to 182 pCi/g based on the sample soil moisture of 3%. Methoxychlor was not disposed of at MDA H and its presence most likely is due to routine surface application. Copper and selenium do not appear to be related to a release from the PRS. Tritium and VOCs are related to a release from MDA H. Tritium is in the form of water vapor. Data gathered during the RFI identified the nature and partial extent of contamination in the surface and subsurface media. Analytical results from the RFI were used to assess the present-day impacts to ecological and human health receptors. The present day-risk assessment concluded that existing contamination does not exceed applicable EPA risk thresholds.

To address the remaining data gaps regarding the extent of tritium and VOC contamination and at the request of NMED, the ER Project prepared and implemented a supplemental RFI SAP in 2001. Supplemental RFI activities completed during 2001 included collecting additional subsurface samples to further define the lateral extent of tritium and organic chemical contamination from

borehole 54-1023 and from two newly drilled boreholes, installing an air-monitoring station adjacent to the southeastern boundary of MDA H to monitor for tritium in air at the MDA H fence line, and collecting a sediment sample near sample location 54-5132 at the interface of the alluvial sediments and bedrock to collect data where all the sediment accumulated over time. An RFI addendum will be issued in May 2002. The report will summarize the 2001 data and assess whether there are changes to the present day-risk assessment presented in the MDA H RFI report.

RCRA Corrective Measures Study

In December 2000, NMED directed LANL to prepare a CMS plan for MDA H because NMED believes that hazardous wastes at MDA H may present a future threat to human health and the environment over the life of the buried wastes. LANL also agreed to proceed with a CMS to address the potential for adverse impacts from future releases of radionuclides (tritium). The CMS plan identified corrective action objectives, preliminary corrective measure alternatives that address potential unacceptable future risks, and the methodology to be followed in evaluating the alternatives during the CMS. The CMS plan was approved by NMED in December 2001. The CMS is being conducted in accordance with RCRA requirements and will meet the intent of DOE Order 5400.5, “Radiation Protection of the Public and the Environment.” The CMS report for MDA H will be issued during the summer of 2002.

References

Monthly Progress Report for Corrective Measures Study for Material Disposal Area H, Potential Release Site 54-004, at Technical Area 54, February 2002 LA-UR Number: 02-1454

Monthly Progress Report for Corrective Measures Study for Material Disposal Area H, Potential Release Site 54-004, at Technical Area -54, January 2002 LA-UR Number: 02-1345

Plan for Supplemental Sampling for the RCRA Facility Investigation at Material Disposal Area H LA-UR Number: 01-2516

RFI Report for Material Disposal Area H at Technical Area -54 LA-UR Number: 01-1208

Corrective Measures Study (CMS) Plan for Material Disposal Area (MDA) H at Technical Area 54 LA-UR Number: 01-1629

RFI Report for Material Disposal Areas G, H, and L at Technical Area -54 LA-UR Number: 00-1140

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 LA-UR Number: No LA-UR

RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) LA-UR Number: 96-0110

RFI Work Plan for Operable Unit 1148 LA-UR Number: 92-0855

ATTACHMENT A

MDA H

OPERATING UNIT REGULATIONS FOR GROUND WATER/CLOSURE/POST-CLOSURE CARE AND CORRESPONDING HSWA ACTIVITIES

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90	Applicability		
§264.90(a)(1)	Except as provided in paragraph (b) of this section, the regulations in this subpart apply to owners or operators of facilities that treat, store or dispose of hazardous waste. The owner/operator must satisfy the requirements identified in paragraph (a)(2) of this section for all wastes (or constituents thereof) contained in solid waste management units at the facility, regardless of the time at which waste was placed in such units.	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies the requirements identified in §264.90(a)(2) through the implemention of alternative requirements (§264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets these requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(a)(2)	All solid waste management units must comply with the requirements in §264.101. A surface impoundment, waste pile, and land treatment unit or landfill that receives hazardous waste after July 26, 1982 (hereinafter referred to as a "regulated unit") must comply with the requirements of §§264.91 through 264.100 in lieu of §264.101 for purposes of detecting, characterizing and responding to releases to the uppermost aquifer. The financial responsibility requirements of §264.101 apply to regulated units.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(b)	The owner/operator's regulated unit or units are not subject to regulation for releases into the uppermost aquifer under this subpart if:	NA	NA
§264.90(b)(1)	The owner/operator is exempted under §264.1; or	NA	NA
§264.90(b)(2)	He operates a unit which the Secretary finds:	NA	NA
§264.90(b)(2)(i)	Is an engineered structure,	NA	NA
§264.90(b)(2)(ii)	Does not receive or contain liquid waste or waste containing free liquids,	NA	NA
§264.90(b)(2)(iii)	Designed and operated to exclude liquid, precipitation, and other run-on and run-off,	NA	NA
§264.90(b)(2)(iv)	Has inner and outer layers of containment enclosing the waste,	NA	NA
§264.90(b)(2)(v)	Has a leak detection system built into each containment layer,	NA	NA
§264.90(b)(2)(vi)	Continuing operation and maintenance of leak detection systems will be provided during active life and during closure/post-closure care periods, and	NA	NA
§264.90(b)(2)(vii)	To reasonable degree of certainty, will not allow hazardous constituents to migrate beyond out containment layer prior to end of post-closure care period.	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(b)(3)	The Secretary finds, pursuant to §264.280(d), that the treatment zone of a land treatment unit that qualifies as a regulated unit does not contain levels of hazardous constituents that are above background levels of those constituents by an amount that is statistically significant, and if an unsaturated zone monitoring program meeting the requirements of §264.278 has not shown a statistically significant increase in hazardous constituents below the treatment zone during the operating life of the unit. An exemption under this paragraph can only relieve an owner or operator of responsibility to meet the requirements of this subpart during the post-closure care period; or	NA	NA
§264.90(b)(4)	The Secretary finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and the post-closure care period specified under §264.117. This demonstration must be certified by a qualified geologist or geotechnical engineer. In order to provide an adequate margin of safety in the prediction of potential migration of liquid, the owner or operator must base any predictions made under this paragraph on assumptions that maximize the rate of liquid migration.	Should sufficient information support this exemption for a regulated unit in the future, the HSWA activity would be equivalent to that prescribed by the exemption.	NA
§264.90(b)(5)	He designs and operates a pile in compliance with §264.250(c).	NA	NA
§264.90(c)	The regulations under this subpart apply during the active life of the regulated unit (including the closure period). After closure of the regulated unit, the regulations in this subpart:	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies the requirements identified in §264.90(c) through the implemention of alternative requirements (§264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets these requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(c)(1)	Do not apply if all waste, waste residues, contaminated containment system components, and contaminated subsurface soils removed or decontaminated at closure;	For MDA H, see the CMS report for a general description of the excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure is selected, details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(c)(2)	Apply during post-closure care period if owner/operator is conducting a detection monitoring program under §264.98; or	The probable corrective measure to be implemented at MDA H will include monitoring in the vadose zone beneath MDA H. The LANL hydrogeologic characterization program (as implemented through the LANL Hydrogeologic Work Plan) proposes the locations for characterization wells for TA-54 that after four sampling events will be included in LANL Environmental Surveillance Program, and may, if appropriate, be used as repetitive monitoring wells for TA-54 as a whole.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(c)(3)	Apply during the compliance period under §264.96 if the owner/operator is conducting a compliance monitoring program under §264.99 or a corrective action program under §264.100.	If monitoring indicates a more comprehensive program is needed to adequately comply with standards developed consistent with §264.92, additional characterization and/or well installation will occur, if appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(d)	Regulations in this subpart may apply to miscellaneous units when necessary to comply with §§264.601-603.	NA	NA
§264.90(e)	The regulations of this subpart apply to all owners and operators subject to the requirements of 40 CFR 270.1(c)(7), when the Bureau issues either a post-closure permit or an enforceable document (as defined in 40 CFR 270.1(c)(7)) at the facility. When the Bureau issues an enforceable document, references in this subpart to "in the permit" mean "in the enforceable document."	CMS and CMI plans and resulting CMS and CMI reports for MDA H describing activities equivalent to post-closure permit requirements will be "enforceable documents" consistent with 265.121.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(f)	The Secretary may replace all or part of the requirements of §§ 264.91 through 264.100 applying to a regulated unit with alternative requirements for groundwater monitoring and corrective action for releases to groundwater set out in the permit (or in an enforceable document) (as defined in 40 CFR 270.1(c)(7)) where the Secretary determines that:	Activities proposed and implemented in the above referenced plans will be effectively equivalent to the cited Subpart F requirements.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(f)(1)	The regulated unit is situated among SWMUs or areas of concern (AOC), a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	If the possibility for this situation exists, alternative activities may appropriately replace all or part of the above cited Subpart F requirements.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(f)(2)	It is not necessary to apply the groundwater monitoring and corrective action requirements of §§264.91-100 because alternative requirements will protect human health and the environment.	Should the above situation exist, §264.90(f)(1), alternative activities protective of human health and the environment and proposed in lieu of §264.91-264.100 will preclude the need for application of Subpart F requirements.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.91	Required programs		
§264.91(a)	Owner/operators subject to this subpart must conduct a monitoring and response program as follows:		
§264.91(a)(1)	Whenever hazardous constituents under §264.93 from a regulated unit are detected at a compliance point under §264.95, owner/operator must institute a compliance monitoring program under §264.99. Detected is defined as statistically significant evidence of contamination as described in §264.98(f);	If "detection" at the aggregate boundary is indicated, additional characterization and/or well installation will occur if appropriate through a more comprehensive monitoring program. The definition of "detected" in §264.91(a)(1) will be used. Concentration limits protective of human health and the environment will be established similar to ground water protection standards in §264.92.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.91(a)(2)	Whenever the ground-water protection standard under §264.92 is exceeded, owner/operator must institute a corrective action program under §264.100. Exceedance is defined as statistically significant evidence of increased contamination as described in §264.99(d);	Actions to correct any exceedances of concentrations established when hazardous constituents area "detected" will be taken as necessary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.91(a)(3)	Whenever hazardous constituents under §264.93 from a regulated unit exceed concentration limits under §264.94 in groundwater between the compliance point under §264.95 and the downgradient facility property boundary, owner/operator must institute a corrective action program under §264.100, or	Should established concentration limits be exceeded between the point of compliance and the downgradient boundary, actions to correct such exceedances will be taken as necessary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.91(a)(4)	In all other cases, owner/operator must institute a detection monitoring program under §264.98.	TA-54 characterization wells will be sampled and analyzed as repetitive monitoring wells as appropriate through the LANL Environmental Surveillance Program.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.91(b)	The Secretary will specify in the facility permit the specific elements of the monitoring and response program. The Secretary may include one or more of the programs identified in paragraph (a) of this section in the facility permit as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs will be required. In deciding whether to require the owner or operator to be prepared to institute a particular program, the Secretary will consider the potential adverse effects on human health and the environment that might occur before final administrative action on a permit modification application to incorporate such a program could be taken.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.92	The owner/operator must comply with conditions specified in the facility permit that are designed to ensure that hazardous constituents under §264.93 detected in the ground water from a regulated unit do not exceed the concentration limits under §264.94 in the uppermost aquifer underlying the waste management area beyond the point of compliance under §264.95 during the compliance period under §264.96. The Secretary will establish this ground-water protection standard in the facility permit when hazardous constituents have been detected in the ground water.	Should "detection" consistent with the definition in §264.91(a)(1) occur, LANL will comply with concentration limits established through a process similar to that described in §264.94.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.93	Hazardous constituents		
§264.93(a)	The Secretary will specify in the facility permit the hazardous constituents to which the ground-water protection standard of §264.92 applies. Hazardous constituents are constituents identified in appendix VIII of part 261 of this chapter that have been detected in ground water in the uppermost aquifer underlying a regulated unit and that are reasonably expected to be in or derived from waste contained in a regulated unit, unless the Secretary has excluded them under paragraph (b) of this section.	For any of the following information that is not already available or developed, it will be prepared and included in a manner consistent with §264.93 in corresponding corrective action/HSWA activity documents.	Section 5.0 of the MDA H CMS Report and future CMI Plan
§264.93(b)	The Secretary will exclude an Appendix VIII constituent from the list of hazardous constituents specified in the facility permit if he finds that the constituent is not capable of posing a substantial present or potential hazard to human health or the environment. In deciding whether to grant an exemption, the Secretary will consider the following:	Concentration limits established for hazardous constituents following "detection" will not include those incapable of posing a substantial present or potential hazard to human health or the environment considering the following:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.93(b)(1)	Potential adverse effects on ground-water quality, considering:	Potential adverse effects on groundwater quality considering:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.93(b)(1)(i)	Physical and chemical characteristics of waste in the regulated unit, including its potential for migration;	Detailed information on waste inventory and chemical characteristics for shaft 9 and shafts 1-8 presented in MDA H RFI Report, RFI Addendum, and CMS Report including potential for migration and site conceptual model.	Section 2.0 of the MDA H RFI and Sections 2.0 and 3.0 of the MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(1)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA H can also be found in the Performance Assessment, Hydrogeologic Assessment of TA-54, Areas G and L, MDA H RFI Report, RFI Addendum, and MDA H CMS Report.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.93(b)(1)(iii)	Quantity of ground water and the direction of ground-water flow;	Information regarding quantity and direction of flow of groundwater can be obtained through the LANL Hydrogeologic Work Plan.	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.93(b)(1)(iv)	Proximity and withdrawal rates of ground-water users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	Future MDA H CMI Plan
§264.93(b)(1)(v)	Current and future uses of ground-water in the area;	Information regarding current and future users of groundwater in the area will be developed.	Future MDA H CMI Plan
§264.93(b)(1)(vi)	Existing quality of ground water, including other sources of contamination and their cumulative impact on ground-water quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Work Plan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER site characterization efforts.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.93(b)(1)(vii)	Potential health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to human receptors. The CMS Report for MDA H will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to ecological receptors. The CMS Report for MDA H will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(1)(ix)	Persistence and permanence of the potential adverse effects; and	See RFI and CMS Reports for MDA H.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.93(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	See RFI and CMS Reports for MDA H.	Section 2.0 of the MDA H RFI and Sections 2.0 and 3.0 of the MDA H CMS Report
§264.93(b)(2)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA H can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, MDA H RFI Report, RFI Addendum, and MDA H CMS Report.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.93(b)(2)(iii)	Quantity and quality of ground water, and the direction of ground-water flow;	Information to be obtained through implementation of the LANL Hydrogeologic Work Plan.	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.93(b)(2)(iv)	Rainfall patterns in the region;	See MDA H RFI Report.	Appendix B-2.0 of MDA H RFI Report
§264.93(b)(2)(v)	Proximity of regulated unit to surface waters;	See RFI and CMS Reports for MDA H.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described will be developed.	Future MDA H CMI Plan
§264.93(b)(2)(vii)	Existing quality of surface water, including other sources of contamination and the cumulative impact on surface-water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program, the multisector CWA permit, as well as through ER Project characterization activities.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.93(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	See RFI and CMS Reports for MDA H.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	See RFI and CMS Reports for MDA H.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(b)(2)(x)	Persistence and permanence of potential adverse effects.	See results of risk assessment in MDA H CMS Report	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility, the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	NA
§264.94	Concentration limits		
§264.94(a)	The Secretary will specify in the facility permit concentration limits in the ground water for hazardous constituents established under §264.93. The concentration of a hazardous constituent:	Proposed concentration limits of detected hazardous constituents will be consistent with evaluation of parameters set forth in §264.94. To the extent that information necessary to establish provisions of this section do not already exist, they will be developed. Otherwise this information can be found in the previously identified documents.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(a)(1)	Must not exceed the background level of that constituent in the ground water at the time that limit is specified in the permit; or	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(a)(2)	For any constituent listed in §264.94, Table 1, must not exceed the respective value given in that table if the background level of the constituent is below the value given in Table 1; or	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(a)(3)	Must not exceed an alternate limit established by the Secretary under paragraph (b) of this section.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(b)	The Secretary will establish an alternate concentration limit for a hazardous constituent if he finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In establishing alternate concentration limits, the Secretary will consider the following factors:	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(b)(1)	Potential adverse effects on groundwater quality, considering:	Potential adverse effects on groundwater quality, considering:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(b)(1)(i)	Physical and chemical characteristics of the waste in the regulated unit, including its potential for migration;	See RFI and CMS Reports for MDA H.	Section 2.0 of the MDA H RFI and Sections 2.0 and 3.0 of the MDA H CMS Report
§264.94(b)(1)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA H can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, MDA H RFI Report, RFI Addendum, and MDA H CMS Report.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(1)(iii)	Quantity of ground water and the direction of ground-water flow;	Information to be obtained through implementation of the LANL Hydrogeologic Work Plan.	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.94(b)(1)(iv)	Proximity and withdrawal rates of ground-water users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	Future MDA H CMI Plan
§264.94(b)(1)(v)	Current and future uses of ground water in the area;	Information regarding current and future users of groundwater in the area will be developed.	Future MDA H CMI Plan
§264.94(b)(1)(vi)	Existing quality of ground water, including other sources of contamination and their cumulative impact on ground-water quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Work Plan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER Project site characterization efforts.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(b)(1)(vii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to human receptors. The CMS Report for MDA H will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to ecological receptors. The CMS Report for MDA H will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(1)(ix)	Persistence and permanence of potential adverse effects; and	See results of risk assessment in MDA H CMS Report	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	See RFI and CMS Reports for MDA H.	Section 2.0 of the MDA H RFI and Sections 2.0 and 3.0 of the MDA H CMS Report
§264.94(b)(2)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA H can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, MDA H RFI Report, RFI Addendum, and MDA H CMS Report.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.94(b)(2)(iii)	Quantity and quality of ground water and direction of ground-water flow;	Information to be obtained through implementation of the LANL Hydrogeologic Work Plan.	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.94(b)(2)(iv)	Patterns of rainfall in the region;	See appendices in RFI and CMS Reports for MDA H.	Appendix B-2.0 of MDA H RFI Report
§264.94(b)(2)(v)	Proximity of regulated unit to surface waters;	See RFI and CMS Reports for MDA H.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.94(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described will be developed.	Future MDA H CMI Plan
§264.94(b)(2)(vii)	Existing surface water quality, including other sources of contamination and their cumulative impact on surface-water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program, the multisector CWA permit, as well as through ER Project characterization activities.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to human receptors. The CMS Report for MDA H will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	A present day ecological risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to ecological receptors. The CMS Report for MDA H will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(2)(x)	Persistence and permanence of potential adverse effects.	See results of risk assessment in MDA H CMS Report	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	NA
§264.95	Point of compliance	In establishing a point of compliance, the limits of the waste management area can be delineated by circumscribing an imaginary line around more than one unit. The aggregate approach used in the Hydrogeologic Work Plan was intended to be consistent with this concept. As characterization efforts progress, the appropriateness of the aggregate boundary for TA-54 will be assessed.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.95(a)	The Secretary will specify in the facility permit the point of compliance at which the ground-water protection standard of §264.92 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.	See above. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the aggregate that extends down into the uppermost aquifer underlying the regulated units.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.95(b)	The waste management area is the limit projected in horizontal plane of the area on which waste will be placed during active life of a regulated unit.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.95(b)(1)	The waste management area includes horizontal space taken up by any liner, dike, or other barrier designed to contain waste in a regulated unit.	NA	NA
§264.95(b)(2)	If the facility contains more than one regulated unit, the waste management area is described by an imaginary line circumscribing the several regulated units.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.96	Compliance period		Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.96(a)	The Secretary will specify in the facility permit the compliance period during which the ground-water protection standard of §264.92 applies. The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting, and the closure period.)	The implementing document for these alternative activities will specify the period during which concentration limits similar to groundwater protection standards and will be equivalent to the remaining active life of (including closure period) the waste management area.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.96(b)	The compliance period begins when the owner/operator initiates a compliance monitoring program meeting the requirements of §264.99.	This period would begin upon detection as defined in §264.91, and, if a more comprehensive program is needed to adequately address hazardous constituent concentration limits that have been prescribed, additional characterization and/or monitoring well installation will occur if appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.96(c)	If the owner/operator is engaged in a corrective action program at the end of the compliance period specified in paragraph (a) of this section, the compliance period is extended until the owner/operator can demonstrate that the ground-water protection standard of § 264.92 has not been exceeded for a period of three consecutive years.	This period will be extended for a period of 3 years, if at the end of the active life and closure period the concentration limits described above continue to be exceeded.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97	The owner/operator must comply with following requirements for any ground-water monitoring program developed to satisfy §264.98, §264.99, or §264.100:	Alternative requirements will be met there.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)	The ground-water monitoring system must consist of sufficient number of wells, installed at appropriate locations and depths to yield ground-water samples from the uppermost aquifer that:	All groundwater monitoring wells will be sufficient in number and placed at appropriate locations and depths in the uppermost aquifer as determined by characterization efforts performed during implementation of the Hydrogeologic Work Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(1)	Represent the quality of background water that has not been affected by leakage from a regulated unit;	Background wells will be placed in an upgradient location determined to be unaffected by potential releases from the waste management area.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(a)(1)(i)	A determination of background quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:	Should existing conditions preclude the location of background wells upgradient, other wells will be used. These wells will be capable of determining background quality passing the aggregate boundary. This determination will be made in part by ongoing characterization efforts establishing groundwater gradient, flow directions, potential transport mechanisms, and waste-specific migration characteristics.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(1)(i)(A)	Hydrogeologic conditions do not allow the owner/operator to determine what wells are hydraulically upgradient; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(1)(i)(B)	Sampling at other wells will provide an indication of background ground-water quality that is representative or more representative than that provided by the upgradient wells; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(2)	Represent the quality of groundwater passing the point of compliance.	The above-mentioned geologic, hydrologic, and waste characteristics will be considered in determining the representativeness of the groundwater passing the downgradient aggregate boundary and the monitoring system's capability of detecting contamination if hazardous waste or hazardous constituents migrate from the aggregate to the uppermost aquifer.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(3)	Allow for the detection of contamination when hazardous waste or hazardous constituents have migrated from the waste management area to the uppermost aquifer.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(b)	If a facility contains more than one regulated unit, separate ground-water monitoring systems are not required for each unit provided that provisions for sampling the ground water in the uppermost aquifer will enable detection and measurement at the compliance point of hazardous constituents from the regulated units that have entered the ground water in the uppermost aquifer.	Consistent with establishing a point of compliance by circumscribing an imaginary line around more than one unit, a groundwater monitoring system capable of detecting and measuring hazardous constituents at the aggregate boundary will meet the intent of this requirement.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(c)	All monitoring wells must be cased in a manner that maintains the integrity of the monitoring-well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the ground water.	The integrity of the monitoring well borehole will be maintained by casing in a manner most appropriate for the use and surrounding subsurface environment. Screen materials should be selected based on compatibility w geochemistry and long-term structural integrity. Well casing size should be determined based on the size of purging and equipment necessary to sample the well and the depth of the well. Filter pack material should be inert (i.e., silica sand). Gravel filters are compatible with screen and subsurface. Annular space should be sealed with materials compatible with the subsurface and have a permeability one to two orders of magnitude less than the surrounding formation. A cement and bentonite mixture, bentonite chips or antishrink cement mixtures can be used in the unsaturated zone and below the frost line. The cap should consist of concrete blending into an apron extending at least three feet from the outer edge of the borehole. Remaining annular space should be sealed with expanding cement. A suitable threaded or flanged cap or compression seal should then be placed and locked.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(d)	The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide a reliable indication of ground-water quality below the waste management area. At a minimum, the program must include procedures and techniques for:	Groundwater sampling and analysis procedures will be in written form and will address the following:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(d)(1)	Sample collection;	1) Groundwater level measurements will be determined prior to collection of sample in accordance with a written procedure describing level of accuracy, measurement reference points, required equipment decontamination, and time period measured. 2) Water collection will occur in accordance with a written procedure describing sampling devices and procedures for use and decontamination, well evacuation volumes and procedures, field measurements and appropriate sample container types.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(d)(2)	Sample preservation and shipment;	SW 846 requirements will be followed to ensure appropriate preservation and temperature controls are utilized.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(d)(3)	Analytical procedures; and	SW 846 or other approved analytical methods, holding times and approved QA/QC analytical procedures will be used.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(d)(4)	Chain-of-Custody control.	Chain-of-custody will include: sample number, time and date; collector's signature; sample type; well identification; number of containers; parameters to be analyzed; signatures of subsequent handlers; inclusive dates of possession; storage temperature at shipment and receipt; and verification of temperature control upon receipt at analytical laboratory.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(e)	The ground-water monitoring program must include sampling and analytical methods appropriate for ground-water sampling and that accurately measure hazardous constituents in ground-water samples.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(f)	The ground-water monitoring program must include determination of the ground-water surface elevation each time ground water is sampled.	Groundwater levels will be determined each time water is sampled.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(g)	In detection monitoring or where appropriate in compliance monitoring, data on each hazardous constituent specified in the permit will be collected from background wells and wells at the compliance point(s). The number and kinds of samples collected to establish background shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. Sample size shall be as large as necessary to ensure with reasonable confidence that a contaminant release to ground water from a facility will be detected. The owner or operator will determine an appropriate sampling procedure and interval for each hazardous constituent listed in the facility permit which shall be specified in the unit permit upon approval by the Secretary. The sampling procedure shall be:	Data will be collected that is appropriate for the statistical methodology applied, sufficient in sample size and utilizes sampling procedures and frequencies of sample collection to ensure that potential contaminant release(s) to groundwater from the waste management unit(s) can be detected.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(g)(1)	A sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained, by reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants, or	An adequate number of samples will be collected at appropriate frequencies to ensure representativeness considering aquifer and potential contaminant characteristics. Information such as retardation potential for metals and organics, and transport time based on groundwater velocity and constituent mobility will be considered in developing the sampling procedure.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(g)(2)	An alternate sampling procedure proposed by the owner/operator and approved by the Secretary.	Should an alternative to the sampling procedure described above be more appropriate, it will be proposed.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(h)	The owner/operator will specify one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent which will be specified in the unit permit. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. Where practical quantification limits (pql's) are used in any of the following statistical procedures to comply with §264.97(i)(5), the pql must be proposed by the owner or operator and approved by the Secretary. Use of any of the following statistical methods must be protective of human health and the environment and must comply with the performance standards outlined in paragraph (i) of this section.	One of the statistical methods described in §264.97(h) or an alternative approved by the Secretary will be chosen to evaluate groundwater monitoring data. It is premature at this time to prescribe a specific method until adequate characterization has been performed.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(1)	A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(2)	An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(3)	A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(4)	A control chart approach that gives control limits for each constituent.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(5)	Another statistical test method submitted by the owner or operator and approved by the Secretary.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)	Any statistical method chosen under §264.97(h) for specification in the unit permit shall comply with the following performance standards, as appropriate:	The appropriate performance standard used for the statistical method applied will be consistent with those prescribed in §264.97(i).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(i)(1)	The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)(2)	If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experimentwise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)(3)	If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be proposed by the owner or operator and approved by the Secretary if he or she finds it to be protective of human health and the environment.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)(4)	If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be proposed by the owner or operator and approved by the Secretary if it finds these parameters to be protective of human health and the environment. These parameters will be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(i)(5)	The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantification limit (pql) approved by the Secretary under §264.97(h) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)(6)	If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(j)	Ground-water monitoring data collected in accordance with paragraph (g) of this section including actual levels of constituents must be maintained in the facility operating record. The Secretary will specify in the permit when the data must be submitted for review.	Groundwater monitoring data obtained will be maintained in the facility records.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98	An owner/operator required to establish a detection monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Upon completion of adequate characterization through the Hydrogeologic Work Plan, and a determination that monitoring would be appropriate, the detection-type monitoring prescribed in §264.98 would be initiated.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(a)	The owner/operator must monitor for indicator parameters (e.g., specific conductance, total organic carbon, or total organic halogen), waste constituents, or reaction products that provide a reliable indication of the presence of hazardous constituents in ground water. The Secretary will specify the parameters or constituents to be monitored in the facility permit, after considering the following factors:	As a result of sampling performed during the four events following well installation under the Hydrogeologic Work Plan, indicator parameters, waste constituents or reaction products will be prescribed that consider the following:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(a)(1)	The types, quantities, and concentrations of constituents in wastes managed at the regulated unit;	Waste information has been obtained and reviewed, identifying hazardous constituents, concentrations, and waste volumes during the RFI/CMS process.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(a)(2)	The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;	Further refinement of the hydrogeologic regime at TA-54, and the behavior of hazardous constituents in the unsaturated zone will be developed and reported through the Hydrogeologic Work Plan activities and the RFI/CMS process. Substantial information regarding these issues has already been provided in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(a)(3)	The detectability of indicator parameters, waste constituents, and reaction products in ground water; and	Based on data collected during the four sampling events following well installation under the Hydrogeologic Work Plan, detectability of indicator parameters, waste constituents and reaction products will be established using SW 846 or Secretary approved methodologies and detection limits.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(a)(4)	The concentrations or values and coefficients of variation of proposed monitoring parameters or constituents in ground-water background values.	Considerations for establishing concentrations and coefficients of variance of background parameters or constituents include: location of the unit, groundwater flow direction, depth to groundwater, appropriate number and location of background wells, available geologic and hydrologic information, drilling methods, well installation details, and sampling data.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(b)	Owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Should it be determined that a groundwater monitoring system will be necessary, installation of this system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary. Vadose zone investigation including delineation of contaminant movement and potential impact can be used to enhance and/or supplement monitoring efforts as an early detection mechanism.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(c)	The owner/operator must conduct ground-water monitoring for each chemical parameter and hazardous constituent specified in the permit pursuant to paragraph (a) of this section in accordance with §264.97(g), and maintain a record of ground-water analytical data as measured and in a form necessary for the determination of statistical significance under §264.97(h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(d)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine whether there is statistically significant evidence of contamination for any parameter or hazardous constituent specified in the permit under paragraph (a) of this section in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during detection monitoring.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of contamination as described in §264.98(d).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer must be determined at least annually.	Groundwater flow rate and direction in the upper-most aquifer will be determined and reevaluated annually.	Future MDA H CMI Plan
§264.98(f)	The owner/operator must determine whether there is statistically significant evidence of contamination for any chemical parameter of hazardous constituent specified in the permit pursuant to paragraph (a) of this section at a frequency specified under paragraph (d) of this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of contamination exists within a reasonable timeframe.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(f)(1)	In determining whether statistically significant evidence of contamination exists, the owner/operator must use the method(s) specified in the permit under §264.97(h). These method(s) must compare data collected at the compliance point(s) to the background ground-water quality data.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(f)(2)	The owner/operator must determine whether there is statistically significant evidence of contamination at each monitoring well as the compliance point within a reasonable period of time after completion of sampling. The facility permit will specify what period of time is reasonable, based on the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of ground-water samples.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)	If the owner/operator determines pursuant to paragraph (f) of this section that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she must:	If statistically significant evidence of contamination for established chemical parameters or hazardous constituents exists, notification will be made and ground water wells will be sampled for Appendix IX constituents. If present and confirmed with a second analysis within the timeframes described in §264.98(g), these constituents will be used in a more comprehensive monitoring program.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(1)	Notify the Secretary of this finding in writing within seven days. The notification must indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(2)	Immediately sample the ground water in all monitoring wells and determine whether constituents in the list of Appendix IX of part 264 are present, and if so, in what concentration.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(3)	For any Appendix IX compounds found in the analysis pursuant to paragraph (g)(2) of this section, resample within one month and repeat the analysis for those compounds detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If groundwater is not resampled for the compounds found pursuant to paragraph (g)(2) of this section, the hazardous constituents found during this initial Appendix IX analysis will form the basis for compliance monitoring.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)	Within 90 days, submit to the Secretary an application for a permit modification to establish a compliance monitoring program meeting the requirements of §264.99. The application must include the following information:	Within 90 days, a request for modification of an enforceable document will be submitted to establish a more comprehensive monitoring program. It will include:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)(i)	An identification of the concentration or any Appendix IX constituent detected in the ground water at each monitoring well at the compliance point;	Appendix IX constituents and associated concentrations confirmed in downgradient aggregate boundary wells;	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)(ii)	Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of §264.99;	Any proposed modifications/enhancements to the existing groundwater monitoring system if necessary:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)(iii)	Any proposed additions or changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical methods used at the facility necessary to meet the requirements of §264.99;	Any proposed changes to monitoring frequency, sampling and analysis procedures or statistical methods, if necessary to address provisions of the more comprehensive monitoring program.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)(iv)	For each hazardous constituent detected at the compliance point, a proposed concentration limit under §264.94(a) (1) or (2), or a notice of intent to seek an alternate concentration limit under §264.94(b); and	For hazardous constituents detected (as defined in §264.91(a)(1)), either background concentrations, maximum concentration limits or alternate concentration limits (ACLs) (or the intent to demonstrate ACLs) will be proposed.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(5)	Within 180 days, submit to the Secretary:	Within the specified time frame of 180 days, unless an alternative approach is more appropriate, submit to the Secretary the following:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(5)(i)	All data necessary to justify an alternate concentration limit sought under §264.94(b); and	Consideration of geologic and hydrologic conditions, waste inventory, receptor location(s), travel time, and degradation mechanisms may be included in the justification.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(5)(ii)	An engineering feasibility plan for a corrective action program necessary to meet the requirement of §264.100, unless:	A feasibility plan for a groundwater corrective action program will be developed during the CMS/CMI process unless:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(5)(ii)(A)	All hazardous constituents identified under paragraph (g)(2) of this section are listed in Table 1 of §264.94 and their concentrations do not exceed the respective values given in that Table; or	Concentrations of hazardous constituents are not greater than MCLs; or	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(5)(ii)(B)	The owner or operator has sought an alternate concentration limit under §264.94(b) for every hazardous constituent identified under paragraph (g)(2) of this section.	An ACL demonstration has been submitted for all constituents found.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(6)	If the owner/operator determines that, pursuant to paragraph (f) of this section, there is a statistically significant difference for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he/she demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. The owner/operator may make a demonstration under this paragraph in addition to, or in lieu of, submitting a permit modification application under paragraph (g)(4) of this section; however, owner/operator is still required to submit a permit modification application within the time specified in paragraph (g)(4) of this section unless the demonstration made under this paragraph successfully shows that a source other than a regulated unit caused the increase, or that the increase resulted from error in sampling, analysis, or evaluation. In making this demonstration, the owner/operator, must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.98(g)(6) and monitoring will continue.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(6)(i)	Notify the Secretary in writing within seven days of determining statistically significant evidence of contamination at the compliance point that he intends to make a demonstration under this paragraph;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(6)(ii)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(6)(iii)	Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the detection monitoring program facility; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(6)(iv)	Continue to monitor in accordance with the detection monitoring program established under this section.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(h)	If the owner/operator determines that the detection monitoring program no longer satisfies the requirements of this section, he/she must within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99	An owner/operator required to establish a compliance monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituents be "detected" (consistent with §264.91(a)(1)) resulting in the subsequent development of concentration limits consistent with §264.93 and §264.94, a more comprehensive monitoring program will be established that determines compliance with these limits. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(a)	The owner/operator must monitor the ground water to determine whether regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(a)(1)	A list of the hazardous constituents identified under §264.93;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(a)(3)	The compliance point under §264.95; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(a)(4)	The compliance period under §264.96.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(b)	The owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Installation of a more comprehensive monitoring system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(c)	The Secretary will specify the sampling procedures and statistical methods appropriate for the constituents and the facility, consistent with §264.97(g) and (h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance using appropriate sampling procedures and statistical methods.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(c)(1)	The owner/operator must conduct a sampling program for each chemical parameter or hazardous constituent in accordance with §264.97(g).	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(c)(2)	The owner/operator must record ground-water analytical data as measured and in form necessary for the determination of statistical significance under §264.97(h) for the compliance period of the facility.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(d)	The owner/operator must determine whether there is statistically significant evidence of increased contamination for any chemical parameter or hazardous constituent specified in the permit, pursuant to paragraph (a) of this section, at a frequency specified under paragraph (f) under this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of increased contamination exists within a reasonable timeframe.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(d)(1)	In determining whether statistically significant evidence of increased contamination exists, owner/operator must use the method(s) specified in the permit under §264.97(h). The methods(s) must compare data collected at the compliance point(s) to a concentration limit developed in accordance with §264.94.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(d)(2)	The owner/operator must determine whether there is statistically significant evidence of increased contamination at each monitoring well at the compliance point within a reasonable time period after completion of sampling. The Secretary will specify that time period in the facility permit, after considering the complexity of the statistical test and the availability of analytical laboratories to perform the analysis of ground-water samples.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the uppermost aquifer will be determined and reevaluated annually.	Future MDA H CMI Report
§264.99(f)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine statistically significant evidence of increased contamination in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during the compliance period of the facility.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of increased contamination as described in §264.99(f).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(g)	Owner/operator must analyze samples from all monitoring wells at the compliance point for all constituents contained in Appendix IX of Part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to procedures in §264.98(f). If the owner/operator finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the owner/operator may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the owner/operator must report the concentration of these additional constituents to the Secretary within seven days after the completion of the second analysis and add them to the monitoring list. If the owner/operator chooses not to resample, then he or she must report the concentrations of these additional constituents to the Secretary within seven days after completion of the initial analysis and add them to the monitoring list.	If annual sampling for all Appendix IX constituents indicates new constituents that are not already addressed statistically exceed background, and resampling within one month confirms this, the Secretary will be notified and the new constituents will be added to the monitoring list.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(h)	If the owner/operator determines pursuant to paragraph (d) of this section that any concentration limits under §264.94 are being exceeded at any monitoring well at the point of compliance, must:	If it has been determined that a statistically significant increase in contamination due to an exceedance of the previously established concentration limits has occurred at the downgradient aggregate boundary, the Secretary will be notified and a modification to the enforceable document requested to establish a corrective action program. It will include the actions necessary to correct the increase in contamination and a plan for a groundwater monitoring program to demonstrate the effectiveness of the action. An analysis of applicable remedial technologies will be performed through the CMS process, and the capabilities of the existing groundwater monitoring system will be assessed. Modifications/enhancements to the existing system will be proposed if necessary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(h)(1)	Notify the Secretary of this finding in writing within seven days. The notification must indicate what concentration limits have been exceeded.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(h)(2)	Submit to the Secretary an application for a permit modification to establish a corrective action program meeting the requirements of §264.100 within 180 days, or within 90 days if an engineering feasibility study has been previously submitted to the Secretary under §264.98(h)(5). The application must at a minimum include the following information:	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(h)(2)(i)	A detailed description of corrective actions that will achieve compliance with the ground-water protection standard specified in the permit under paragraph (a) of this section; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(h)(2)(ii)	A plan for a ground-water monitoring program that will demonstrate the effectiveness of the corrective action. Such a ground-water monitoring program may be based on a compliance monitoring program developed to meet the requirements of this section.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(i)	If the owner/operator determines, pursuant to paragraph (d) of this section, that the ground-water concentration limits under this section are being exceeded at any monitoring well at the point of compliance, may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. In making a demonstration under this paragraph, the owner/operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.99(i) and monitoring will continue.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(i)(1)	Notify the Secretary in writing within seven days that he intends to make a demonstration under this paragraph;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(i)(2)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the standard to be exceeded or that the apparent noncompliance with the standards resulted from error in sampling, analysis, or evaluation;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(i)(3)	Within 90 days, submit an application for a permit modification to the Secretary to make any appropriate changes to the compliance monitoring program at the facility; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(i)(4)	Continue to monitor in accord with the compliance monitoring program established under this section.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(j)	If the owner/operator determines that the compliance monitoring program no longer satisfies the requirements of this section, must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100	An owner/operator required to establish a corrective action program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituent concentration levels be exceeded, a program that takes action to address the statistically significant increase identified will be established. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)	Owner/operator must take corrective action to ensure that regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)(1)	A list of the hazardous constituents identified under §264.93;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)(3)	The compliance point under §264.95; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)(4)	The compliance period under §264.96.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(b)	The owner/operator must implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance point by removing the hazardous waste constituents or treating them in place. The permit will specify the specific measures that will be taken.	A program will be implemented to prevent hazardous constituent concentration exceedances at the downgradient aggregate boundary that considers: contaminant distribution and mobility, additional characterization and/or monitoring needs (including vadose zone investigation), source term removal, and applicable remedial techniques.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(c)	The owner/operator must begin corrective action within a reasonable time period after the ground-water protection standard is exceeded. The Secretary will specify that time period in the facility permit. If a facility permit includes a corrective action program in addition to a compliance monitoring program, the permit will specify when the corrective action will begin and such a requirement will operate in lieu of §264.99(i)(2).	Corrective action will begin within a reasonable time period after hazardous constituent concentration limits have been exceeded and will be conducted pursuant to the requirements established in the above-referenced corrective action program.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(d)	In conjunction with a corrective action program, owner/operator must establish and implement a ground-water monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under §264.99 and must be as effective as that program in determining compliance with the ground-water protection standard under §264.92 and in determining the success of a corrective action program under paragraph (e) of this section, where appropriate.	A groundwater monitoring program to demonstrate the effectiveness of the corrective action will be established and implemented. It will be based on considerations identified in the corrective action program and capable of detecting statistically significant exceedances in previously established hazardous constituent concentration limits. Additional monitoring wells may be installed and sampled if necessary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(e)	In addition to the other requirements of this section, owner/operator must conduct a corrective action program to remove or treat in place any hazardous constituents under §264.93 that exceed concentration limits under §264.94 in groundwater:	The corrective action will also address hazardous constituents that exceed the concentration limits between the downgradient aggregate boundary and the downgradient property boundary, and off-site. Removal or in situ treatment of such constituents will occur in a reasonable time period, and, if off site, where necessary to protect human health and the environment. Corrective action can cease once limits are no longer exceeded.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(e)(1)	Between the compliance point under §264.95 and the downgradient property boundary; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(e)(2)	Beyond the facility boundary, where necessary to protect human health and the environment, owner/operator demonstrates to the satisfaction of the Secretary that, despite the owner's or operator's best efforts, the owner or operator was unable to obtain the necessary permission to undertake such action. The owner/operator is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(e)(3)	Corrective action measures under this paragraph must be initiated and completed within a reasonable period of time considering the extent of contamination.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(e)(4)	Corrective action measures under this paragraph may be terminated once the concentration of hazardous constituents under §264.93 is reduced to levels below their respective concentration limits under §264.94.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(f)	The owner/operator must continue corrective action measures during the compliance period to the extent necessary to ensure that the ground-water protection standard is not exceeded. If the owner or operator is conducting corrective action at the end of the compliance period, he must continue that corrective action for as long as necessary to achieve compliance with the ground-water protection standard. The owner/operator may terminate corrective action measures taken beyond the period equal to the active life of the waste management area (including the closure period) if he can demonstrate, based on data from the ground-water monitoring program under paragraph (d) of this section, that the ground-water protection standard of §264.92 has not been exceeded for a period of three consecutive years.	Corrective action measures will continue until hazardous constituent concentration limits are no longer exceeded during the period equivalent to the remaining active life of the waste management area (including closure period). If corrective action is still occurring at the end of this period, it will continue until concentration limits are no longer exceeded for 3 consecutive years.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(g)	The owner/operator must report in writing to the Secretary on the effectiveness of the corrective action program. The owner/operator must submit these reports semi-annually.	Semi-annual reports on the effectiveness of the corrective action will be provided to the Secretary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(h)	The owner/operator determines that the corrective action program no longer satisfies the requirements of this section, he must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if it is determined that this program is no longer appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.110(c)	The Secretary may replace all or part of the requirements of this subpart (and the unit-specific standards referenced in §264.111(c) applying to a regulated unit), with alternative requirements set out in a permit or enforceable document where the Secretary determines that:	See the CMS report for a general description of how the proposed corrective measure meets the closure and post-closure care requirements of 264.111 - 264.120. The approved CMI plan will describe in detail how the selected corrective measure meets closure/post-care requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA H once they are approved.	Section 5.0 of the MDA H CMS Report
§264.110(c)(1)	The regulated unit is situated among SWMUs or AOCs, a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	MDA H meets the criteria for alternative requirements because the existing land-based unit (shaft 9) is situated among SWMUs (disposal shafts 1 - 8), a release has occurred, and the origin of the release is uncertain (details provided in RFI report).	Section 2.0 of the MDA H RFI Report and Section 1.0 of the MDA H CMS Report
§264.110(c)(2)	It is not necessary to apply the closure requirements of this subpart (and those referenced herein) because the alternative requirements will protect human health and the environment and will satisfy the closure performance standard of §264.111(a) and (b).	See the CMS report for a general description of how the proposed corrective measure meets applicable closure and post-closure care requirements of §264.111 - 264.120; details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report
§264.111	Closure Performance Standard. Owner/operator must close the facility in a manner that:	This requirement refers to closure the entire facility - LANL. For MDA H only: alternative requirements specified in the CMS report and ultimately detailed in the approved CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.111(a)	Minimizes the need for further maintenance; and	For MDA H, see the CMS report for a general description of how the proposed corrective measure meets this closure requirement; details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.111(b)	Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.	For MDA H, see the CMS report for a general description of how the proposed corrective measure meets this closure requirement; details will be provided in the approved CMI Plan. Leachate is defined as any liquid including suspended components in the liquid, that has percolated through or drained from hazardous waste.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)	Closure plan must identify steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least:	The proposed corrective measure will be equivalent to a "partial closure" as defined in §260.10 for MDA H only (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.112(b)(8)).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(1)	A description of how each hazardous waste management unit at the facility will be closed in accordance with §264.111;	For MDA H, see the CMS report for a general description of how the proposed corrective measure meets this closure requirement (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.112(b)(8)); details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(2)	A description of how final closure of the facility will be conducted in accordance with §264.111. The description must identify the maximum extent of the operations which will be unclosed during the active life of the facility; and	This requirement refers to closure the entire facility - LANL. Not applicable to MDA H.	NA
§264.112(b)(3)	An estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the type(s) of the off-site hazardous waste management units to be used, if applicable; and	For MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies this closure requirement (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.112(b)(8)); details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(4)	A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard; and	For MDA H, see the CMS report for a general description of the excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure is selected, details will be provided in the approved CMI Plan following permit modification. Not applicable for containment corrective measure alternatives.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(5)	A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control; and	Final closure refers to the entire facility - LANL. For MDA H only (partial closure): alternative requirements specified in the CMS report and ultimately detailed in the approved CMI plan will satisfy closure performance standards in accordance with alternative requirements of §264.90(f), 264.110(c) and 264.112(b)(8).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(6)	A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover must be included.)	For MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies this closure requirement. A schedule for implementing the selected corrective measure (that meets the intent of this closure requirement in accordance with alternative requirements §264.90(f), 264.110(c) and 264.112(b)(8)) will be included in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(7)	For facilities that use trust funds to establish financial assurance under §264.143 or §264.145 and that are expected to close prior to the expiration of the permit, an estimate of the expected year of final closure.	NA	NA
§264.112(b)(8)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §264.90(f), §264.110(d), and/or §264.140(d), either the alternative requirements applying to the regulated unit, or a reference to the enforceable document containing those alternative requirements.	For MDA H, see the CMS report for a general description of how the proposed corrective measure meets closure and post-closure care requirements. The approved CMI plan will describe in detail how the selected corrective measure meets closure/post-care requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA H once they are approved.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(c)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan in accordance with the applicable procedures in parts 124 and 270. The written notification or request must include a copy of the amended closure plan for review or approval by the Secretary.	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the closure plan at any time prior to the notification of partial or final closure of the facility.	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(2)(i)	Changes in operating plans or facility design affect the closure plan, or	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(c)(2)(ii)	There is a change in the expected year of closure, if applicable, or	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(2)(iii)	In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or § 264.140(d)	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(3)	The owner/operator must submit a written request for a permit modification including a copy of the amended closure plan for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the owner/operator must request a permit modification no later than 30 days after the unexpected event. An owner/operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to prepare a contingent closure plan under §264.228(c)(1)(i) or §264.258(c)(1)(i), must submit an amended closure plan to the Secretary no later than 60 days from the date that the owner/operator or the Secretary determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §264.310, or no later than 30 days from that date if the determination is made during partial or final closure. The Secretary will approve, disapprove, or mo	This requirement refers to closure the entire facility - LANL. Not applicable to MDA H.	NA
§264.112(c)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.112(c)(2). The owner/operator must submit the modified plan within 60 days of the Secretary's request, or within 30 days if the change in facility conditions occurs during partial or final closure. Any modifications requested by the Secretary will be approved in accordance with the procedures in parts 124 and 270	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(d)	Notification of partial closure and final closure.		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(d)(1)	Owner/operator must notify Secretary in writing at least 60 days prior to the date on which he expects to begin closure of a surface impoundment, waste pile, land treatment or landfill unit, or final closure of a facility with such a unit. Owner/operator must notify the Secretary in writing at least 45 days prior to the date on which he expects to begin final closure of a facility with only treatment or storage tanks, container storage, or incinerator units to be closed. Owner/operator must notify the Secretary in writing at least 45 days prior to the date on which he expects to begin partial or final closure of a boiler or industrial furnace, whichever is earlier	For MDA H, the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(d)(2)	The date when it "expects to begin closure" must be either:	For MDA H, the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(d)(2)(i)	No later than 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional hazardous wastes, no later than one year after the date on which the unit received the most recent volume of hazardous wastes. If the owner/operator of a hazardous waste management unit can demonstrate to the Secretary that the hazardous waste management unit or facility has the capacity to receive additional hazardous wastes and it has taken all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit; or	For MDA H, the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(d)(2)(ii)	For units meeting the requirements of §264.113(d), no later than 30 days after the date on which the hazardous waste management unit receives the known final volume of non-hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional non-hazardous wastes, no later than one year after the date on which the unit received the most recent volume of non-hazardous wastes. If the owner/operator can demonstrate to the Secretary that the hazardous waste management unit has the capacity to receive additional non-hazardous wastes and it has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit.	NA	NA
§264.112(d)(3)	If the facility's permit is terminated, or if the facility is otherwise ordered, by judicial decree or final order under section 3008 of RCRA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the owner/operator must close the facility in accordance with the deadlines established in §264.113	NA	NA
§264.112(e)	Nothing in this section shall preclude the owner/operator from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure	NA	NA
§264.113	Closure; Time allowed for closure		
§264.113(a)	Within 90 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner/operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at a hazardous waste management unit or facility, the owner/operator must treat, remove from the unit or facility, or dispose of on-site, all hazardous wastes in accordance with the approved closure plan. The Secretary may approve a longer period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(a)(1)(i)	The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; or	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(a)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(a)(1)(ii)(B)	There is a reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(a)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(a)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements.	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)	The owner/operator must complete partial and final closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner or operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at the hazardous waste management unit or facility. The Secretary may approve an extension to the closure period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)(1)(i)	The partial or final closure activities will, of necessity, take longer than 180 days to complete; or	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)(1)(ii)(B)	There is reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(b)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit or facility, including compliance with all applicable permit requirements	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(c)	The demonstrations referred to in paragraphs (a)(1) and (b)(1) of this section must be made as follows:	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(c)(1)	The demonstrations in paragraph (a)(1) of this section must be made at least 30 days prior to the expiration of the 90-day period in paragraph (a) of this section; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(c)(2)	The demonstration in paragraph (b)(1) of this section must be made at least 30 days prior to the expiration of the 180-day period in paragraph (b) of this section, unless the owner/operator is otherwise subject to the deadlines in paragraph (d) of this section.	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(d)	The Secretary may allow an owner/operator to receive only non-hazardous wastes in a landfill, land treatment, or surface impoundment unit after the final receipt of hazardous wastes at that unit if:	NA	NA
§264.113(d)(1)	The owner/operator requests a permit modification in compliance with all applicable requirements in parts 270 and 124 of this title and in the permit modification request demonstrates that:	NA	NA
§264.113(d)(1)(i)	The unit has the existing design capacity as indicated on the part A application to receive non-hazardous wastes; and	NA	NA
§264.113(d)(1)(ii)	There is a reasonable likelihood that the owner or operator or another person will receive non-hazardous wastes in the unit within one year after the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(1)(iii)	The non-hazardous wastes will not be incompatible with any remaining wastes in the unit, or with the facility design and operating requirements of the unit or facility under this part; and	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(d)(1)(iv)	Closure of the hazardous waste management unit would be incompatible with continued operation of the unit or facility; and	NA	NA
§264.113(d)(1)(v)	The owner/operator is operating and will continue to operate in compliance with all applicable permit requirements; and	NA	NA
§264.113(d)(2)	The request to modify the permit includes an amended waste analysis plan, ground-water monitoring and response program, human exposure assessment required under RCRA section 3019, and closure and post-closure plans, and updated cost estimates and demonstrations of financial assurance for closure and post-closure care as necessary and appropriate, to reflect any changes due to the presence of hazardous constituents in the non-hazardous wastes, and changes in closure activities, including the expected year of closure if applicable under § 264.112(b)(7), as a result of the receipt of non-hazardous wastes following the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(3)	The request to modify the permit includes revisions, as necessary and appropriate, to affected conditions of the permit to account for the receipt of non-hazardous wastes following receipt of the final volume of hazardous wastes; and	NA	NA
§264.113(d)(4)	The request to modify the permit and the demonstrations referred to in paragraphs (d)(1) and (d)(2) of this section are submitted to the Secretary no later than 120 days prior to the date on which the owner/operator of the facility receives the known final volume of hazardous wastes at the unit, or no later than 90 days after the effective date of this rule in the state in which the unit is located, whichever is later.	NA	NA
§264.113(e)	Requirements for the owner/operator of a hazardous waste surface impoundment that is not in compliance with the liner and leachate collection system requirements.	NA	NA
§264.114	During the partial and final closure periods, all contaminated equipment, structures and soils must be properly disposed of or decontaminated unless otherwise specified in §§ 264.197, 264.228, 264.258, 264.280 or § 264.310. By removing any hazardous wastes or hazardous constituents during partial and final closure, the owner/operator may become a generator of hazardous waste and must handle that waste in accordance with all applicable requirements of part 262 of this chapter	For MDA H, see the CMS report for a general description of the excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure alternative is selected, details will be provided in the approved CMI Plan following permit modification. Not applicable for the containment corrective measure alternatives.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.115	Within 60 days of completion of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill unit, and within 60 days of the completion of final closure, the owner/operator must submit to the Secretary, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for closure under §264.143(i).	Final closure refers to the entire facility - LANL. For MDA H only (partial closure): alternative requirements specified in the CMS report and ultimately detailed in the approved CMI plan will satisfy closure performance standards. Corrective measure implementation requirements specify that the owner/operator conduct inspections, reviews and acceptance testing in accordance with the construction quality assurance plan and submit routine progress reports to the Secretary. Corrective measure implementation requirements also dictate that the owner/operator prepare a corrective measure completion report that includes all supporting documentation confirming that the corrective measure was successfully implemented. This report must be certified by an independent professional(s) skilled in the appropriate discipline(s) and submitted to the Secretary See the CMS report for a general description of the how the corrective measure certification meets the intent of this closure requirement. The approved CMI plan will contain a detailed description of the certification process and criteria.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.116	No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary, a survey plat indicating the location and dimensions of landfills cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable subpart G regulations.	For MDA H - this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable). A survey plat prepared in accordance with 264.116 will be provided in the CMI completion report.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117	Post-closure care and use of property		Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117(a)(1)	Post-closure care for each hazardous waste management unit subject to the requirements of §§ 264.117 through 264.120 must begin after completion of closure of the unit and continue for 30 years after that date and must consist of at least the following:	This requirement applies to the containment corrective measure alternatives for MDA H. Activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(a)(1)(i)	Monitoring and reporting in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	This requirement applies to the containment corrective measure alternatives for MDA H. Activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117(a)(1)(ii)	Maintenance and monitoring of waste containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part.	For the containment corrective measure alternatives for MDA H, maintenance activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.) A description of the waste containment system monitoring systems are provided above in the Comment/Implementation of HSWA Activities column for Subpart F (§264.90 - 264.100 implemented through alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117(a)(2)	Any time preceding partial closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period for a particular unit, the Secretary may, in accordance with the permit modification procedures in parts 124 and 270:	This requirement applies to the containment corrective measure alternatives for MDA H. Activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117(a)(2)(i)	Shorten the post-closure care period applicable to the hazardous waste management unit, or facility, if all disposal units have been closed, if he finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or ground-water monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit or facility is secure); or	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(a)(2)(ii)	Extend the post-closure care period applicable to the hazardous waste management unit or facility if he finds that the extended period is necessary to protect human health and the environment (e.g., leachate or ground-water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment).	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(b)	The Secretary may require, at partial and final closure, continuation of any of the security requirements of §264.14 during part or all of the post-closure period when:	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(b)(1)	Hazardous wastes may remain exposed after completion of partial or final closure; or	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(b)(2)	Access by the public or domestic livestock may pose a hazard to human health.	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(c)	Post-closure use of property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the facility's monitoring systems, unless the Secretary finds that the disturbance:	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(c)(1)	Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(c)(2)	Is necessary to reduce a threat to human health or the environment.	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(d)	All post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in §264.118.	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f) and 264.110(c)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved MDA H CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118	Post-Closure Plan, Amendment of Plan	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)	For each hazardous waste management unit subject to the requirements of this section, the post-closure plan must identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least:	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(1)	A description of the planned monitoring activities and frequencies at which they will be performed to comply with subparts F, K, L, M, N, and X of this part during the post-closure care period; and	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.) A description of the planned monitoring activities and frequencies at which they will be performed is provided above in the Comment/Implementation of HSWA Activities column for Subpart F (264.90 - 264.100 implemented through alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(2)	A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure:	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(b)(2)(i)	The integrity of the cap and final cover or other containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(2)(ii)	The function of the monitoring equipment in accordance with the requirements of subparts, F, K, L, M, N, and X of this part; and	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(3)	The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure care period.	The name, address, and phone number of the office to contact about MDA H during the CMS/CMI period is: the U.S. Department of Energy, National Nuclear Security Administration, Office of Los Alamos Site Operations, 528 35th Street, Los Alamos, NM, 87544, (505) 667-5105.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(4)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §§264.90(f), 264.110(c), and/or §264.140(d), either the alternative requirements that apply to the regulated unit, or a reference to the enforceable document containing those requirements.	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(c)	Until final closure of the facility, a copy of the approved post-closure plan must be furnished to the Secretary upon request, including request by mail. After final closure has been certified, the person or office specified in §264.188(b)(3) must keep the approved post-closure plan during the remainder of the post-closure period.	For MDA H, this requirement will be completed as part of the CMS/CMI corrective action process, (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). See CMS the report for a general description of how these requirements will met; details will be provided in the approved CMI plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(d)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan in accordance with the applicable requirements in parts 124 and 270. The written notification or request must include a copy of the amended post-closure plan for review or approval by the Secretary.	Any significant change to the approved selected corrective measure, including post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv). See CMS the report for a general description of how these requirements will met; details will be provided in the approved CMI plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(d)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period.	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)(i)	Changes in operating plans or facility design affect the approved post-closure plan, or	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)(ii)	There is a change in the expected year of final closure, if applicable, or	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)(iii)	Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan.	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d).	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(d)(3)	The owner/operator must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan. An owner/operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to submit a contingent post-closure plan under §264.228(c)(1)(ii) and §264.258(c)(1)(ii) must submit a post-closure plan to the Secretary no later than 90 days after the date that the owner or operator or the Secretary determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §264.310. The Secretary will approve, disapprove or modify this plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved post-closure plan will become a permit condition.	Any significant change to the approved selected corrective measure, including post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv). See CMS the report for a general description of how these requirements will met; details will be provided in the approved CMI plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan and future request for mod. of enforceable document
§264.118(d)(4)	The Secretary may request modifications to the plan under the conditions described in §264.118(d)(2). The owner/operator must submit the modified plan no later than 60 days after the Secretary's request, or no later than 90 days if the unit is a surface impoundment or waste pile not previously required to prepare a contingent post-closure plan. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in parts 124 and 270.	The Secretary will always have the authority to change the approved CMI plan and post-CMI requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.119(a)	No later than 60 days after certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the owner/operator must identify the type, location, and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records it has kept	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)	Within 60 days of certification of closure of the first hazardous waste disposal unit and within 60 days of certification of closure of the last hazardous waste disposal unit, the owner/operator must:	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.119(b)(1)	Record, in accordance with State law, a notation on the deed to the facility property -- or on some other instrument which is normally examined during title search -- that will in perpetuity notify any potential purchaser of the property that:	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)(1)(i)	The land has been used to manage hazardous wastes; and	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)(1)(ii)	Its use is restricted under 40 CFR subpart G regulations; and	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)(1)(iii)	The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the facility required by §264.116 and §264.119(a) have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Secretary; and	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)(2)	Submit a certification, signed by the owner/operator, that he has recorded the notation specified in paragraph (b)(1) of this section, including a copy of the document in which the notation has been placed, to the Secretary.	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(c)	If the owner/operator or any subsequent owner/operator of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes and hazardous waste residues, the liner, if any, or contaminated soils, it must request a modification to the post-closure permit in accordance with the applicable requirements in parts 124 and 270. The owner/operator must demonstrate that the removal of hazardous wastes will satisfy the criteria of §264.117(c). By removing hazardous waste, the owner/operator may become a generator of hazardous waste and must manage it in accordance with all applicable requirements of this chapter. If it is granted a permit modification or otherwise granted approval to conduct such removal activities, the owner/operator may request that the Secretary approve either:	This is a facility-wide permit requirement not specifically addressed in a CMS report or CMI plan for a specific site at the facility.	NA
§264.119(c)(1)	The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or	This is a facility-wide permit requirement not specifically addressed in a CMS report or CMI plan for a specific site at the facility.	NA
§264.119(c)(2)	The addition of a notation to the deed or instrument indicating the removal of the hazardous waste	This is a facility-wide permit requirement not specifically addressed in a CMS report or CMI plan for a specific site at the facility.	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.120	No later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the owner/operator must submit to the Secretary, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification must be signed by the owner/operator and an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for post-closure care under §264.145(i).	This is a facility-wide permit requirement not specifically addressed in a CMS report or CMI plan for a specific site at the facility.	NA
§264.310	Closure and post-closure care for landfills/landfill cells	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)	At final closure of the landfill or upon closure of any cell, the owner/operator must cover the landfill or cell with a final cover designed and constructed to:	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)(1)	Provide long-term minimization of migration of liquids through the closed landfill;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310(a)(2)	Function with minimum maintenance;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)(3)	Promote drainage and minimize erosion or abrasion of the cover;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)(4)	Accommodate settling and subsidence so that the cover's integrity is maintained; and	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)(5)	Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(b)	After final closure, the owner/operator must comply with all post-closure requirements contained in §264.117 through §264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under §264.117). The owner/operator must:	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310(b)(1)	Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(b)(2)	Continue to operate the leachate collection and removal system until leachate is no longer detected;	NA - construction of all shafts at MDA commenced well before July 29, 1992 per 264.301(a) and (c) and 265.301(a).	NA
§264.310(b)(3)	Maintain and monitor the leak detection system in accordance with § 264.301(c)(3)(iv) and (4) and §264.303(c), and comply with all other applicable leak detection system requirements of this part;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(b)(4)	Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of subpart F of this part;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(b)(5)	Prevent run-on and run-off from eroding or otherwise damaging the final cover; and	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310(b)(6)	Protect and maintain surveyed benchmarks used in complying with §264.309.	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

CERTIFICATION

I certify under penalty of law that this document and attachment were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
Operator

4/25/02
Date Signed

E. Dennis Martinez
Acting Director
U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
Owner/Operator

4/25/02
Date Signed