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DEPARTMENT OF ENERGY
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

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NMED Hazardous
Waste Bureau

John E. Kieling, Program Manager
Permits Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, New Mexico 87505-6303

Dear Mr. Kieling,

Subject: Closure Certification Report for the Technical Area 54, Area L Storage Shafts 36 and 37 Container Storage Unit, Los Alamos National Laboratory (LANL) EPA Hazardous Waste Identification Number NM 0890010515

The purpose of this letter is to submit the attached closure report for the Storage Shafts 36 and 37 Container Storage Unit located at Technical Area 54, Area L. Closure of the unit was performed in accordance with the "Los Alamos National Laboratory Technical Area 54, Area L, Storage Shafts 36 and 37 Closure Sampling and Analysis Plan," which was submitted to the New Mexico Environment Department Hazardous Waste Bureau on April 21, 2005.

The closure report contains a description of the closure activities for the unit. The lead stringer waste stored in the unit was removed and shipped off-site to Envirocare of Utah for disposal. Decontamination of each shaft was achieved by removal of all additional waste residuals, dust, and debris at the base of each shaft using a high-capacity vacuum unit equipped with high-efficiency particulate air filtration. Surface wipe samples were collected from the floor and walls of each shaft and analyzed to verify decontamination. A human health risk assessment was performed and residual levels of waste lead residues on the interior of each shaft demonstrated no unacceptable risk to human health or the environment. The report also contains certifications by facility representatives and an independent registered professional engineer as required by 20.4.1.500 NMAC, incorporating 40 CFR §265.115.

This submittal includes three copies of the certification report and an electronic copy on an enclosed compact disk. Should you have any questions regarding this subject, please call me at (505) 667-5794 or Jack Ellvinger of LANS, at (505) 667-0633.

RECEIVED
SEP 11 2007
By ___

Sincerely,

Gene E. Turner
Environmental Permitting Manager

EO: 2GT-023

cc:
James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
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September 2006

Los Alamos National Laboratory Closure Certification Report for the Technical Area 54, Area L, Storage Shafts 36 and 37 Container Storage Unit

Revision 0.0

Prepared by:

Los Alamos National Laboratory
Environmental Protection Division – Water Quality and RCRA Group
Los Alamos, New Mexico 87545

LOS ALAMOS NATIONAL LABORATORY
CLOSURE CERTIFICATION REPORT
FOR THE TECHNICAL AREA 54, AREA L,
STORAGE SHAFTS 36 AND 37 CONTAINER STORAGE UNIT

REVISION 0.0

Facility ID No.:	NM0890010515
Facility Name:	Los Alamos National Laboratory
Facility Address:	Los Alamos National Laboratory P.O. Box 1663 Los Alamos, New Mexico 87545
Legal Owner:	U.S. Department of Energy
Legal Operators:	U.S. Department of Energy Los Alamos Site Office 528 35th Street Los Alamos, New Mexico 87544
	Los Alamos National Security, LLC 4200 West Jemez Road, Suite 4000 Los Alamos, New Mexico 87545
Contact Person:	Gene E. Turner Environmental Permitting Manager Los Alamos Site Office National Nuclear Security Administration U.S. Department of Energy
Date:	September 2006

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ACRONYMS AND ABBREVIATIONS

µg/dL	micrograms per deciliter
µg/L	micrograms per liter
µg/100 cm^2	micrograms per 100 square centimeters
ALARA	as low as reasonably achievable
cm	centimeter
CSU	Container Storage Unit
DTSC	California Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
HHRA	human health risk assessment
HWB	Hazardous Waste Bureau
LANL	Los Alamos National Laboratory
mL	milliliter(s)
MLLW	mixed low-level waste
NIOSH	National Institute of Occupational Safety and Health
20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
NMED	New Mexico Environment Department
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
TA	technical area
TCLP	Toxicity Characteristic Leaching Procedure

EXECUTIVE SUMMARY

This report summarizes activities performed to meet Resource Conservation and Recovery Act closure requirements for the Storage Shafts 36 and 37 Container Storage Unit (CSU) located in Area L at Technical Area 54 at Los Alamos National Laboratory (LANL). Closure of the Storage Shafts CSU was performed in accordance with the "Los Alamos National Laboratory Technical Area 54, Area L, Storage Shafts 36 and 37 Closure Sampling and Analysis Plan" (SAP) (LANL, 2005), which was submitted to the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) on April 21, 2005. The SAP presented descriptions of the site and unit, the unit's operational history, waste removal, SAP objectives and scope, and decontamination demonstration criteria. It also presented information on previous site characterization, the investigation approach, sampling and analysis procedures, waste management, and the proposed schedule of closure activities. The SAP was prepared in accordance with the conditions contained in the most recent LANL permit renewal applications submitted to the NMED. A copy of the SAP and the submittal letter are included in this report as Attachment A. Because the SAP lacks formal approval by NMED, closure activities were performed at risk. These activities and results were discussed with NMED HWB representatives during the course of closure activities.

Decontamination of each shaft was achieved by removal of all additional dust and debris at the base of each shaft using a high-capacity vacuum unit equipped with high-efficiency particulate air filtration. Surface wipe (swipe) samples were collected from the floor and walls of each shaft and analyzed for total lead to verify decontamination. A human health risk assessment was performed, and residual levels of waste lead residues on the interior of each shaft demonstrated no unacceptable risk to human health or the environment.

LOS ALAMOS NATIONAL LABORATORY CLOSURE CERTIFICATION REPORT FOR THE TECHNICAL AREA 54, AREA L, STORAGE SHAFTS 36 AND 37 CONTAINER STORAGE UNIT

1.0 INTRODUCTION

This closure certification report summarizes the activities performed to meet Resource Conservation and Recovery Act (RCRA) interim status closure requirements for the Storage Shafts 36 and 37 Container Storage Unit (CSU) located in Area L at Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) (Figures 1 and 2). The closure activities described in this report will minimize the need for further maintenance, preclude the release of hazardous constituents to environmental media, and protect human health in accordance with the closure performance standards specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart VI, Part 265, Subpart G [10-1-03].

The Storage Shafts CSU was operated as an interim status mixed (hazardous and radioactive component) waste storage unit, and was used solely to provide radioactively-shielded storage for seven waste "stringers" between 1986 and 2004. The hollow steel stringers were originally designed and used to push targets in and out of the TA-53 linear accelerator beam line for radioisotope research. The lower end cavity of the hollow steel was filled with cement, sand, and lead shot; therefore, the stringer wastes were characterized as mixed low-level waste (MLLW) bearing the toxicity characteristic for lead (U.S. Environmental Protection Agency [EPA] Hazardous Waste Number D008).

The stringer wastes were removed in September 2004 and disposed of as MLLW at Envirocare of Utah. The approach of the LANL "Site Treatment Plan" (LANL, 2002) deadline for final disposition of the lead stringer waste and absence of further plans for continued mixed waste storage in the Storage Shafts CSU supported the decision to proceed with closure prior to issuance of LANL's renewed Hazardous Waste Facility Permit. Some remaining debris (e.g., miscellaneous steel pieces, a discarded wrench, and dust/dirt that had accumulated during storage) was also removed in April and July 2005; the removed debris was characterized as nonhazardous low-level radioactive waste and will be disposed of at TA-54, Area G.

A detailed description of the Storage Shafts CSU, its operational history, and the lead stringer wastes is presented in the "Los Alamos National Laboratory Technical Area 54, Area L, Storage Shafts 36 and 37 Closure Sampling and Analysis Plan" (SAP) (LANL, 2005), provided herein as Attachment A. Section 2.0 of this report includes a description of the closure activities, results of sampling and analysis, details regarding disposition of waste generated during closure activities, variances from the SAP, location of supporting documentation, and a discussion of quality assurance (QA) and quality control (QC). Section 3.0 presents the risk assessment conducted to demonstrate clean closure, and Section 4.0 discusses conclusions. Section 5.0 includes the certification of the accuracy of this report and the independent registered professional engineer's certification.

2.0 CLOSURE PERFORMANCE

2.1 Closure Activities

Closure activities for the Storage Shafts CSU were conducted in two phases. Phase I began in September 2004 and consisted of removal of the lead stringers and miscellaneous debris; these activities are documented in Attachment A of the SAP. Phase II began in August 2005 and consisted of final removal of the remaining dust and debris, collecting surface wipe samples from the interior of each shaft, and disposition of the remaining dust and debris. The rationale for limiting decontamination verification to lead wipe sampling, as discussed with New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) representatives, includes the limited waste in storage (with lead as the only hazardous waste component), limited waste management operations with no off-normal events, engineered isolation from surroundings, and no significant degradation of the stringer wastes. Phase II closure activities were performed in accordance with the SAP, except as noted in Section 2.2 of this report. The following provides a description of the Phase II closure activities.

2.1.1 Remaining Dust and Debris Removal

All remaining dust and debris were removed on August 18, 2005, using a high-capacity vacuum unit equipped with high-efficiency particulate air filtration. The vacuum operation also served as a means of decontamination. Pictures of this activity were taken and are provided herein as Photographs 1 through 4. Photographs 2 and 4 show the concrete bottoms of Storage Shafts 36 and 37, respectively, after vacuuming was completed.

2.1.2 Surface Wipe Sampling

After the final removal of dust and debris, surface wipe samples were collected from the floor and walls of each shaft to verify decontamination by demonstrating there are no significant concentrations of residual lead in the storage shafts, or that residual levels of waste residues do not present a potential hazard to on-site workers or for post-closure escape to the environment. Wipe sampling, conducted in accordance with the National Institute of Occupational Safety and Health (NIOSH) *Manual of Analytical Methods*, Method 9100 (NIOSH, 1996), was performed on August 18, 2005.

The SAP called for each shaft to be sampled in three locations that were most likely to have come in contact with the stringers or to have collected waste residues (one from the floor, one within one foot of the bottom, and one at approximately 26 feet above the bottom, for a total of three samples per shaft). However, nine samples were collected from each shaft to better represent the shaft interior surfaces; three samples were collected from the bottom of each shaft, three samples were collected within one foot of the bottom, and three samples were collected at approximately 26 feet above the bottom. Samples collected at each depth were located at the 2, 6, and 10 o'clock positions when facing west. Photograph 5 shows surface wipe sample preparation during the closure sampling activity at Storage Shafts 36 and 37.

As described in the SAP, surface wipe sampling was to be performed from the top of the shafts using long handles or poles to alleviate the need to enter the shafts. However, upon using this procedure, the poles proved to be too unwieldy to meet the requirements of the NIOSH sampling method. Thus, each wipe was affixed with tape to a sledge hammer, and the sledge hammer, attached to a rope, was lowered to each sampling location. The hammer provided sufficient mass to effectively press the wipe against the sampled surface and better control of the sampling location. The hammer was decontaminated in between each sample collection and at the end of the sampling process by spraying/wiping with Fantastik®, rinsing with distilled water, and wiping dry with clean towels. In addition to wipe samples collected at each shaft, a blank from the wipe solution and an equipment rinsate blank were also collected. A field duplicate sample was not collected, as stated in the SAP, because this would have required collecting two samples from the same location. Such sampling is contraindicated by the NIOSH wipe sampling method, which requires wiping an area to collect a sample; thus, collection of a field duplicate would not have yielded useful analytical results or met the acceptance criteria for field duplicates. Sample handling and documentation was performed as described in Section 4.4 of the SAP.

Each surface wipe sample was submitted to Severn Trent Laboratories, Inc., in Earth City, MO, for total lead analysis using EPA's *SW-846* Method 6020 (EPA, 1986a). This laboratory meets the requirements contained in Section 4.5.2 of the SAP. Table 1 provides a summary of analytical results for the surface wipe samples, and the wipe sampling data are included herein as Attachment B. Results in Table 1 are provided in units of both micrograms per liter (µg/L) and micrograms per 100 square centimeters (µg/100 cm^2). Results received from the analytical laboratory are in µg/L and represent the concentration of lead extracted from the wipe into an extract solution. The volume of the extract solution was 100 milliliters (mL), and the lead in this 100 mL solution represents the total lead obtained from a surface wipe sample over a 100 cm^2 surface area. To convert from µg/L (or µg/1000 mL) to µg/100 cm^2, the numerical analytical laboratory result was divided by 10.

Because the wipe sampling results exceeded the target detection limit of 2 micrograms of lead per sample (2 µg/100 cm^2), a decontamination verification goal in Table 1 of the SAP, a risk-based analysis was performed to demonstrate successful decontamination, in accordance with Criterion 4 in Section 1.5 of the SAP. The risk assessment modeling is described in Section 3.0 of this report.

2.1.3 Dust and Debris Sampling

Dust and debris removed from the bottom of each shaft during two previous vacuuming efforts were sampled and analyzed for lead using the Toxicity Characteristic Leaching Procedure (TCLP) for waste characterization purposes. One sample was collected from Storage Shaft 36, and one sample was collected from Storage Shafts 36 and 37 combined. Both were analyzed for lead using TCLP, and both TCLP analyses were non-detect. The dust and debris waste characterization data are summarized in Table 2 and provided herein as Attachment C. The nonhazardous low-level dust and debris waste is scheduled to be disposed of at TA-54, Area G.

2.1.4 Waste Management

Wastes generated as a result of Phase II closure activities (i.e., dust and debris, equipment decontamination rinsate, absorbent cloths, and personal protective equipment [PPE]) were managed and disposed of in accordance with LANL waste management procedures, as required by the SAP. As discussed in Section 2.1.3, dust and debris waste was characterized as nonhazardous low-level radioactive waste and will be disposed of at TA-54, Area G. The entire volume of equipment decontamination rinsate was consumed during analysis. Disposable sampling equipment used (i.e., absorbent cloths, PPE) was placed with the dust and debris waste and will be disposed of at TA-54, Area G.

2.2 Variances from the Sampling and Analysis Plan

RCRA closure of the Storage Shafts 36 and 37 CSU was performed in accordance with the SAP, with the exception of the following variances:

- SAP, Section 4.1, Sampling Approach: Although the SAP indicated that sampling activities would be conducted to verify that lead waste residuals are not present on the interior surfaces of the Storage Shafts CSU in significant concentrations or, if necessary, to form the basis for a risk assessment, it did not specify procedures or methods for the performance of a human health risk assessment (HHRA) using surface wipe sample results that exceeded the target detection limit for wipe samples. An HHRA was conducted for the maximum detected concentration of lead using methods developed by the EPA Technical Review Workgroup for Lead (EPA, 2003). The assessment included an evaluation of health risks to a future worker at TA-54, Area L, from exposure to airborne lead potentially released from Storage Shaft 36 or 37 interior surfaces. Results of this risk assessment are summarized in Section 3.0 and detailed in Attachment D of this report.

- SAP, Section 4.2, Swipe Sampling: The SAP stated that "Each shaft will be sampled in three locations . . . on the floor . . . one foot from the bottom . . . and approximately 26 feet above the bottom". However, nine samples were collected from each shaft to better represent the shaft interior surfaces. For each shaft, three samples were collected from the bottom, three samples were collected within one foot of the bottom, and three samples were collected at approximately 26 feet above the bottom. Samples collected at each depth were located at the 2, 6, and 10 o'clock positions when facing west.

- SAP, Section 4.2, Swipe Sampling: As described in the SAP, surface wipe (swipe) sampling was to be performed from the top of the shafts using long handles or poles to alleviate the need to enter the shafts. Upon implementation of this technique, however, the poles were too unwieldy to meet the requirements of the NIOSH sampling method. Thus, each wipe was affixed to a sledge hammer using tape, and the sledge hammer, attached to a rope, was lowered to each sampling location. The hammer provided sufficient mass to effectively press the wipe against the sampled surface and better control of the sampling location.

- SAP, Section 4.2, Swipe Sampling: The SAP stated that swipe samples will be taken in accordance with the NIOSH *Manual of Analytical Methods*, Method 9100. Method 9100 describes the use of a plastic 10 centimeter (cm) x 10 cm template to define the 100 cm^2 surface area to be sampled. A template could not be used for the shaft sampling due to the distance to the remote sampling points from the top of each shaft and the nature of the sampled surface for most of the sampling locations (corrugated metal). The appropriate sampling contact area was estimated by the sampling technician in lieu of the template.

- SAP, Section 4.5.3.1, Field Quality Control, and Table 3, Recommended Quality Control Samples, Frequency, and Acceptance Criteria: The SAP indicated that at least one duplicate QC sample would be collected. A field duplicate sample was not collected because this would have required collecting two samples from the same location. Such sampling is contraindicated by the NIOSH wipe sampling method, which requires wiping an area to collect a sample. Thus, collection of a field duplicate would not have yielded useful analytical results or met the acceptance criteria for field duplicates.

- SAP, Section 6.0, Schedule of Activities, and Table 5, Schedule of Closure Activities: The SAP, which was submitted to the NMED HWB in April 2005, proposed a schedule of closure activities. The planned schedule of activities, including submittal of closure certification, was to conclude in July 2005. The footnote to that entry, however, stated that "Closure certification submittal is subject to change depending on results of decontamination analysis and potential meetings with NMED to determine use of alternative decontamination determination criteria (Section 1.5)". Concerns with potential worker exposure to relatively high levels of radioactivity from the remaining debris in the shafts after removal of the waste delayed activities. U.S. Department of Energy "As Low as Reasonably Achievable" (ALARA) worker safety standards required LANL to develop additional radiation safety procedure documentation, which in turn drove changes to the schedule, as discussed with NMED HWB representatives.

- SAP, Table 1, Decontamination Verification Analytical Methodology for Stringer Shafts CSU: The analytical method number for surface wipe and debris samples provided in Table 1 of the SAP was listed as *SW-846* Method 7420-1. This method was removed from *SW-846* methods; thus, wipe samples were analyzed for total lead using the inductively coupled plasma-mass spectrometry technique in *SW-846* Method 6020, and dust and debris samples were analyzed for TCLP lead using the inductively-coupled plasma/atomic emission spectrometry technique in *SW-846* Method 6010B. The target detection limit for surface wipe samples provided in Table 1 of the SAP was described as 0.02 µg cm^2, which contained a typographical error and should have read 0.02 µg/cm^2.

2.3 Location of Supporting Documentation

Field logs, analytical data, chain-of-custody documentation, and waste disposal records in support of the completed closure activities at the Storage Shafts 36 and 37 CSU will be maintained by the LANL Environmental Protection Water Quality and RCRA Group.

2.4 Quality Assurance/Quality Control

QA/QC and sampling activities during closure of the Storage Shafts 36 and 37 CSU were conducted in accordance with Section 4.0 of the SAP. This included collection of field QA/QC samples (i.e., a wipe solution blank and an equipment rinsate blank) to assess the overall quality of the data and evaluate field sampling procedures and laboratory analysis. Attachment B of this document presents the analytical data and reporting limits, as well as the analytical laboratory's QC summary statement regarding the method blank, the laboratory control spike, and the batch QC matrix spike and duplicate. The data were verified and validated, as required by Section 4.5.4 of the SAP.

3.0 RISK ASSESSMENT

Proposed future use of the Storage Shafts CSU at TA-54, Area L, is classified as occupational/industrial. The constituent detection forwarded to risk assessment from sampling the interior of Storage Shafts 36 and 37 was lead at concentrations of 18.2 µg/100 cm^2 in Shaft 36 and 8.63 µg/100 cm^2 in Shaft 37. The detailed risk assessment, potential exposure pathways, and calculations are provided in Attachment D.

Risk assessment methods based on threshold values do not apply in the Storage Shafts CSU closure because lead toxicity does not exhibit a threshold for non-cancer health effects. Therefore, the California Department of Toxic Substances Control (DTSC) developed a model to evaluate exposures to lead contamination in soil. The lead assessment for this closure is based on a surface wipe model that specifically evaluates exposures to lead on surfaces as measured by surface wipe samples. The surface wipe model was developed as a modification of the DTSC model. The model estimates the lead concentration in the blood of a pregnant worker who is exposed to lead released from contaminated surfaces. The model is designed to ensure that the estimated concentrations of lead in blood of the worker and the fetus are below the goal of 10 micrograms per deciliter (µg/dL) specified in EPA guidance (EPA, 1986b and 2003) with 95 percent confidence. It is conservatively assumed in the assessment that the maximum lead concentration measured on a surface wipe sample from a shaft is representative of the entire shaft.

The results of the risk assessment indicate that estimated concentrations of lead in blood of the worker and the fetus are well below the goal of 10 µg/dL specified in EPA guidance with 95 percent confidence (EPA, 1986b and 2003). The probability that the mean concentration exceeds 10 µg/dL is approximately 0.3%. Based on this assessment, the potential risk to a future worker at TA-54, Area L, from exposure to airborne lead potentially released from Storage Shaft 36 or 37 interior surfaces is below the applicable criteria specified in EPA guidance (EPA, 1986b).

4.0 CONCLUSIONS

Analytical results from wipe sampling of the Storage Shafts 36 and 37 interior surfaces are provided in Table 1. The analytical results were above the target detection limit of 2 µg/100 cm^2; therefore, an HHRA was conducted to demonstrate clean closure in accordance with Criterion 4 of the SAP.

The HHRA, described in Section 3.0 of this report and further detailed in Attachment D, was performed for lead, the only contaminant of potential concern for the Storage Shafts CSU interior surfaces. This HHRA determined that the potential risk to future occupational site workers is below the applicable criteria specified in the EPA guidance (EPA, 1986b). Based upon the demonstration of closure provided in Table 1 and the results of the HHRA, this closure certification report concludes that the Storage Shafts 36 and 37 CSU is closed in accordance with the SAP.

5.0 CERTIFICATIONS

5.1 Certification of Accuracy

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 gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title: Los Alamos National Laboratory
Closure Certification Report for the Technical Area 54, Area L, Storage Shafts 36 and 37 Container Storage Unit
Revision 0.0

Richard S. Watkins — Date: 10/18/06
Associate Director
Associate Directorate Environment, Safety, Health, & Quality
Los Alamos National Laboratory
Operator

Gene Turner for
Edwin L. Wilmot — Date: 10/19/06
Manager, Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy
Owner/Operator

5.2 Independent Registered Professional Engineer's Certification

This certification was prepared in accordance with generally accepted professional engineering principles and practice pursuant to the requirements of 20.4.1 NMAC, Subpart VI, §265.115 [10-1-03], for an independent registered professional engineer's certification. These services have been performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions at the same time and in the same manner or in a similar locality. No other warranty is either expressed or implied. The finding and certification are based on 1) reviewing the SAP dated April 2005; 2) discussion with Waste Services Division field representatives and PeaK Technical Consulting, Inc., personnel who were present during closure decontamination and sampling activities; 3) observing Phase II closure activity photographs; 4) reviewing analytical results; and 5) reviewing the risk assessment.

With the signature and seal below, I certify that, except for the variances presented in Section 2.2, the closure of the Storage Shafts 36 and 37 CSU at TA-54, Area L, was conducted in accordance with the SAP. The information presented in this report is, to the best of my knowledge and belief, true, accurate, and complete.

Respectfully,

Adelante Consulting, Inc.

CHARLES J. ENGLISH, JR.
NEW MEXICO
17350
LICENSED PROFESSIONAL ENGINEER

9-12-06

Charles J. English, Jr.
New Mexico Registered Professional Engineer No. 17350
Expires December 31, 2006

Date:

6.0 REFERENCES

EPA, 2003, *Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil*, (EPA-540-R-01-001), Technical Review Workgroup for Lead, Final (December 1996), January.

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EPA, 1986b, *Air Quality Criteria for Lead, Volumes I-IV*, (EPA 600/8-83-028 a-d), Environmental Criteria and Assessment Office, Office of Research and Development, Research Triangle Park, North Carolina.

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NIOSH, 1996, National Institute of Occupational Safety and Health *Manual of Analytical Methods*, Fourth Edition, May 15, 1996.

TABLES

Table 1

Summary of Decontamination Verification Surface Wipe Sampling Analytical Data for the Storage Shafts 36 and 37 Container Storage Unit [a]

Sample ID	Sample Number	Sample Location	Total Lead Result (µg/L)	Reporting Limit (µg/L)	Total Lead Result (µg/100 cm²)	Decontamination Criterion Met [b]
LPB36-00-02	001	Shaft 36, floor, 2 o'clock,	5.9	3.0	0.59	#4
LPB36-00-06	002	Shaft 36, floor, 6 o'clock	22.0	3.0	2.2	#4
LPB36-00-10	003	Shaft 36, floor, 10 o'clock	5.4	3.0	0.54	#4
LPB36-01-02	004	Shaft 36, 1 foot, 2 o'clock	182	3.0	18.2	#4
LPB36-01-06	005	Shaft 36, 1 foot, 6 o'clock	175	3.0	17.5	#4
LPB36-01-10	006	Shaft 36, 1 foot, 10 o'clock	29.4	3.0	2.94	#4
LPB36-26-02	007	Shaft 36, 26 foot, 2 o'clock	16.2	3.0	1.62	#4
LPB36-26-06	008	Shaft 36, 26 foot, 6 o'clock	27.6	3.0	2.76	#4
LPB36-26-10	009	Shaft 36, 26 foot, 6 o'clock	27.7	3.0	2.77	#4
LPB36-36-B	010	Shaft 36, surface wipe blank	1.1 B [c]	3.0	0.11	#4
LPB37-00-02	011	Shaft 37, floor, 2 o'clock	41.3	3.0	4.13	#4
LPB37-00-06	012	Shaft 37, floor, 6 o'clock	86.3	3.0	8.63	#4
LPB37-00-10	013	Shaft 37, floor, 10 o'clock	38.2	3.0	3.82	#4
LPB37-01-02	014	Shaft 37, 1 foot, 2 o'clock	14.3	3.0	1.43	#4
LPB37-01-06	015	Shaft 37, 1 foot, 6 o'clock	2.2 B [c]	3.0	0.22	#4
LPB37-01-10	016	Shaft 37, 1 foot, 10 o'clock	9.9	3.0	0.99	#4
LPB37-26-02	017	Shaft 37, 26 foot, 2 o'clock	6.4	3.0	0.64	#4
LPB37-26-06	018	Shaft 37, 26 foot, 6 o'clock	48.4	3.0	4.84	#4
LPB37-26-10	019	Shaft 37, 26 foot, 10 o'clock	24.3	3.0	2.43	#4
LPB37-RB	020	Equipment rinsate	18.1	3.0	1.81	#4

a With the exception of Sample Number 020, all samples were surface wipe samples collected on August 18, 2005. Sample Number 020 was the equipment rinsate blank. All analyses were performed using *SW-846* Method 6020 Inductively-Coupled Plasma/Mass Spectrometry.

b Decontamination Criterion #4, presented in Section 1.5 of the SAP (LANL, 2005) is "Detectable concentrations of RCRA-regulated constituents that cannot be removed or decontaminated to acceptable levels . . . will be allowed to remain provided that these constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED." The presence of analytical results above the target detection limit of 2 µg/100 cm^2 resulted in the conservative use of a risk assessment for the highest reported lead concentrations in each shaft to demonstrate clean closure in accordance with Criterion #4 of the SAP.

c B = Estimated result. Result is less than reporting limit.

Table 2

Summary of Dust and Debris Waste Characterization Analytical Data for the Storage Shafts 36 and 37 Container Storage Unit

Sample ID	Dust and Debris Sample Location	Sample Collection Date	TCLP Lead Result [a]	Reporting Limit
10460-M	Storage Shaft 36	10/26/04	Not Detected (ND)	250 µg/L
HV10460-M2	Storage Shafts 36 and 37	2/10/05	ND	250 µg/L

[a] Toxicity Characteristic Leaching Procedure (TCLP) for Lead:
Analytical Method: *SW-846* 1311 TCLP / 6010B Inductively Coupled Plasma/Atomic Emission Spectrometry.

µg/L = micrograms per liter.
Regulatory limit for lead is 5.0 milligrams per liter.

FIGURES

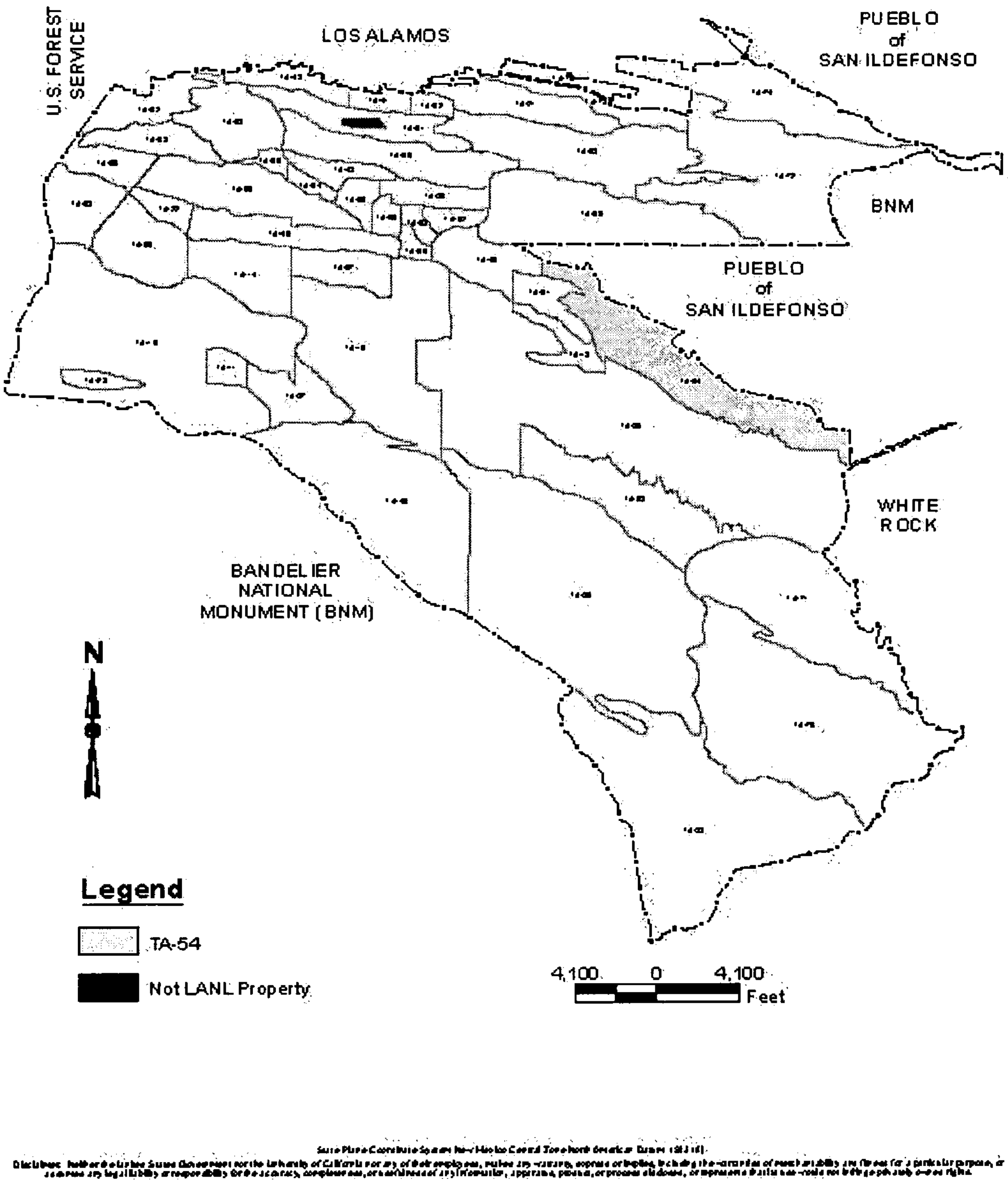


Figure 1

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

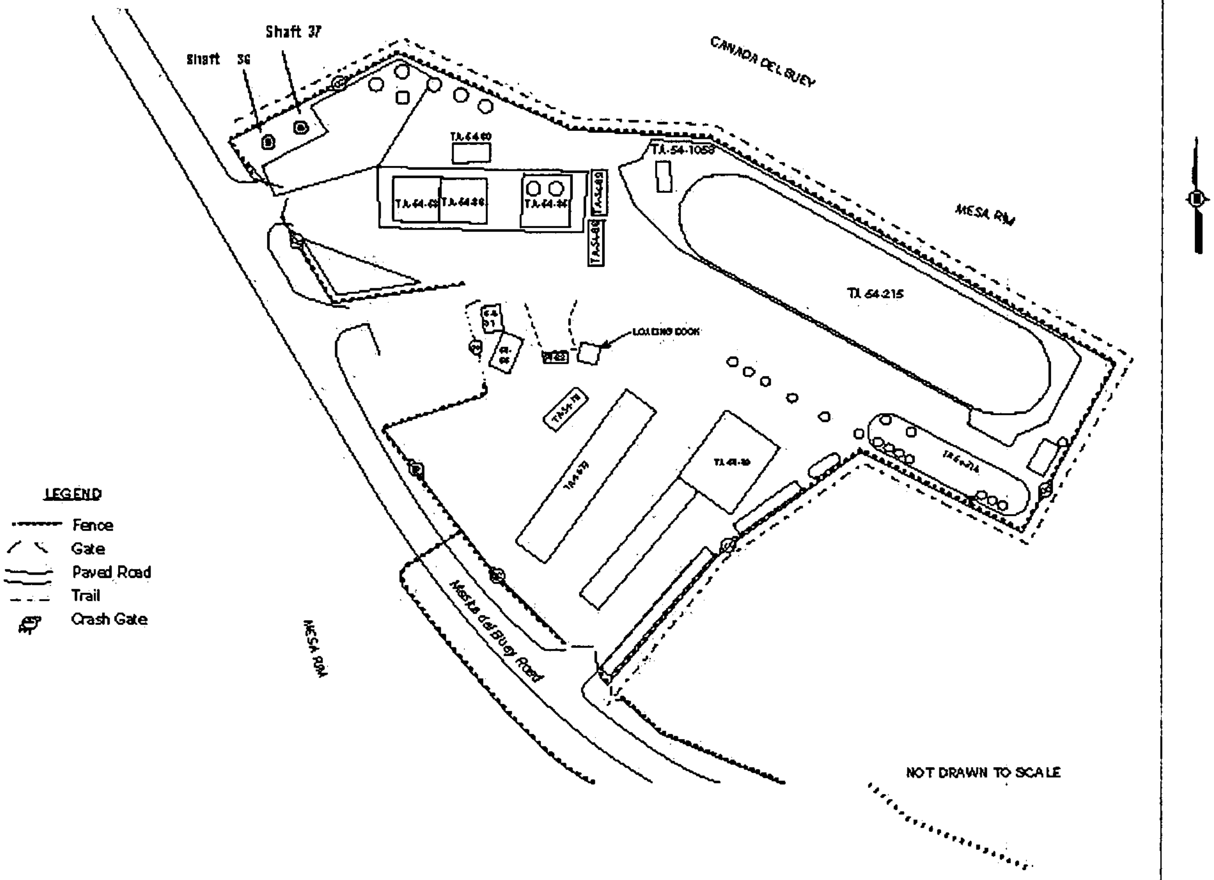
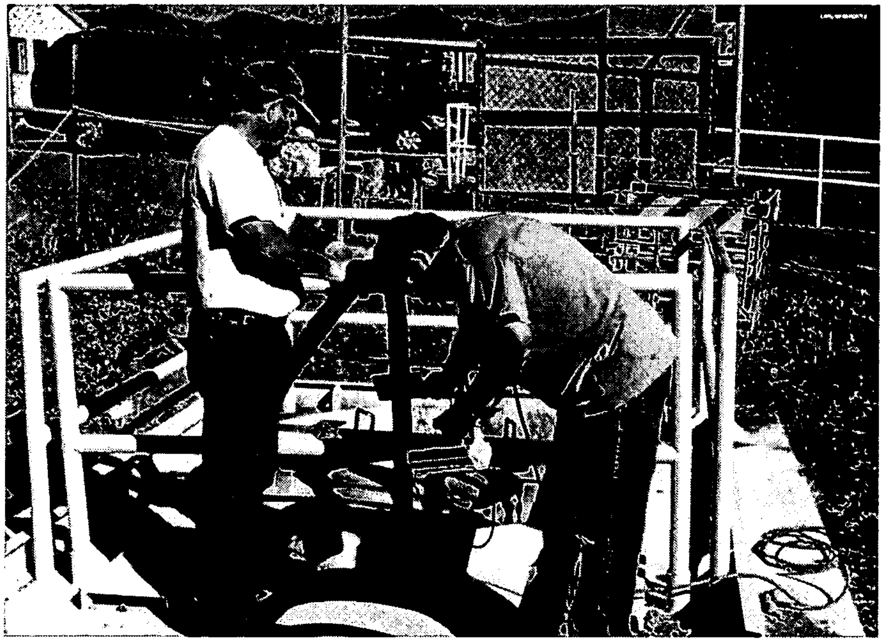


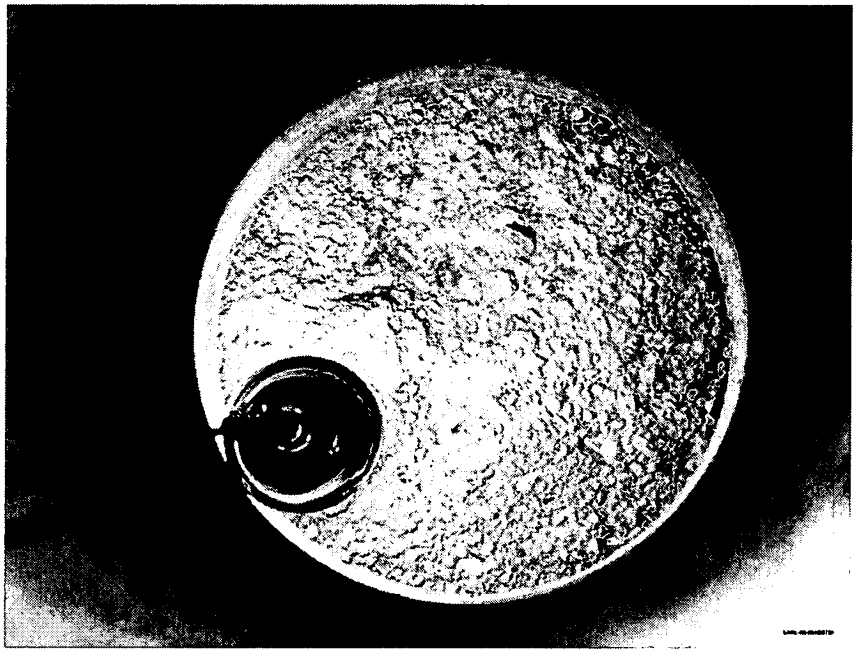
Figure 2

Technical Area (TA) 54, Area L, Container Storage Area

PHOTOGRAPHS

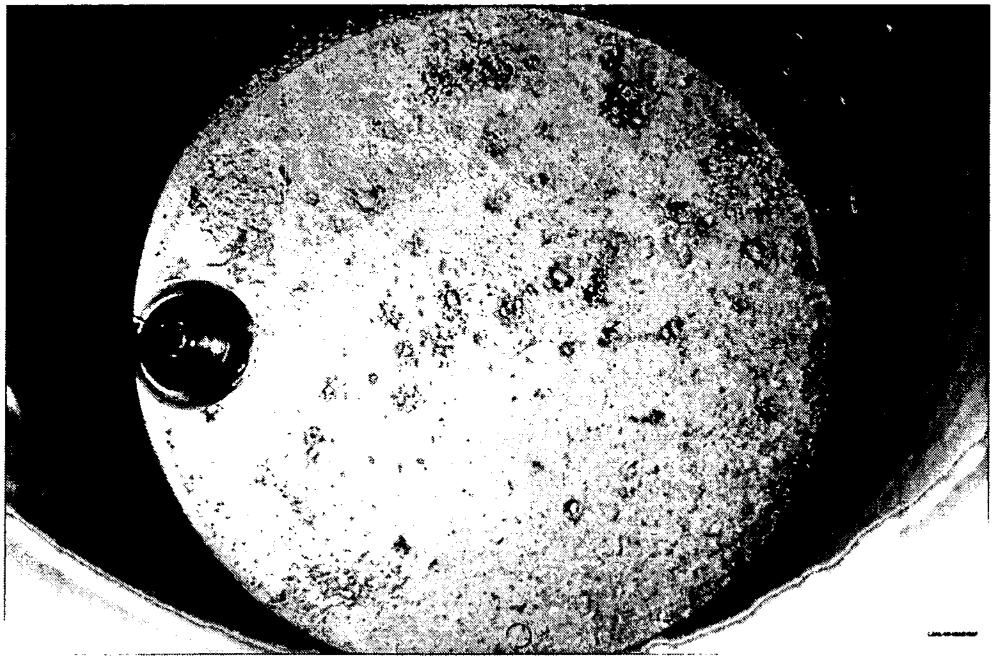


Photograph 1. Vacuuming Storage Shaft 36

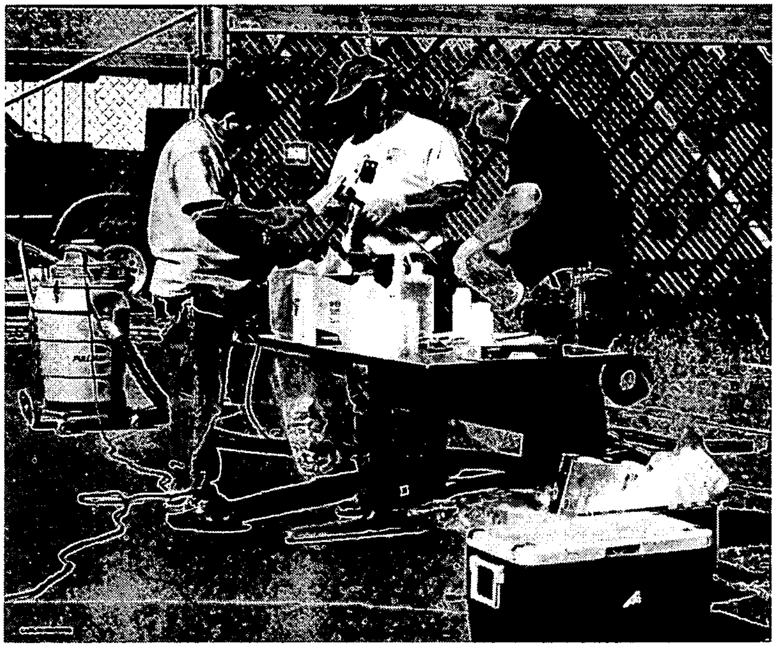


Photograph 2. Concrete Floor of Storage Shaft 36 after Vacuuming/Decontamination

Photograph 3. Vacuuming Storage Shaft 37



Photograph 4. Concrete Floor of Storage Shaft 37 after Vacuuming/Decontamination



Photograph 5. Surface Wipe Sample Preparation during Closure Decontamination Verification Sampling Activities

ATTACHMENT A

SAMPLING AND ANALYSIS PLAN
AND SUBMITTAL LETTER

DEPARTMENT OF ENERGY
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

APR 2 1 2005

Mr. John Kieling, Manager
Permits Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Dear Mr. Kieling:

Subject: Submittal of the Technical Area 54, Area L, Storage Shafts 36 and 37 Closure Sampling and Analysis Plan, Los Alamos National Laboratory (LANL), EPA ID NM0890010515

The purpose of this letter is to submit the above referenced Sampling and Analysis Plan (SAP) for your review and approval in support of the closure of the Technical Area (TA) 54 Area L Storage Shafts 36 and 37 by the National Nuclear Security Administration and the University of California (NNSA/UC). The SAP contains sampling and analysis procedures consistent with those informally discussed with your office on September 22, 2004. A summary of the lead stringer waste removal project is also included as Attachment A of the SAP.

Storage Shafts 36 and 37 operated as interim status storage units for mixed hazardous and radioactive waste. The completion of the Site Treatment Plan deadline for final disposition of the lead stringer waste stored in the shafts and no further plans for continued storage in these units has resulted in the decision to proceed with closure prior to issuance of NNSA/UC's renewed Hazardous Waste Facility Permit. Closure will be performed in accordance with the conditions included in the Technical Area 54 Part B Permit Renewal Application, Attachment F, to guarantee that it meets the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart VI, Part 265, Subparts G, as revised October 1, 2003. Section F.4 of the permit application details the submission of this SAP.

This submittal contains three copies of the SAP document and one compact disc containing an electronic copy as a .pdf format file. If you have any further comments or questions regarding the information presented in the SAP, please contact me at 667-5794 or Gian Bacigalupa, UC at 667-1579.

Sincerely,

Gene Turner

Gene Turner
Environmental Permitting Manager

ES: 2GT-005

cc w/enclosures:
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LA-UR-05-2810
April 2005

LOS ALAMOS NATIONAL LABORATORY TECHNICAL AREA 54, AREA L, STORAGE SHAFTS 36 AND 37 CLOSURE SAMPLING AND ANALYSIS PLAN

Prepared by:

Solid Waste Regulatory Compliance Group
Environmental Stewardship Division
Los Alamos National Laboratory

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LIST OF ABBREVIATIONS/ACRONYMS

CFR	Code of Federal Regulations
CMP	corrugated metal pipe
CSU	Container Storage Unit
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
eV	electron volt
ft	feet/foot
in	inch/inches
LANL	Los Alamos National Laboratory
mL	milliliter
NIOSH	National Institute of Occupational Safety and Health
NMED	New Mexico Environment Department
PCE	perchloroethylene
PID	photo ionization detector
ppmv	parts per million by volume
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
STP	Site Treatment Plan
SUP-3	Materials Management Group
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
TA	Technical Area
TCA	trichloroethane
TCE	trichloroethylene
μg	microgram

1.0 INTRODUCTION

This sampling and analysis plan (SAP) provides the approach for collection of representative samples for the Resource Conservation and Recovery Act (RCRA) closure of the Los Alamos National Laboratory (LANL) Technical Area (TA) 54, Area L, Storage Shafts 36 and 37 Container Storage Unit (Storage Shafts CSU). It is intended to ensure that the data generated are of sufficient quality to support a closure by removal of hazardous waste and hazardous waste residues (i.e., clean closure) for the Storage Shafts CSU. This SAP has been prepared in accordance with the conditions contained in Appendix F of the "Los Alamos National Laboratory General Part B Permit Renewal Application," (LANL, 2003a) and Attachment F, Section F.4, of the "Los Alamos National Laboratory TA-54 Part B Permit Renewal Application," (LANL, 2003b).

Storage Shafts 36 and 37 operated as interim status storage units for mixed waste (waste that includes RCRA-regulated hazardous waste components and radioactive components) (LANL, 1991). The shafts were included in RCRA Part B hazardous waste facility permit applications submitted to the New Mexico Environment Department (NMED) beginning in 1996. The completion of the LANL Site Treatment Plan (STP) (LANL, 2002b) deadline for final disposition of the lead stringer waste and no further plans for continued mixed waste storage in these units has resulted in the decision to proceed with closure prior to issuance of LANL's renewed Hazardous Waste Facility Permit. As indicated above, closure will be performed in accordance with the conditions included in the latest permit application to guarantee that it meets the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart VI, Part 265, Subpart G, revised October 1, 2003 [10-1-03].

This SAP is organized as follows:

- Section 1.0 contains this introduction, a unit description and operational history of the Storage Shafts CSU, information on waste removal, the objectives for the sampling activity, and criteria for demonstrating decontamination.
- Section 2.0 provides additional site description and information regarding previous field investigations.
- Section 3.0 presents the investigation approach including sampling strategy and safe work practices.

- Section 4.0 discusses the sampling approach, sample management procedures, and analytical requirements.
- Section 5.0 provides information on waste management practices.
- Section 6.0 presents the schedule of activities.
- Section 7.0 provides contact information.
- Section 8 includes a list of references.

1.1 Site and Unit Description

LANL is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by the University of California. LANL is located in Los Alamos County in north-central New Mexico. TA-54 is located in the southeastern portion of LANL (Figure 1) and includes much of Mesita del Buey, an east-west trending mesa 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 includes four waste management sites at Areas G, H, J, and L.

The Storage Shafts CSU is comprised of two below-grade retrievable storage structures, Shafts 36 and 37. The CSU is located in the western corner of Area L (Figure 2). Shaft 36 is constructed of 30-inch (in) diameter corrugated metal pipe (CMP) set vertically into the surrounding tuff; Shaft 37 is constructed of 48-in CMP (Figures 3 and 4). Each shaft has a welded metal plate capping the bottom with a 1-ft deep concrete plug poured above the plate to complete the base (floor). Shaft 36 is approximately 27 ft deep; Shaft 37 is almost 36 ft deep. The annular space surrounding each CMP shaft structure was backfilled with crushed tuff to within 4 ft of the surface. The remaining depth to the surface is filled with concrete. At the surface, the CMP is raised above a concrete pad that extends 2½ to 3 ft from the edge of the shaft to prevent infiltration of precipitation (Figures 3 and 4). Each shaft has a steel cover and was also covered with 5 by 5 by 1-ft concrete blocks resting on railroad ties for additional radiation shielding during the operational life of the shaft.

1.2 Operational History

The Storage Shafts CSU was used solely to provide radioactively-shielded storage for seven waste "stringers" between 1986 and 2004. The stringers had been used to move targets into the particle beam of the LANL TA-53 linear accelerator and were subsequently heavily irradiated. The long-term storage of the wastes was necessary to allow the radioactivity to decay to levels that would allow further management and/or disposition while providing safe and secure shielding below ground.

Each stringer was composed of two rectangular steel tubes. The bottom portion of each stringer had slightly smaller dimensions allowing it to telescope into the upper portion. The stringers' overall dimensions were approximately 4 in by 8 in by 26 ft long. The stringers were individually wrapped with plastic sheeting prior to placement in the shafts. Miscellaneous steel hangers and nylon rope were also added to the waste packages for placement.

Portions of the stringers were filled with a hardened cement and sand mix for shielding. Lead shot was added to the cement in the inner tube to provide additional protection. A waste simulation of the lead-cement matrix subjected to the Extraction Procedure (EP) Toxicity Test (SW-846, Method 1310) showed there was sufficient leaching of the lead for the stringers to be conservatively characterized as hazardous waste.

The stringers are included in the Compliance Plan Volume of the LANL STP as part of the Treatability Group LA-W934, "High Activity Waste." The stringers were removed from the shafts in September 2004 in compliance with the STP and shipped to Envirocare of Utah for disposal.

There have been no known or observed incidents of spills or releases of waste associated with the Storage Shafts CSU. One factor contributing to this is the nature of the stored stringers. The stringers were wrapped in plastic in the shafts and their hazardous waste lead content was stabilized in a solid matrix within the external structure of the stringer tubes. At the time of removal, their condition had not deteriorated since from their original placement into the unit in 1987-88. The storage shafts are physically separate from other waste management activities at Area L. Inspections of the external concrete portions of the storage shafts never indicated evidence of storm water run-on into the shafts or degradation of the shaft covers. In May 2004, prior to removal of the stringers, a video was taken of the conditions within the Storage Shafts CSU. No evidence of deterioration of the unit or infiltration of moisture was noted on the video.

1.3 Removal of Wastes

The waste stringers were removed from the Storage Shafts CSU in September 2004. Photographs and a description of the removal process are included in Attachment A of this SAP. Each stringer was lifted from the shafts by overhead crane and sectioned into a radioactive shipping cask for transportation and disposal at Envirocare of Utah.

In addition to the stringers, some debris has been removed from the shafts. Additional material in the shafts consisted of a separated steel portion from a waste stringer package, miscellaneous steel pieces, a discarded wrench, and dust/dirt that had accumulated during the storage period. Waste characterization analysis of the removed debris has not indicated lead contamination. All additional dust or debris will be retrieved with a high capacity vacuum unit equipped with HEPA filtration prior to final sampling. The vacuum operation will also serve as a means of decontamination. In the event further decontamination of the interior of the shafts is necessary, dry or abrasive methods will be used to avoid introduction of water into the shafts and to minimize safety concerns for the activity.

After the debris removal/decontamination process has been completed, pictures will be taken or a video will be made of the interior of the CSU to document the completion of the process.

1.4 Sampling and Analysis Plan Objectives and Scope

Swipe samples will be collected from the TA-54 Storage Shafts CSU floor and walls to verify there are no significant concentrations of residual lead in the storage shafts, or to determine that residual levels of waste lead residues do not present a potential hazard to on-site workers or for post-closure escape to the environment.

1.5 Decontamination Demonstration Criteria

Successful decontamination will meet a minimum of one of the following four criteria:

- No detectable hazardous waste or hazardous waste constituents from storage of RCRA-regulated wastes are identified in the verification samples.

- Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.

- Detectable concentrations of RCRA-regulated constituents in samples collected during decontamination verification activities are at or below levels agreed upon with the NMED to be protective of human health and the environment based on results of risk assessment methods.

- Detectable concentrations of RCRA-regulated constituents that cannot be removed or decontaminated to acceptable levels as described above will be allowed to remain provided that these constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED.

2.0 PREVIOUS SITE CHARACTERIZATION

The following sections provide a description of the below ground disposal units near the Storage Shafts CSU and the investigations performed to date to characterize site contamination. The nature of the Storage Shafts CSU structure indicates that contamination associated with the disposal units would not impact the closure and sampling activities contained in this SAP.

2.1 Site Description

The TA-54 Area L waste management area is a 2½-acre fenced enclosure that includes surface hazardous and mixed waste storage units, the Storage Shaft CSU, and other below-grade inactive waste disposal units. Hazardous waste disposal practices at Area L began in the late 1950s and ended in 1985. The disposal units include one inactive subsurface disposal pit (Pit A), three inactive subsurface treatment and disposal impoundments (Impoundments B, C, and D), and 34 inactive disposal shafts (Shafts 1 through 34). An asphalt base covers all the inactive units and the disposal shafts are filled in with concrete plugs.

2.2 Previous Field Investigations

Early disposal practices at Area L resulted in the presence of a subsurface volatile organic vapor plume that extends beneath the waste management facility and beyond its boundary. In

1985, the New Mexico Environmental Improvement Department issued a compliance order to LANL requiring quarterly pore-gas monitoring at Material Disposal Areas G and L. Nine boreholes were drilled at or near Area L between 1985 and 1988 to monitor the subsurface organic vapor plume. Analytical data from the pore-gas monitoring shows that 1,1,1-trichlorethane (TCA) is the primary plume constituent. It is present to at least 200 ft below the mesa surface, and concentrations vary across the plume. Pore-gas sampling of the vapor phase organic plume at Area L is ongoing; sampling results are reported in LANL environmental remediation quarterly reports. Modeling of the pore-gas data indicates the TCA concentration in the media adjacent to the storage shafts is approximately 500 parts per million by volume (ppmv).

Field investigation sampling was performed at Area L from 1993 through 2001 as part of a RCRA Facility Investigation Report (RFI). Results of the RFI and other previous investigations are presented in the Historical Investigation Report appendix to the Investigation Work Plan for Material Disposal Area L submitted to NMED in December 2003 (LANL, 2003c). Core samples from boreholes at Area L were analyzed for volatile, semi-volatile and other organic compounds with inorganic chemicals. The presence of the subsurface plume was confirmed with TCA and trichloroethylene (TCE) as the main constituents. Barium, cobalt, copper, chromium, mercury, nickel, uranium, and zinc were also detected at concentrations higher than baseline values in subsurface soil samples.

3.0 INVESTIGATION APPROACH

The following sections present the sampling strategy to verify decontamination of the Storage Shafts CSU.

3.1 Distribution of Contaminants

Based on the design of the TA-54 stringer shafts, operational history, and the nature of the stored waste, surface contamination of the interior of the shafts is the primary concern for demonstrating removal of potential hazardous waste constituents. Lead is the only hazardous waste constituent stored in the shafts. Steel, concrete, and plastic sheeting were the only additional materials used. No pathway for contamination by other inorganic constituents has been indicated by the operational history of the shafts. The design of the shafts and the surface concrete collars minimize the likelihood of infiltration by vadose zone moisture, run-on and precipitation. Subsurface moisture levels measured at Area L are relatively low at 1% to 13% gravimetric moisture content (LANL, 2003c). In instances when the shafts have been opened for radiological monitoring and waste removal, the interior of the shafts has been dry. In addition, external inspections have not detected evidence of water infiltration of the concrete and steel surface structures of the shafts. As described in section 1.2, a video was taken of the conditions within the Storage Shafts CSU prior to the removal of the stringers. No evidence of deterioration of the unit or infiltration of moisture was noted on the video.

Although organic compounds were not present in the waste stored in the shafts, the subsurface vapor plume at Area L surrounds the Storage Shafts CSU. The enclosed design of the shafts minimizes the potential for organic soil vapors from the plume entering the shaft. Health and safety monitoring for organic vapor screens was performed in July 2004 when the shafts were opened for preliminary waste removal plan development and again in September 2004 prior to the removal of the stringer shafts. This screening was performed using a portable Photovac photo ionization detector (PID). 10.6 electron volt (eV) and 11.7 eV ultraviolet lamps were used in the instrument for the analyses. No organics were detected with the PID.

Further organic vapor sampling was conducted in October 2004 to determine the presence of TCA, TCE, Freon-11 and perchloroethylene (PCE). The shafts were sampled with a Brüel and Kjaer Type 1302 multigas monitor. Air in the lower part of the shafts was sampled using a Teflon tube lowered to within 6 inches of the floor of the shafts to measure the highest potential vapor levels. Average levels for TCA were approximately 2 ppmv in Shaft 36 and 0.6 ppmv in Shaft 37. Ambient air samples taken at the surface outside the shafts averaged about 0.4 ppmv TCA. These results indicate a very low level of residual organic TCA vapor even though the surrounding soil vapor levels are estimated to be approximately 500 ppmv. Results for the other compounds were lower than for TCA (Shaft 36: <0.3 ppmv TCE, <0.03 ppmv Freon-11, and <0.12 ppmv PCE). These levels may represent the accumulation of trace vapor quantities trapped in the shaft air volume from ambient Area L levels but are unlikely to represent any measurable organic levels on the shafts' interior surfaces.

3.2 Sampling Strategy and Design

The sampling strategy is designed to ensure the appropriate type, quantity, and quality of data is collected to support the objectives outlined in Section 1.4 and 1.5. The sampling strategy is focused on demonstrating the absence of or the removal of any potential lead residue from the stringers.

Sampling for lead contamination of the shafts will consist of preliminary sampling of the debris removed from the Storage Shafts CSU and lead swipe sampling of the interior of each shaft once empty. If the interior surfaces of the shafts are determined to be contaminated with lead at higher concentrations than target levels, LANL will discuss additional closure activities with NMED. Any subsequent closure activities will be dependent on the safety advisability of further decontamination activities (the Storage Shafts CSU are deep enclosed spaces with significant ventilation and falling risks). If further decontamination activities are deemed too risky for closure personnel, a risk assessment may be performed to demonstrate no unacceptable risk to human health or the environment from any material that remains in place.

3.3 Safe Work Procedures

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 Operations Group (HSR-1) and the Industrial Hygiene and Safety Group (HSR-5), and will follow good hygiene practices to protect themselves from exposure to hazardous and/or mixed waste. The level of PPE will be determined based on the potential exposures anticipated using data from previous investigations and upon the levels of radiological and/or chemical contamination detected. Sampling personnel safety requirements and associated levels of PPE will be established using LANL's "Integrated Work Management for Work Activities" (LANL, 2004). Hazards will be identified and appropriate controls (engineered, administrative, and PPE) will be implemented through this process. All workers involved in closure activities will be required to have appropriate training including waste management worker training as specified in LANL's Hazardous Waste Facility Permit and site-specific training for TA-54. Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

4.0 SAMPLING AND ANALYSIS PLAN

The following sections describe procedures and methods for sampling, analysis, and documentation applicable to the Storage Shafts CSU closure activities. Sampling and analysis will be conducted in accordance with approved procedures or methods in *SW-846* (U.S. Environmental Protection Agency [EPA], 1986), National Institute of Occupational Safety and Health (NIOSH, 1996), or equivalent.

4.1 Sampling Approach

Sampling activities will be conducted to verify that lead waste residuals are not present on the interior surfaces of the Storage Shafts CSU in significant concentrations or, if necessary, to form the basis for a risk assessment. Samples will be collected from discrete locations according to the methods and procedures provided in this section and will be analyzed for lead as identified in Table 1 of this SAP. Prior to commencement of verification sampling, blank samples will be collected from the lead sampling equipment and swipe solutions. The results from these samples will be used to determine if these materials contribute any lead contamination to the decontamination verification samples.

4.2 Swipe Sampling

Swipe sampling will be the primary analytical tool used to determine if residual concentrations of lead remain within the interior of the stringer shafts. Swipe samples will be taken in accordance with the NIOSH *Manual of Analytical Methods*, Method 9100 (NIOSH, 1996). This method includes wiping a 100 square centimeter (cm^2) area at each discrete location with a gauze swipe wetted with deionized water, which is the appropriate collection media for lead. Swipe sampling will be performed from the top of the shafts using long handles or poles to alleviate the need to enter the shafts. Each sampling event will consist of the following steps:

- Define the area (100 cm^2) within the shafts for each sampling event.
- Using clean PPE, remove the swipe from its sample jar and/or packaging.
- Affix the swipe to the remote sampling handle/pole.
- Wipe the surface to be sampled with firm pressure using an overlapping pattern to cover the appropriate surface area.
- Retrieve the swipe from the handle with non-contaminated gloves or other devices.
- Fold the swipe, exposed side in, and place into a clean hard-walled sample container.
- Seal the container and label.

The samples will be taken at the positions within the shafts that are the most likely to have come in contact with the stringers or to have collected waste residues. Each shaft will be sampled in three locations, as defined below:

- On the floor of the shaft where fallen cement debris or other waste components may be present,
- Around the interior of the shaft within one foot of the bottom, and
- Approximately 26 feet above the bottom of the shafts where plastic wrapped stringers were leaned against the interior surface of the shafts.

Disposable sampling equipment will be used when appropriate in order to minimize the need for equipment decontamination procedures. This equipment may be presumed clean prior to use if still in a factory-sealed wrapper. Other non-disposable sampling equipment such as swipe holders and sampling poles will be decontaminated between samples and after the sampling process to remove any potential waste residue that may have adhered to the equipment. Decontamination will consist of scrubbing and/or rinsing the equipment with appropriate laboratory non-phosphate detergent solutions (e.g., Alconox) followed by distilled water rinsing. When using the same equipment for multiple samples, sampling personnel will prepare equipment rinsate blanks. All rinsate, used absorbent cloths, and decontamination solutions will be disposed of properly using LANL's waste characterization procedures as described in the General Part B Permit Renewal Application, Appendix B (LANL, 2003a).

4.3 Sampling of Debris

Any remaining debris taken from the shafts will be sampled to determine appropriate waste management procedures. Representative samples of the debris will be taken and analyzed using SW-846 methods for lead.

4.4 Sample Management Procedures

Samples will be collected and transported using documented chain-of-custody and sample management procedures to ensure integrity of samples and provide an accurate and defensible written record of the possession and handling of a sample from the time of collection, through laboratory analysis. An approved analytical laboratory will provide coolers, containers, preservative, labels, chain-of-custody forms, analysis request forms, and custody seals prior to sampling. The following provides a description of chain-of-custody; sample documentation; sample handling, preservation, and storage; and sample packaging and transportation requirements that will be followed during the sampling activities associated with closure.

4.4.1 Chain-of-Custody

Sample chain-of-custody forms will be maintained by sampling personnel until the samples are relinquished to the analytical laboratory. The sample collector will be responsible for the integrity of samples collected until properly transferred to another person. The EPA considers a sample to be in a person's custody if it is:

- In a person's physical possession,
- In view of the person in possession, or
- Secured by that person in a restricted access area to prevent tampering.

The sample collector will document all pertinent sample collection data. Individuals relinquishing or receiving custody of the samples will sign, date, and note the time on the analysis request/chain-of-custody form. A chain-of-custody form shall accompany the sample containers or coolers, including transport to the analytical laboratory.

4.4.2 Sample Documentation

Sampling personnel will complete and maintain records to document sampling and analysis activities. Sample documentation will include, at a minimum, sample identification numbers, sample container labels and custody seals, chain-of-custody forms, analysis request forms, sample logbooks detailing sample collection activities, and shipping forms (if necessary).

4.4.2.1 Sample Labels and Custody Seals

A sample label, completed in blue or black ink, will be affixed to each sample container. The sample label will include, at a minimum the following information:

- A unique sample identification number.
- Name of sample collector.
- Date and time of collection.
- Type of preservatives used, if any.

- Location from which the sample was collected.

A custody seal will be placed on each sample container to ensure detection of unauthorized tampering with samples. These labels must be initialed, dated, and affixed by the sample collector to the container in such a manner that it is necessary to break the seal to open the container.

4.4.2.2 Chain-of-Custody Form

A chain-of-custody form must accompany all samples from collection through laboratory analysis. The completed original chain-of-custody form will be returned by the analytical laboratory and will become a part of the permanent record documenting the sampling effort and the analyses requested. One chain-of-custody form may be used to document all of the samples collected from a single sampling event.

4.4.2.3 Sample Logbook

All pertinent information on the sampling effort must be recorded in a logbook. The sample logbook will include, at a minimum, the following information:

- Sample location.
- Suspected waste composition.
- Sample identification number.
- Volume/mass of waste taken.
- Purpose of sampling.
- Description of sample point and sampling methodology.
- Date and time of collection.
- Name of the sample collector.
- Sample destination and how it will be transported.
- Observations.
- Signatures of personnel responsible for the observations.

4.4.3 Sample Handling, Preservation, and Storage

Samples will be collected and containerized in appropriate pre-cleaned sample containers. Table 2 presents the requirements specified in *SW-846* (EPA, 1986), for sample containers, preservation techniques, and holding times. Samples that require cooling to 4 degrees Celsius (°C) will be placed in a cooler with ice or ice gel or in a refrigerator immediately upon collection.

4.4.4 Sampling Packaging and Transportation of Samples

All packaging and transportation activities will meet safety expectations, quality assurance (QA) requirements, DOE Orders, and relevant local, state, and federal laws (including the Code of Federal Regulations, Title 10, [10 CFR] and 49 CFR). The LANL Laboratory Implementation Requirement 405-10-01.1, "Packaging and Transportation" (LANL, 1999) establishes requirements that will be implemented for packaging design, testing, acquisition, acceptance, use, maintenance, and decommissioning and for on-site, intra-site, and off-site shipment preparation and transportation of general commodities, hazardous materials, substances, wastes, and defense programs materials. Samples that require cooling to 4 °C will be transported in a cooler with ice or ice gel.

Off-site transportation of samples will occur via private, contract, or common motor carrier, air carrier, or freight. All off-site transportation will be processed through the Materials Management Group (SUP-3) shipping office unless the shipper is specifically authorized, through formal documentation by SUP-3, to independently tender shipments to common motor or air carriers.

4.5 Analytical Requirements

The following sections provide information on analytical methods and associated quality assurance procedures to be used for decontamination verification analyses covered by this SAP.

4.5.1 Proposed Analytical Methods

Each swipe sample will be analyzed for lead, as identified in Table 1. Proposed analytical methods and target detection limits are also presented in the table.

4.5.2 Analytical Laboratory Requirements

The analytical laboratory will perform the lead swipe analyses. The analytical laboratory will include at a minimum:

- A documented comprehensive QA and quality control (QC) program.
- Technical analytical expertise.
- A document control/records management plan.
- The capability to perform data reduction, validation, and reporting.

4.5.3 Quality Assurance/Quality Control

Field sampling procedures and laboratory analyses will be evaluated through the use of QA/QC samples to assess the overall quality of the data produced. QC samples used to evaluate precision, accuracy, and potential sample contamination associated with the sampling and analysis process, are described in the following sections for field and laboratory activities. Recommended frequency of collection or analysis and acceptance criteria also are presented, along with information on calculations necessary to evaluate the QC results.

4.5.3.1 Field Quality Control

For the Storage Shaft CSU samples taken during decontamination verification, at least one duplicate QC sample will be collected. Table 3 presents a summary of the analysis, frequency, and acceptance criteria for the field duplicate QC sample(s). The field duplicate sample(s) will be given a unique sample identification number and be submitted to the analytical laboratory as blind samples. Field duplicate samples will be identified on the applicable forms so that the results can be applied to the associated sample.

4.5.3.2 Analytical Laboratory Quality Control Samples

QA/QC considerations are an integral part of analytical laboratory operations. Laboratory QA is undertaken to ensure that analytical methods generate data that are technically sound, statistically valid, and can be documented. Individual analytical method QC procedures will be followed as required by SW-846.

4.5.4 Data Reduction, Verification, Validation, and Reporting

Analytical data generated as a result of the activities described in this closure plan will be verified and validated. Data reduction will involve conversion of raw data to reportable units;

transfer of data between recording media; and computation of summary statistics, standard errors, confidence intervals, and statistical tests.

4.5.5 Data Reporting Requirements

Analytical results will include all pertinent information about the condition and appearance of the sample as received. At a minimum, analytical reports will include:

- A summary of analytical results for each sample.
- Results from analytical laboratory QC samples such as blanks, spikes, and calibrations.
- Reference to standard methods or a detailed description of analytical procedures.
- Raw data printouts for comparison with summaries.

The laboratory will describe the sample preparation procedure used in the analysis in sufficient detail so that the data user can understand how the sample was manipulated during analysis.

5.0 WASTE MANAGEMENT

All sample collection activities will be conducted with waste minimization goals in mind. All waste material generated will be controlled, handled, characterized, and disposed in accordance with LANL waste management procedures. Table 4 provides a list of the potential waste materials that could be generated during closure, possible waste type(s), and disposal options.

6.0 SCHEDULE OF ACTIVITIES

An estimated schedule for the sampling and analysis activities described in this SAP is presented as Table 5. The schedule is subject to change depending upon the length of time (sampling iterations) necessary to demonstrate decontamination and the potential need for coordination of alternative decontamination demonstration criteria. If complications do not develop, the certification report submittal may occur earlier.

7.0 CONTACTS

Further information regarding the information contained in this SAP may be obtained by contacting the Environmental Protection Program, Los Alamos Site Office, DOE, at (505) 667-

5794, or the Solid Waste Regulatory Compliance Group, Environmental Stewardship Division, LANL, at (505) 667-0666.

8.0 REFERENCES

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

LANL,2004, "Integrated Work Management for Work Activities," IMP 300-00-00.1, Los Alamos National Laboratory, September 2004.

LANL, 2003a, "Los Alamos National Laboratory, General Part B Permit Renewal Application," Rev. 2.0, LA-UR-03-5923, Los Alamos National Laboratory, August 2003.

LANL, 2003b, "Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application," Rev. 3.0, LA-UR-03-3579, Los Alamos National Laboratory, June 2003.

LANL, 2003c, "Investigation Work Plan for MDA L, SWMU 54-006 at TA-54, Revision 1," LA-UR-03-9120, Los Alamos National Laboratory, December 2003.

LANL, 2002a, "RRES-SWRC Sampling Plan," Rev. 2, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002b, "Site Treatment Plan," Rev. 12, Los Alamos National Laboratory, March, 2002.

LANL, 1999, "Packaging and Transportation," Laboratory Implementation Requirement 405-10-01.2, Los Alamos National Laboratory, August 1998.

LANL, 1991, "Part A Permit Application for Mixed Waste," Los Alamos National Laboratory, Los Alamos, New Mexico, January, 1991

NIOSH, 1996, National Institute of Occupational Safety and Health Manual of Analytical Methods, Fourth Edition, May 15, 1996.

Table 1: Decontamination Verification Analytical Methodology for Stringer Shafts CSU

Parameter	Sample Method Number	Analytical Method Number	Target Detection Limit
Swipe Samples: - Lead	NIOSH[a] Method 9100, Lead in Surface Wipe Samples	SW-846[b] 3050B/7420-1	2 ug Pb per sample (0.02 ug cm^2 for 100-cm^2 area)
Debris samples: - Lead		SW-846[b] 3050B/7420-1	Regulatory limit of 5.0 mg/L

a National Institute of Occupational Safety and Health "Manual of Analytical Methods," Fourth Edition, May 15, 1996.

b U.S. Environmental Protection Agency, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846.

Table 2: Recommended Sample Containers, Preservation Techniques and Holding Times

Analytical Class and Sample Type	Container[a]	Preservative	Holding Time
Swipe Samples: - Lead	500 mL glass or polyethylene with Teflon-lined lid	Cool to 4° C	180 days

a Smaller sample containers may be required due to health and safety concerns associated with potential radiation exposure, transportation requirements, and waste management considerations.

Table 3: Recommended Quality Control Samples, Frequency, and Acceptance Criteria

Quality Control Sample Type	Applicable Analysis	Frequency	Acceptance Criteria
Field Duplicate	Lead samples	One for each sampling sequence	Relative percent difference less than or equal to 20 percent
Equipment rinsate blank	Lead	As necessary	Method detection limit

Table 4: Potential Waste Materials, Waste Types, and Disposal Options

Potential Waste Materials	Possible Waste Type(s)	Disposal Options
Steel portion of stringer package remaining in shaft.	Low-level solid waste	Technical Area 54
PPE	Non-regulated solid waste Low-level solid waste Hazardous waste	Sanitary Waste Collection System Technical Area 54 Hazardous Waste Disposal Vendors
Shaft Debris	Non-regulated solid waste Low-level solid waste Hazardous waste Mixed low-level waste	Sanitary Waste Collection System Technical Area 54 Hazardous Waste Disposal Vendors Mixed Waste Disposal Vendors
Disposed Sampling Equipment	Non-regulated solid waste Low-level solid waste Hazardous waste	Sanitary Waste Collection System Technical Area 54 Hazardous Waste Disposal Vendors
Analytical samples	Non-regulated solid waste Low-level solid waste Hazardous waste Mixed low-level waste	Sanitary Waste Collection System Returned to LANL for LLW disposal Hazardous Waste Disposal Vendors Mixed Waste Disposal Vendors

Table 5: Schedule of Closure Activities

Activity	Planned Schedule
Submit CSU-specific sampling and analysis plan (SAP)	April, 2005
Begin closure activities - final removal of waste residuals Decontamination of structures and/or equipment as necessary Perform verification sampling of the structure(s) and/or equipment	Early May, 2005
Receive and evaluate analytical data	End of May, 2005
Perform additional decontamination (if necessary) Perform additional sampling (if necessary)	Early June, 2005
Receive and evaluate additional analytical data (if necessary)	End of June, 2005
Verify decontamination	July, 2005
Submit closure certification to NMED	July, 2005[a]

[a] Closure certification submittal is subject to change depending on results of decontamination analysis and potential meetings with NMED to determine use of alternative decontamination determination criteria (Section 1.5).

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.

Kenneth M. Hargis
Division Director
Environmental Stewardship Division
Los Alamos National Laboratory

4/20/05
Date Signed

Gene E. Turner
Environmental Permitting Manager
Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy
Owner/Operator

4/21/05
Date Signed

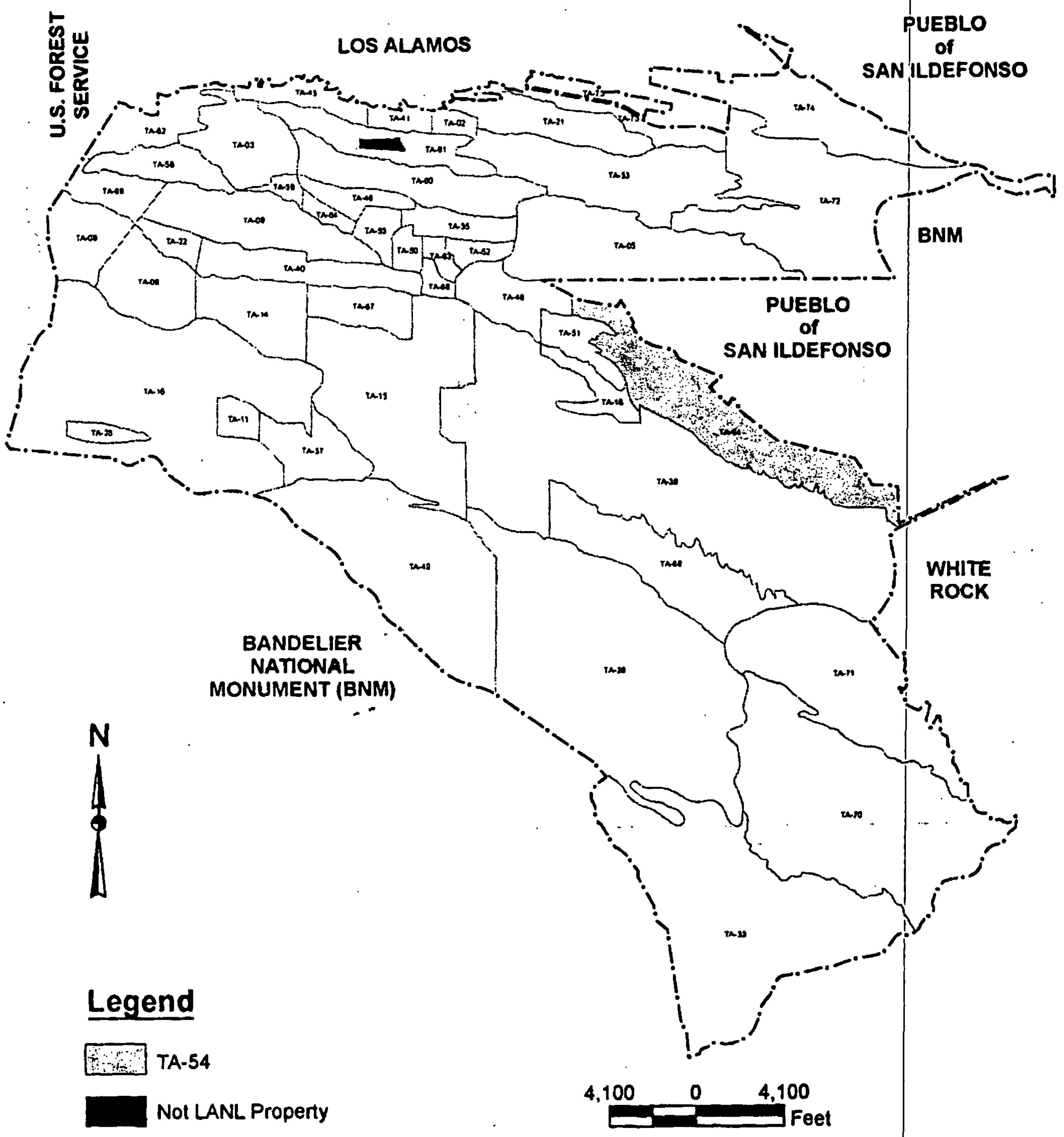


Figure 1

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.

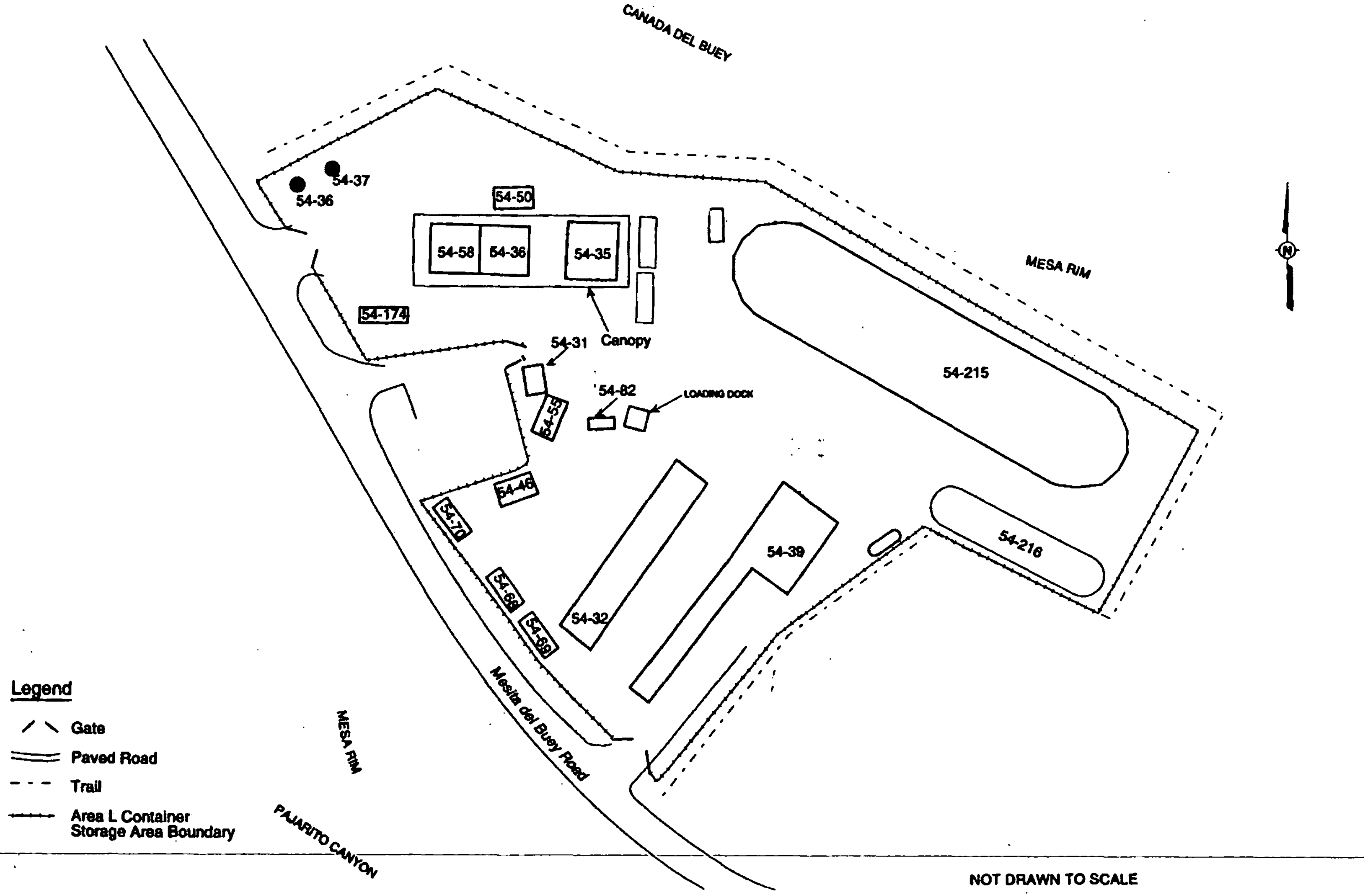


Figure 2

Technical Area (TA) 54, Area L, Container Storage Area

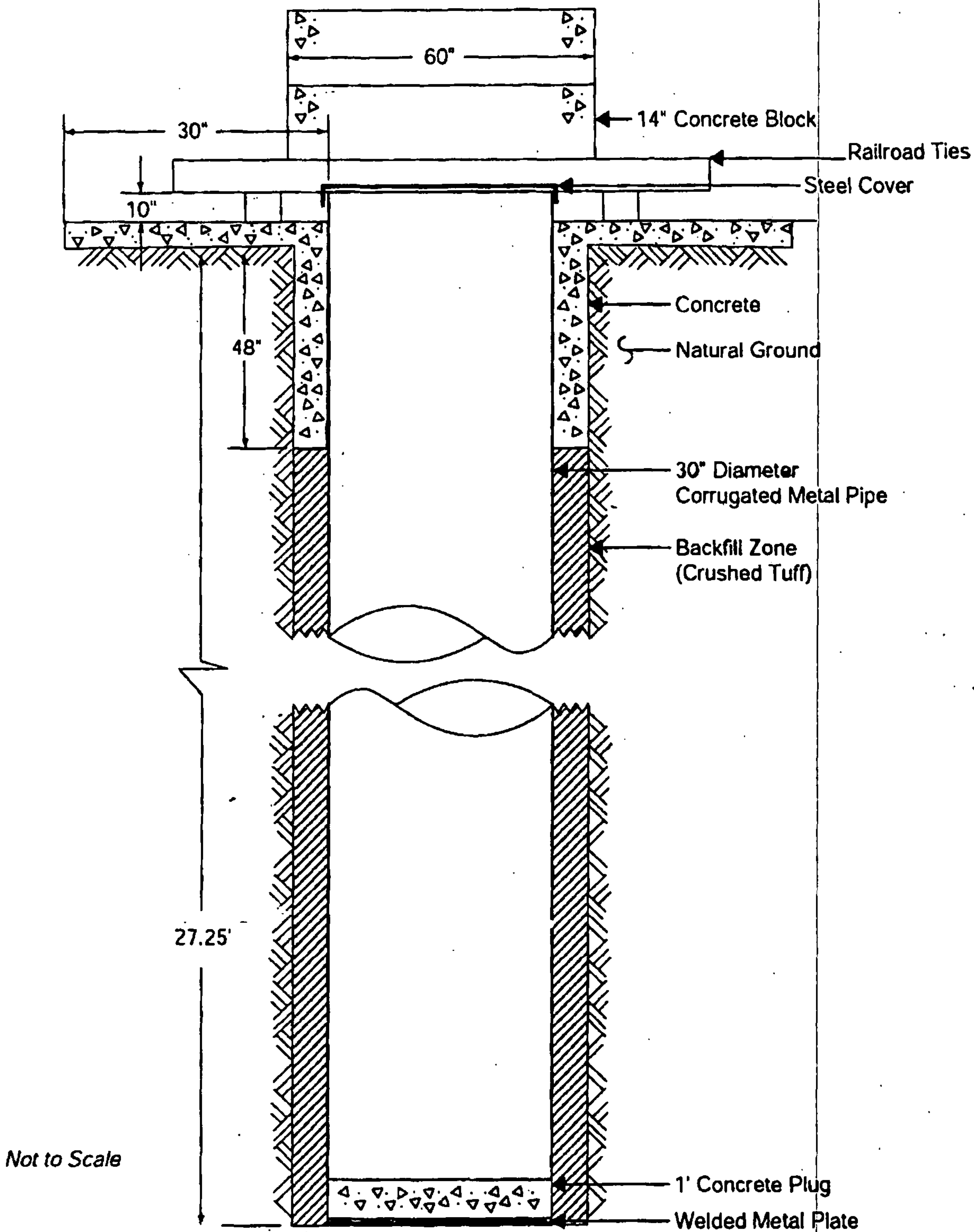
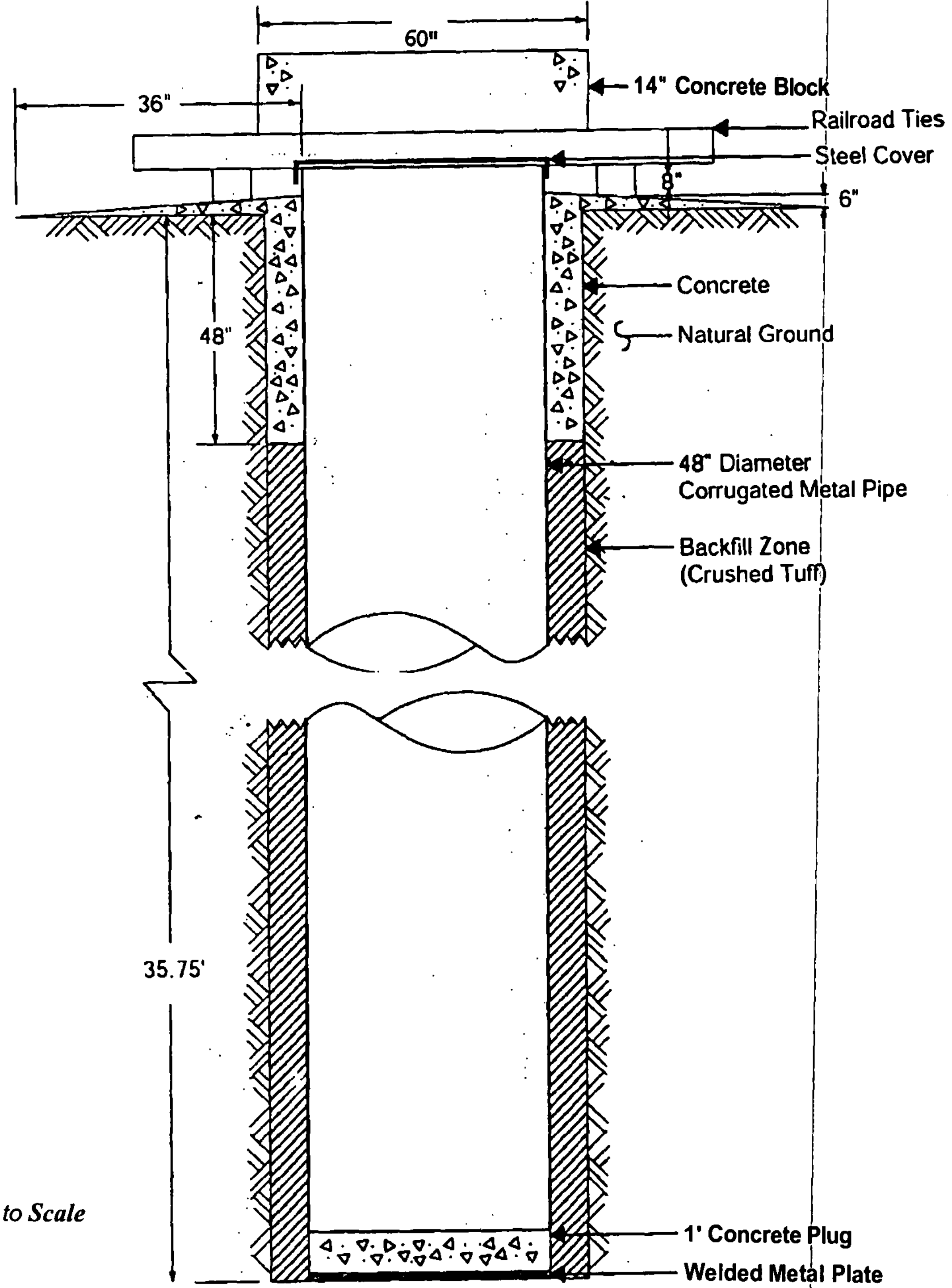


Figure 3

Shaft 36

01/08/03



Not to Scale

Figure 4

Shaft 37

01/08/03

ATTACHMENT A

TA-54 AREA L LEAD STRINGER RETRIEVAL PROJECT

INTRODUCTION

Seven isotope-production stringers previously used in operations at TA-53 were placed in storage between March 1987 and March 1988 in two shafts (shafts 36 and 37) in the northwest corner of Area L in Technical Area 54 (TA-54). Workers on the Lead Stringer Shaft Retrieval project removed the stringers from storage September 17–20, 2004, and shipped them to final disposition. The stringers, sheared into 2-foot pieces, were trucked in a sealed cask to Envirocare in Utah for macroencapsulation.

BACKGROUND

The seven 26-ft-long stringers were used to move targets into the beam line of the linear accelerator at TA-53. The forward 11.2-foot end of each stringer (the end that contacted the target when in use at the accelerator) was rectangular steel tubing filled with a matrix of Portland cement, sand, and 75 pounds of elemental lead shot. The lead shot was added for extra shielding. The remaining length of the two stringers differed in construction. The rear 15-foot section of stringers 1–4 was hollow; the rear 15-foot section of stringers 6–8 was filled with Portland cement and sand matrix. The stringers had coolant supply and return lines running lengthwise within them. Attached to the forward end of each of the stringers was the carrier attachment fixture that held the target holder when the stringers were in use at the accelerator.

For storage at TA-54, Area L, stringers 6–8 were placed in shaft 36 (28 feet deep). They were size reduced for storage. Stringers 1–4 were stored in shaft 37 (36 feet deep). At the time of storage, they had not been size reduced. The stringers were stored vertically in the shafts, "head down," that is, with their forward ends, their most highly activated portions, at the bottom. Each stringer had an eye and cable attached to the opposite end. In vertical storage, the end of the stringer with the eye-and-cable rigging was at the top of the shaft, where the rigging could be used for lifting.

The shielding matrix in the front portion (lower portion in storage) of stringers 6–8 was tested using a surrogate matrix and an Environmental Protection Agency extraction procedure to determine toxic waste characteristics. Testing on the surrogate failed for lead. The portions of all the stringers that were activated and also contained lead shot were managed as low-level mixed waste.

SCOPE OF WORK

The retrieval project included identifying the steps and processes for planning and for safely removing the isotope production stringers from storage. A characterization plan was developed, including historical information relative to the stringers and a description of the procedure for verifying their radiological characterization. The objective was to collect sufficient data to plan for removing, size reducing, and disposing of the stringers. Information gathered during the characterization focused on identifying the radiological and physical hazards associated with (1) retrieving the stringers from the storage shafts, (2) managing the work according to the requirements of the U.S. Department of Energy (DOE) "as low as reasonably achievable" (ALARA) personnel conditions and industrial safety, and (3) packaging and transporting the stringers.

SUMMARY OF HAZARDS

A risk assessment of the project identified the exposure of personnel to activated components as a particularly important hazard. The risks were evaluated through the Permits and Requirements Identification System (PR-ID) process (PR-ID Profile No. 04P-0196, Retrieval of Lead Stringers from Area L) and controls to minimize risks were specified in the site specific health and safety plan, detailed operating procedure (DOP-SWO-058, R.0.1 Retrieval and Packaging of Isotope Production Stringers from TA-54, Area L), critical lift plan, and the project's Integrated Work Document (IWD).

PROJECT DESCRIPTION

In May 2004 Duratek, the contractor in charge of stringer removal, characterized shafts 36 and 37 by lowering a camera to obtain visual verification of each stringer's condition and a RO-7 to obtain real-time dose rates at the top and bottom of each stringer and at various positions along its length.

On September 17, 2004, workers positioned retrieval equipment—a mobile crane and a track hoe with a shear for cutting the stringers—at a safe working distance from the shafts. The cask in which the stringers would be transported to Envirocare in Utah was placed on a trailer and the trailer leveled. Then, using a man-lift to access the top of the cask, workers removed the cask lid and, using the mobile crane, placed it on the rear of the trailer. They then secured the cask liner open and draped plastic over the cask and the surface area around the operation. Throughout this activity, workers were secured with heavy straps to the crane's hook as protection against falling.

Workers removed the lid from each shaft and evaluated the rigging attached to the top of each stringer. A rigger evaluated the positions of the stringers to determine the order in which they could be removed, and the stringers were then lifted free of the shaft one at a time, attached to a hook suspended from the mobile crane. Each stringer was then carefully suspended over the transportation cask's open liner and sheared, beginning with the bottom end. Each stringer was sheared into pieces about 2-feet long that were allowed to fall into the cask liner. Finally, the last portion of the stringer was sheared from its rigging and the rigging saved as non-waste.

Once the retrieval and shearing were completed, workers secured the liner and lifted it clear of the cask to collect 1-foot and 1-meter dose rates and to weigh the liner and survey it for loose surface contamination. The liner was then placed back inside the shipping cask and the cask's lid replaced and secured. The cask was then labeled for transport.

WASTE OPERATIONS

The only radioactive constituents were the activation products resulting from the stringers' being bombarded in the accelerator's beam line. The characterization data collected when Duratek lowered detectors and a camera down the stringer storage shafts (May 2004) showed that only the lower ends of the stringers were radioactive. Data collected during the characterization showed an abrupt increase in activity as the detector approached the shaft bottom where the hot ends of the stringers rested. Because portions of the stringers contained added lead shot, the stringers were considered D008, the Resource Conservation and Recovery Act designation denoting an item as hazardous for lead. Because portions were also radioactive, the stringers were classified as mixed low-level waste. The stringer debris was amenable to macroencapsulation, so no further analysis was performed.

The debris was shipped to Envirocare of Utah in two casks: (1) a Duratek 8120, 125-cubic -foot lined and shielded cask containing the stringer pieces and (2) a B-25 cask containing the personal protection equipment, hoses, and HEPA filters associated with the removal and containerization effort. The waste in the stringer cask equaled about 20 cubic foot and weighed about 8,000 pounds. Radiological data from ion detectors showed that the total activity within the cask was about 6.37 curies. The maximum dose rate was about 13.5 rem/hour.

Adapted From: Gonzales, W., Millensted, Avril, "Lead Stringer Retrieval Project, Technical Area 54, Area L" (LA-UR-04-8954), Los Alamos National Laboratory

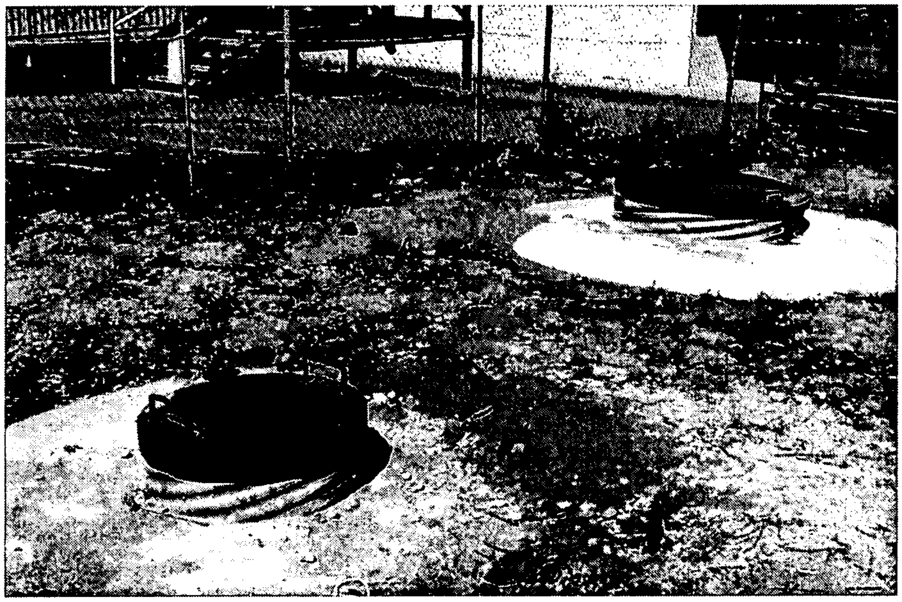


Figure 1: Shafts 36 and 37 prior to retrieval

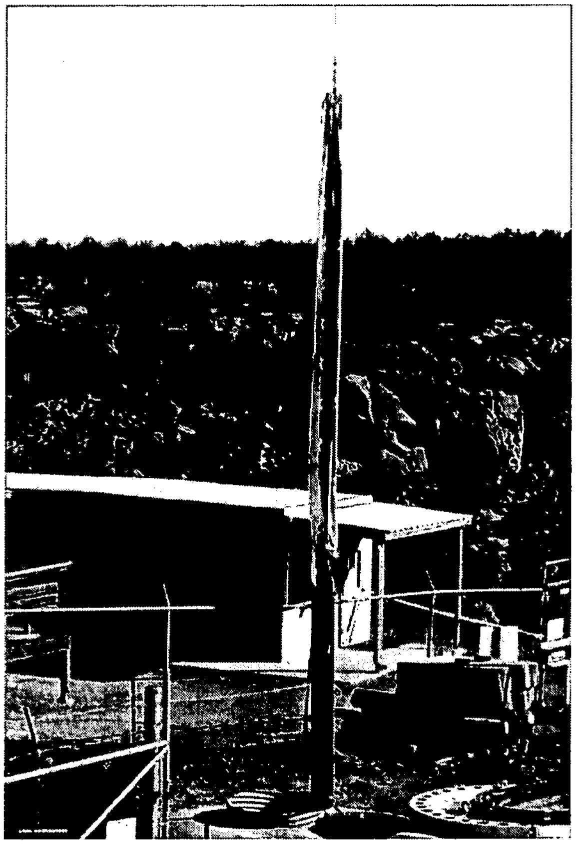


Figure 2: Lead stringer being lifted from shaft.

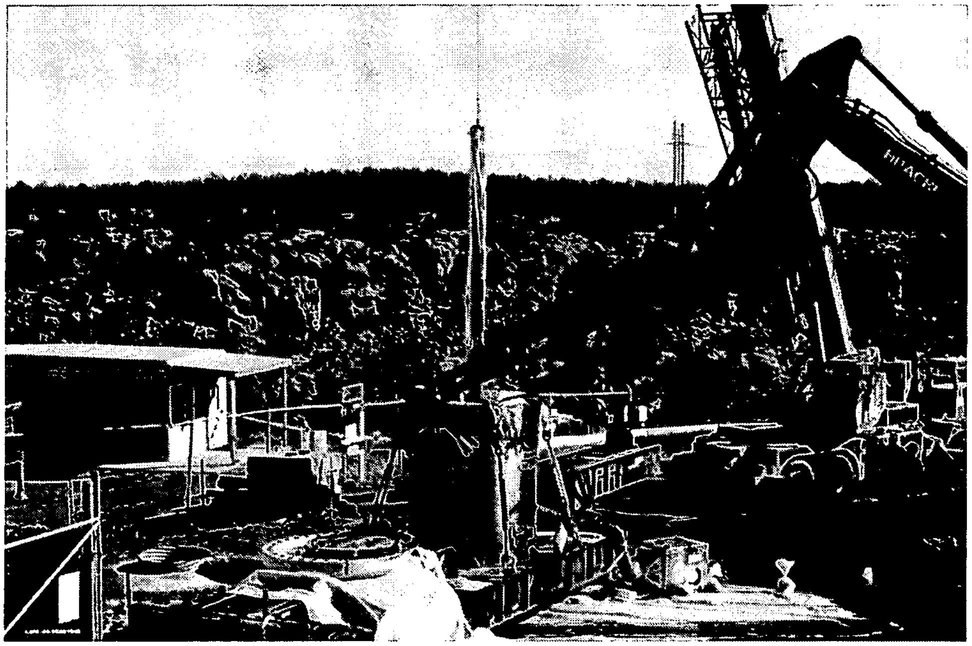


Figure 3: Stringer sections being sheered and stacked into transport cask

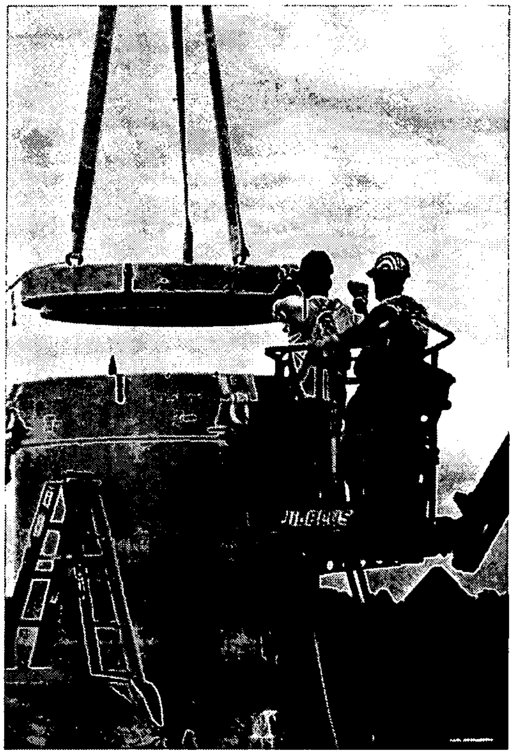


Figure 4: Transport cask being closed

Figure 5: Placing hazardous waste label on transport cask

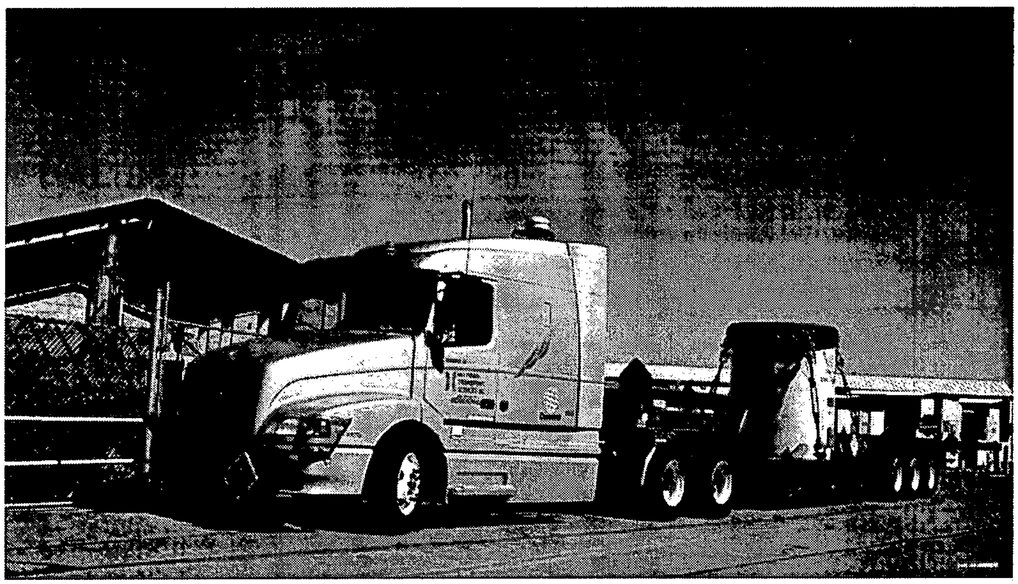


Figure 6: Ready for shipping

ATTACHMENT B

SURFACE WIPE SAMPLING ANALYTICAL DATA

SEVERN TRENT STL

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

Tel: 314 298 8566 Fax: 314 298 8757
www.stl-inc.com

ANALYTICAL REPORT

RECD SEP 28 2005

PROJECT NO. 3201S

Los Alamos Non-Rad

Lot #: F5H240367

Joylene Valdez or Keith Greene

Los Alamos National Laboratory
SMO TA-00 Bldg 1237
DP: 03U; MS: 707
Los Alamos, NM 87545

SEVERN TRENT LABORATORIES, INC.

Ed Kao
Project Manager

September 19, 2005

METHODS SUMMARY

F5H240367

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
ICP-MS (6020)	SW846 6020	SW846 3010

References:

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB36-00-02

TOTAL Metals

Lot-Sample #...: F5H240367-001 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	5.9	3	ug/L	SW846 6020	08/25-09/02/05	HH6161AJ
		Dilution Factor: 1		Analysis Time..: 20:20		

LOS ALAMOS NATIONAL LABORATORY

:L ST LOUIS

TL ST LOUIS

TL ST LOUIS

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB36-26-06

TOTAL Metals

Lot-Sample #...: F5H240367-008 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	27.6	3	ug/L	SW846 6020	08/25-09/02/05	HH62Q1AM
		Dilution Factor: 1		Analysis Time..: 21:03		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB36-26-10

TOTAL Metals

Lot-Sample #...: F5H240367-009 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	27.7	3	ug/L	SW846 6020	08/25-09/02/05	HH62T1AM
		Dilution Factor: 1		Analysis Time..: 21:07		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB36-36-B

TOTAL Metals

Lot-Sample #...: F5H240367-010 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	1.1 B	3	ug/L	SW846 6020	08/25-09/02/05	HH62V1AM
		Dilution Factor: 1		Analysis Time..: 21:12		

NOTE(S):

B Estimated result. Result is less than RL.

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-00-02

TOTAL Metals

Lot-Sample #...: F5H240367-011 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	41.3	3	ug/L	SW846 6020	08/25-09/02/05	HH62X1AM
		Dilution Factor: 1		Analysis Time..: 21:17		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-00-06

TOTAL Metals

Lot-Sample #...: F5H240367-012   Matrix.......: WATER
Date Sampled...: 08/18/05   Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	86.3	3	ug/L	SW846 6020	08/25-09/02/05	HH6251AM
		Dilution Factor: 1		Analysis Time..: 21:21		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-00-10

TOTAL Metals

Lot-Sample #...: F5H240367-013   Matrix.......: WATER
Date Sampled...: 08/18/05   Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	38.2	3	ug/L	SW846 6020	08/25-09/02/05	HH6271AM
		Dilution Factor: 1		Analysis Time..: 21:26		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-01-02

TOTAL Metals

Lot-Sample #...: F5H240367-014 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	14.3	3	ug/L	SW846 6020	08/25-09/02/05	HH63A1AM
		Dilution Factor: 1		Analysis Time..: 21:30		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-01-06

TOTAL Metals

Lot-Sample #...: F5H240367-015 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	2.2 B	3	ug/L	SW846 6020	08/25-09/02/05	HH63E1AM
		Dilution Factor: 1		Analysis Time..: 21:46		

NOTE(S):

B Estimated result. Result is less than RL.

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-01-10

TOTAL Metals

Lot-Sample #...: F5H240367-016 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	9.9	3	ug/L	SW846 6020	08/25-09/02/05	HH63J1AM
		Dilution Factor: 1		Analysis Time..: 21:51		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-26-02

TOTAL Metals

Lot-Sample #...: F5H240367-017 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	6.4	3	ug/L	SW846 6020	08/25-09/02/05	HH63M1AM
		Dilution Factor: 1		Analysis Time..: 21:55		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-26-06

TOTAL Metals

Lot-Sample #...: F5H240367-018 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	48.4	3	ug/L	SW846 6020	08/25-09/02/05	HH63N1AM
		Dilution Factor: 1		Analysis Time..: 22:00		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-26-10

TOTAL Metals

Lot-Sample #...: F5H240367-019 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	24.3	3	ug/L	SW846 6020	08/25-09/02/05	HH63R1AM
		Dilution Factor: 1		Analysis Time..: 22:04		

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: LPB37-RB

TOTAL Metals

Lot-Sample #...: F5H240367-020 Matrix.......: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5237351						
Lead	18.1	3	ug/L	SW846 6020	08/25-09/02/05	HH63X1AM
		Dilution Factor: 1		Analysis Time..: 22:09		

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: F5H240367 **Matrix.........: WATER**

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: F5H250000-351		Prep Batch #...: 5237351				
Lead	ND	3	ug/L	SW846 6020	08/25-09/02/05	HH85T1AJ
		Dilution Factor: 1				
		Analysis Time..: 20:11				

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: F5H240367 Matrix.........: WATER

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: F5H250000-351	Prep Batch #...: 5237351				
Lead	88	(85 - 115)	SW846 6020	08/25-09/02/05	HH85T1A2
		Dilution Factor: 1		Analysis Time..: 20:15	

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: F5H240367 Matrix.........: WATER
Date Sampled...: 08/18/05 Date Received..: 08/24/05

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: F5H240367-020 Prep Batch #...: 5237351					
Lead	88	(75 - 125)	SW846 6020	08/25-09/02/05	HH63X1CA
		Dilution Factor: 1		Analysis Time..: 22:09	

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

SAMPLE DUPLICATE EVALUATION REPORT

Metals

Client Lot #...: F5H240367   Work Order #...: HH63X-SMP HH63X-DUP   Matrix.......: WATER

Date Sampled...: 08/18/05   Date Received..: 08/24/05

PARAM	RESULT	DUPLICATE RESULT	UNITS	RPD	RPD LIMIT	METHOD	PREPARATION-ANALYSIS DATE	PREP BATCH #
Lead						SD Lot-Sample #: F5H240367-020		
	18.1	17.4	ug/L	3.9	(0-20)	SW846 6020	08/25-09/02/05	5237351
			Dilution Factor: 1			Analysis Time..: 22:09		

STL-ST. LOUIS

Metals Data Reporting Form

Initial Calibration Verification Standard

Instrument: ICPMS **Units:** ug/L

Chart Number: 090205M2.REP **Acceptable Range:** 90% - 110%

Standard Source: INORGANIC VENTURES **Standard ID:** See Standards Log

			ICV 9/2/05 1:48 PM									
Element	**WL/ Mass**	**True Conc**	**Found**	**% Rec**	**Found**	**% Rec**	**Found**	**% Rec**	**Found**	**% Rec**	**Found**	**% Rec**
Lead	208	200.0	192.42	96.2								

Version 4.75.1 *Form 2A Equivalent*

STL-ST. LOUIS

Metals Data Reporting Form

Continuing Calibration Verification

Instrument: ICPMS **Units:** ug/L

Chart Number: 090205M2.REP **Acceptable Range:** 90% - 110%

Standard Source: INORGANIC VENTURES **Standard ID:** See Standards Log

Element	Wt./ Mass	True Conc	CCV 9/2/05 2:15 PM		CCV 9/2/05 2:56 PM		CCV 9/2/05 3:54 PM		CCV 9/2/05 4:51 PM		CCV 9/2/05 5:47 PM	
			Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Lead	208	200.0	199.58	99.8	192.40	96.2	194.94	97.5	188.47	94.2	192.49	96.2

STL-ST. LOUIS

Metals Data Reporting Form

Continuing Calibration Verification

.strument: ICPMS

Units: ug/L

Chart Number: 090205M2.REP

Acceptable Range: 90% - 110%

Standard Source: INORGANIC VENTURES

Standard ID: See Standards Log

Element	WL/ Mass	True Conc	CCV 9/2/05 6:45 PM		CCV 9/2/05 7:41 PM		CCV 9/2/05 8:38 PM		CCV 9/2/05 9:35 PM		CCV 9/2/05 10:31 PM	
			Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Lead	208	200.0	195.35	97.7	192.47	96.2	189.60	94.8	194.36	97.2	197.80	98.9

Version 4.75.1

Form 2A Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

Contract Required Detection Limit Standard

Instrument: ICPMS **Units:** ug/L

Chart Number: 090205M2.REP **Acceptable Range:** 50% - 150%

Standard Source: Inorganic Ventures **Standard ID:** See Standards Log

			CRI 9/2/05 2:00 PM									
Element	WL/ Mass	True Conc	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Lead	208	3.0	2.85	95.1								

Version 4.75.1 *Form 2B Equivalent*

STL-ST. LOUIS

Metals Data Reporting Form

itial Calibration Blank Results

Instrument: ICPMS **Units:** ug/L

Chart Number: 090205M2.REP

Standard Source: **Standard ID:**

Element	WL/ Mass	Report Limit	ICB 9/2/05 1:54 PM									
			Found	Q	Found	Q	Found	Q	Found	Q	Found	Q
Lead	208	1.5	0.3	U								

Version 4.75.1

U Result is less than the IDL
B Result is between IDL and RL

Form 3 Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

Continuing Calibration Blank Results

Instrument: ICPMS **Units:** ug/L

Chart Number: 090205M2.REP

Standard Source: **Standard ID:**

Element	WL/ Mass	Report Limit	CCB 9/2/05 2:20 PM		CCB 9/2/05 3:02 PM		CCB 9/2/05 3:59 PM		CCB 9/2/05 4:56 PM		CCB 9/2/05 5:53 PM	
			Found	Q	Found	Q	Found	Q	Found	Q	Found	Q
Lead	208	1.5	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U

U Result is less than the IDL
B Result is between IDL and RL

STL-ST. LOUIS

Metals Data Reporting Form

Continuing Calibration Blank Results

Instrument: ICPMS **Units:** ug/L

Chart Number: 090205M2.REP

Standard Source: ______ **Standard ID:** ______

Element	WL/ Mass	Report Limit	CCB 9/2/05 6:50 PM Found	Q	CCB 9/2/05 7:47 PM Found	Q	CCB 9/2/05 8:44 PM Found	Q	CCB 9/2/05 9:41 PM Found	Q	CCB 9/2/05 10:37 PM Found	Q
Lead	208	1.5	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U

Version 4.75.1

U Result is less than the IDL
B Result is between IDL and RL

Form 3 Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

Preparation Blank Results

Lab Sample ID: HH85TB

Matrix: Water **Units:** ug/L **Prep Date:** 8/25/05 **Prep Batch:** 5237351

Weight: 50 **Volume:** 100 **Percent Moisture:** NA

Element	WL/ Mass	MDL	Report Limit	Conc	Q	DF	Instr	Anal Date	Anal Time
Lead	208	0.57	3.0	0.57	U	1	ICPMS	9/2/05	20:11

Comments: Lot #: F5H240367

Version 4.75.1

U Result is less than the IDL
B Result is between IDL and RL

Form 3 Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

Interference Check Standard A

.astrument: ICPMS

Units: ug/L

Chart Number: 090205M2.REP

Acceptable Range: 50% - 150%

Standard Source: Inorganic Ventures

Standard ID: See Standards Log

				ICSA 9/2/05 2:11 PM				
Element	WL/ Mass	Reporting Limit	True Conc	Found	Found	Found	Found	Found
Lead	208	1.5		0				

Version 4.75.1

U Result is less than the IDL
B Result is between IDL and RL

Form 4 Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

Interference Check Standard AB

Instrument: ICPMS **Units:** ug/L

Chart Number: 090205M2.REP **Acceptable Range:** 50% - 150%

Standard Source: Inorganic Ventures **Standard ID:** See Standards Log

			ICSAB 9/2/05 2:05 PM									
Element	**WL/ Mass**	**True Conc**	**Found**	**% Rec**	**Found**	**% Rec**	**Found**	**% Rec**	**Found**	**% Rec**	**Found**	**% Rec**
Lead	208	100	85.2	85.2								

STL-ST. LOUIS

Metals Data Reporting Form

trix Spike Sample Results

Spike Sample ID: HH63XS

Original Sample ID: HH63X **Client ID:** LPB37-RB S

Matrix: Water **Units:** ug/L **Prep Date:** 8/25/05 **Prep Batch:** 5237351

Weight: 50 **Volume:** 100 **Percent Moisture:** NA

Element	Wt./ Mass	OS Conc	Q	MS Conc	Q	Spike Level	% Rec	OS DF	MS DF	Instr	OS Anal Date	OS Anal Time	MS Anal Date	MS Anal Time
Lead	208	18.1		35.7		20	88.0	1	1	ICPMS	9/2/05	22:09	9/2/05	22:22

Comments: Lot #: F5H240367 Sample #: 20

on 4.75.1

U Result is less than the IDL
B Result is between IDL and RL
N Spike recovery failed
NC Percent recovery was not calculated
* Duplicate analysis RPD was not within limits

Form 5A Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

Duplicate Sample Results

Lab Sample ID: HH63XX **Client ID:** LPB37-RB X

Matrix: Water **Units:** ug/L **Prep Date:** 8/25/05 **Prep Batch:** 5237351

Weight: 50 **Volume:** 100 **Percent Moisture:** NA

Element	WL/ Mass	IDL	Report Limit	Conc	Q	DF	Instr	Anal Date	Anal Time
Lead	208	0.57	3.0	17.4		1	ICPMS	9/2/05	22:13

Comments: Lot #: F5H240367 Sample #: 20

Version 4.75.1 U Result is less than the IDL *Form I Equivalent*

STL-ST. LOUIS

Metals Data Reporting Form

Sample Duplicate RPD Report

Duplicate Sample ID: HH63XX

Original Sample ID: HH63X **Client ID:** LPB37-RB X

Matrix: Water **Units:** ug/L **Prep Date:** 8/25/05 **Prep Batch:** 5237351

Weight: 50 **Volume:** 100 **Percent Moisture:** NA

Element	Wt./Mass	OS Conc	Q	Dupe Conc	Q	% RPD	OS DF	Dupe DF	Instr	OS Anal Date	OS Anal Time	Dupe Anal Date	Dupe Anal Time
Lead	208	18.1		17.4		3.9	1	1	ICPMS	9/2/05	22:09	9/2/05	22:13

Version 4.75.1

U Result is less than the IDL
B Result is between IDL and RL
* Duplicate analysis RPD was not within limits

Form 6 Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

Laboratory Control Sample Results

Lab Sample ID: HH85TC

Matrix: Water **Units:** ug/L **Prep Date:** 8/25/05 **Prep Batch:** 5237351

Weight: 50 **Volume:** 100 **Percent Moisture:** NA

Element	Wt./ Mass	Spike Level	Conc	Percent Recovery	Q	Range	DF	Instr	Anal Date	Anal Time
Lead	208	500	443	88.5		80-120	1	ICPMS	9/2/05	20:15

Comments: Lot #: F5H240367

Version 4.75.1

U Result is less than the IDL

B Result is between IDL and RL

Form 7 Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

ial Dilution RPD Report

Serial Dilution Sample ID: HH63XV

Original Sample ID: HH63X **Client ID:** LPB37-RB

Matrix: Water **Units:** ug/L **Prep Date:** 8/25/05 **Prep Batch:** 5237351

Weight: 50 **Volume:** 100 **Percent Moisture:** NA

Element	WL/ Mass	OS Conc	Q	Serial Dilution Conc	Q	Percent Diff	OS DF	Ser Dil DF	Instr	OS Anal Date	OS Anal Time	Ser Dil Anal Date	Ser Dil Anal Time
Lead	208	18.1		17.3			1	5	ICPMS	9/2/05	22:09	9/2/05	22:27

mments: 10X

Version 4.75.1

U Result is less than the IDL
B Result is between IDL and RL
E Serial dilution percent difference not within limits

Form 9 Equivalent

STL-ST. LOUIS

Metals Data Reporting Form

Instrument Detection Limits

Instrument: ICPMS **Units:** ppb

Element	Wavelength /Mass	Reporting Limit	MDL	Date of MDL
Lead	208.00	1.5	0.28	1/28/05

ATTACHMENT C

DUST AND DEBRIS SAMPLING
WASTE CHARACTERIZATION ANALYTICAL DATA

SEVERN TRENT STL

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

Tel: 314 298 8566 Fax: 314 298 8757
www.stl-inc.com

ANALYTICAL REPORT

PROJECT NO. 2438S

Los Alamos Rad

Lot #: F4J290151

Joylene Valdez or Keith Greene

Los Alamos National Laboratory
SMO TA-00 Bldg 1237
DP: 03U; MS: 707
Los Alamos, NM 87545

SEVERN TRENT LABORATORIES, INC.

Elaine Wild for

Ed Kao
Project Manager

November 4, 2004

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: 10460-M

TCLP Metals

Lot-Sample #...: F4J290151-001 **Matrix.......:** SOLID
Date Sampled...: 10/26/04 **Date Received..:** 10/29/04
Leach Date.....: 11/02/04 **Leach Batch #..:** P430715

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 4308049						
Lead	ND	250	ug/L	SW846 6010B	11/03-11/04/04	GVR9H1EE
		Dilution Factor: 2.5		Analysis Time..: 10:43	Analyst ID.....: 401052	
		Instrument ID..: 61T				

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

SEVERN TRENT STL

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

Tel: 314 298 8566 Fax: 314 298 8757
www.stl-inc.com

ANALYTICAL REPORT

Los Alamos Rad

Lot #: F5B160149

Joylene Valdez or Keith Greene

Los Alamos National Laboratory
SMO TA-00 Bldg 1237
DP: 03U; MS: 707
Los Alamos, NM 87545

SEVERN TRENT LABORATORIES, INC.

Elaine Wild

Ed Kao
Project Manager

March 11, 2005

LOS ALAMOS NATIONAL LABORATORY

Client Sample ID: HV10460-M2

STRINGER SHAFT

TCLP Metals

Lot-Sample #...: F5B160149-012 Matrix.......: SOLID
Date Sampled...: 02/10/05 13:55 Date Received..: 02/16/05
Leach Date.....: 02/17/05 Leach Batch #..: P504815

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 5049224						
Arsenic	ND	500	ug/L	SW846 6010B	02/18-02/21/05	G4H0G1AA
		Dilution Factor: 2.5		Analysis Time..: 14:57	Analyst ID.....: 401052	
		Instrument ID..: 61T				
Barium	428 B	500	ug/L	SW846 6010B	02/18-02/21/05	G4H0G1AC
		Dilution Factor: 2.5		Analysis Time..: 14:57	Analyst ID.....: 401052	
		Instrument ID..: 61T				
Cadmium	ND	25	ug/L	SW846 6010B	02/18-02/21/05	G4H0G1AD
		Dilution Factor: 2.5		Analysis Time..: 14:57	Analyst ID.....: 401052	
		Instrument ID..: 61T				
Chromium	ND	50	ug/L	SW846 6010B	02/18-02/21/05	G4H0G1AE
		Dilution Factor: 2.5		Analysis Time..: 14:57	Analyst ID.....: 401052	
		Instrument ID..: 61T				
Lead	ND	250	ug/L	SW846 6010B	02/18-02/21/05	G4H0G1AF
		Dilution Factor: 2.5		Analysis Time..: 14:57	Analyst ID.....: 401052	
		Instrument ID..: 61T				
Silver	ND	50	ug/L	SW846 6010B	02/18-02/21/05	G4H0G1AG
		Dilution Factor: 2.5		Analysis Time..: 14:57	Analyst ID.....: 401052	
		Instrument ID..: 61T				
Selenium	ND	500	ug/L	SW846 6010B	02/18-02/21/05	G4H0G1AH
		Dilution Factor: 2.5		Analysis Time..: 14:57	Analyst ID.....: 401052	
		Instrument ID..: 61T				
Prep Batch #...: 5051063						
Mercury	ND	10	ug/L	SW846 7470A	02/20-02/21/05	G4H0G1AJ
		Dilution Factor: 5		Analysis Time..: 19:55	Analyst ID.....: 402423	
		Instrument ID..: HAA				

NOTE(S):

Analysis performed in accordance with USEPA Toxicity Characteristic Leaching Procedure Method 1311

B Estimated result. Result is less than RL.

ATTACHMENT D

HUMAN HEALTH RISK ASSESSMENT METHODOLOGY:

TECHNICAL AREA 54, AREA L, STORAGE SHAFTS 36 AND 37
CONTAINER STORAGE UNIT

HUMAN HEALTH RISK ASSESSMENT METHODOLOGY: Technical Area 54, Area L, Storage Shafts 36 and 37 Container Storage Unit

D.1 INTRODUCTION

This attachment presents the assessment of potential risks associated with lead residues on the interior surfaces of Storage Shafts 36 and 37 (the Storage Shafts Container Storage Unit [CSU]) located at Technical Area (TA) 54, Area L. The Storage Shafts CSU was an interim status storage unit for mixed waste lead stringers. Waste was removed from the CSU as referenced and/or described in Section 2.0 of the closure certification report.

The assessment evaluates potential risks to future workers in the vicinity of the Storage Shafts CSU site after removal of the lead stringers. Results of lead decontamination verification sampling and development of exposure point concentrations are described in Section D.2. Exposure assumptions and the description of potential intake by workers are described in Section D.3. Estimated risks to human health from exposure and conclusions are described in Section D.4. Section D.5 describes uncertainties associated with the risk assessment, and references are provided in Section D.6.

D.2 DATA EVALUATION

The collection of wipe samples from the interior surfaces of Shafts 36 and 37 are described in Section 2.0 of the closure certification report. The maximum concentration of lead measured on a surface wipe sample (18.2 micrograms lead per 100 square centimeters [μg Pb/100 cm^2]) from Shaft 36 and 8.63 μg Pb/100 cm^2 from Shaft 37 (Table 1 in the closure certification report) were used in the risk assessment.

D.3 EXPOSURE ASSESSMENT

The assessment of exposure to lead on interior shaft surfaces involves identification of complete exposure pathways. A complete exposure pathway is defined by all of the following factors (U.S. Environmental Protection Agency [EPA], 1989):

- Source of contaminated media
- Contaminant release mechanisms
- Contaminant transport pathways

- Intermediate or transport media
- Exposure media
- Receptors
- Routes of exposure.

If any of these factors is absent, the exposure pathway is considered incomplete and has no associated risk.

D.3.1 Lead Release and Transport

The design of the storage shafts and the retrieval of lead stringers for disposal are documented in the "Los Alamos National Laboratory Technical Area 54, Area L, Storage Shafts 36 and 37 Closure Sampling and Analysis Plan" (LANL, 2005), which is included as Attachment A of the closure certification report. Section 2.0 of the report describes surface wipe sampling of interior surfaces following waste retrieval. The maximum lead concentrations that were measured on wipe samples from each shaft (Table 1 in the closure certification report) are assumed to represent the surficial lead concentration throughout each shaft, and are used as the exposure point concentrations in the risk assessment. The assessment incorporates release by physical release of lead from the interior shaft surface and suspension as airborne dust. Although the shafts will remain closed with steel covers, the lead release and transport scenario assumes a leaking shaft cover that goes undetected for one year.

D.3.2 Human Receptors and Exposure Pathways

The human receptor for potential exposure at the Storage Shafts CSU is assumed to be a full time worker in the western corner of Area L. Since removal of the lead stringers, the shafts were covered to prevent inadvertent entry. Because any future work planned in the shafts will require confined space work permits (that specify characterization of the shafts) and health and safety plans, potential exposure pathways for a worker to lead in the shafts by direct dermal contact or incidental ingestion of dust are assumed to be incomplete. Potential inhalation exposures of workers near the shafts to airborne dust released from the shafts are considered a complete pathway in this risk assessment.

D.3.3 Surface Wipe Lead Model for Worker Exposure

Risk assessment methods based on threshold values do not apply in the Storage Shafts CSU closure because lead toxicity does not exhibit a threshold for non-cancer health effects. Therefore, the EPA has developed the Adult Lead Model (ALM) to address worker exposures

(EPA, 2003). The ALM estimates the lead concentration in the blood of a pregnant worker exposed by ingestion of soil and dust. However, the ALM does not address the inhalation pathway, except as a default baseline concentration that also includes dietary contributions. Various other simulation models developed to evaluate blood lead concentration from exposures to lead have been reviewed and compared with the ALM (EPA, 2001). Although none of the models reviewed address worker exposure to lead contamination on surfaces, the review found that the model developed by the California Department of Toxic Substances Control (DTSC) (DTSC, 2000) specifically addresses the inhalation exposure pathways and can provide simulation results consistent with the ALM.

The surface wipe model developed for this risk assessment is a modification of the model (DTSC, 2000) that evaluates exposure to lead on surfaces as measured by wipe samples. The surface wipe model and the DTSC model assume that the concentration of lead in blood is calculated using Equation 1.

$$PbB_{adult} = PbB_0 + \left\{ Pb_{sw} \times \frac{EF}{AT} \times SF_{inh} \times K \times CF \right\} \quad Eq\,(1)$$

The ALM describes the concentration of lead in fetal blood according to Equation 2.

$$PbB_{fetal} = PbB_{adult} \times R_{fetal/maternal} \qquad Eq(2)$$

The EPA guidance (EPA, 1986 and 2003) assumes that PbB_{adult} is lognormally distributed and described by Equation 3. The guidance requires remediation of lead concentrations such that PbB_{fetal} will not exceed 10 micrograms per deciliter (µg/dL) with 95% confidence as described in:

$$PbB_{fetal,0.95} = PbB_{fetal} \times GSD^{1.645} \qquad Eq\,(3)$$

PbB_{adult} represents the estimated concentration of lead in blood of an adult worker expressed in µg/dL. $PbB_{fetal,0.95}$ represents the 95th percentile of fetal blood lead concentration, µg/dL. Other factors and their default values are shown in Table D-1.

The regulatory goal for the 95th percentile fetal blood lead concentration ($PbB_{fetal,\ goal}$) is specified as 10 µg Pb/dL to be achieved with 95% confidence (EPA, 1986 and 2003). Therefore, use of the model to evaluate whether the Storage Shafts CSU residual concentrations meet the specified limit requires that:

$$PbB_{fetal,0.95} \leq PbB_{fetal\,goal} = 10 \mu g / dL \qquad Eq(4)$$

D.3.4 Exposure Factors

The surface wipe model (Eq 1-4) is applied to evaluate $PbB_{fetal,0.95}$ using exposure factors described in Table D-1. The maximum lead concentrations measured on wipe samples from the interior of the shafts were assumed to be representative of the surficial lead concentration in the shafts after removal of the lead stringers.

In the model (Table D-1), default values are used for PbB_0 and $R_{fetal/maternal}$, the geometric standard deviation (GSD) of the mean blood lead concentration in the adult population (EPA, 2003), and the exposure frequency (EF) (EPA, 1989). The slope factor used in the calculations for inhalation exposures (SF_{inh}) is given in EPA (1986) guidance. The inhalation exposure pathway included the resuspension factor (K) as empirically developed to estimate resuspension of dust from soil surfaces by pedestrians or vehicular traffic (Linsley, 1978; Royal Society, 2002). The chosen values for EF and averaging time (AT) are consistent with EPA (1989 and 2003) guidance and with LANL (2000) guidance.

D.4. RISK CHARACTERIZATION AND CONCLUSIONS

The estimated concentrations of lead in blood of the worker and the fetus (Table D-1) are well below the goal of 10 µg/dL specified in EPA guidance (EPA, 1986 and 2003) with 95% confidence. This conclusion is confirmed by the calculation of the probability that the mean blood lead concentration of the fetus (PbB_{fetal}) exceeds 10 µg/dL based on the assumption that the adult blood lead concentration is lognormally distributed (EPA, 1986 and 2003). For a distribution with geometric mean concentration (PbB_{fetal}) of 1.6 and GSD of 1.8, the probability that the mean concentration exceeds 10 µg/dL is approximately 0.3% (Table D-1). Based on this assessment, the potential risk to a future worker at Area L from exposure to lead dust resuspended from the interior surfaces of Storage Shafts 36 or 37 and released through a leaking shaft cover is below the applicable criterion specified in EPA guidance (EPA, 1986).

D.5 UNCERTAINTIES

Generally, risk assessments carry two types of uncertainty. Measurement uncertainty refers to the usual variance that accompanies measurements of chemical concentrations (e.g., uncertainty associated with laboratory instrument accuracy and precision). Methodological uncertainty arises from assumptions made to account for gaps in knowledge of the site and the potentially exposed population. Assumptions related to the use of data from the sampling effort to verify decontamination of the Storage Shafts CSU and use of default exposure parameters are the predominant sources of uncertainty in this assessment.

Use of the maximum concentration of lead measured on wipe samples as representative of the entire interior surface of the shafts introduces uncertainty to the exposure assessment. However, the uncertainty is believed to conservatively overestimate the surface concentration in other decontaminated areas.

In the absence of data describing future workers at Area L, the use of default parameters describing the intake of lead by the inhalation pathway, and the variability of the adult population, introduce additional uncertainty. However, the regulatory limit of mean blood concentration (10 µg/dL) was developed as a conservatively protective criterion (EPA, 1986 and 2003). The default parameters used to describe exposure were all developed, as described in the references cited, to result in conservatively high estimates of blood lead concentration in an otherwise uncharacterized worker population. Therefore, the exposure assumptions address the absence of specific data about the future worker population by selecting conservatively protective values.

The assumption that an Area L worker will be employed full time (250 days/year) in the vicinity of the shafts, when coupled with the assumption that leaking of airborne lead from the shaft will be undiscovered for a year, represent a reasonably conservative overestimation of inhalation exposure.

The assumption that an unknown mechanical process will suspend lead from the interior surface of the shafts, which is then released through leaking shaft covers, is an extremely conservative assumption. The use of the dust resuspension factor ($K = 1 \times 10^{-7}\ cm^{-1}$), which was developed to approximate suspension of dust from bare soil by pedestrians or vehicular traffic, leads to further overestimation of the airborne lead concentration available for worker exposure.

D.6 REFERENCES

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Table D-1

Risk Assessment of Workers Potentially Exposed to Lead Contained on Surfaces in Shafts 36 and 37 at the Technical Area 54, Area L, Storage Shafts Container Storage Unit Los Alamos National Laboratory, Los Alamos, New Mexico

Exposure Parameter	Exposure Parameter Description	Units	Parameter	Reference
Pbsw Shaft 36	**Lead concentration on wipe/100** [a]	**ug/cm^2**	**1.82E-01**	**Maximum Observed in Shaft 36**
Pbsw Shaft 37	**Lead concentration on wipe/100** [a]	**ug/cm^2**	**8.63E-02**	**Maximum Observed in Shaft 37**
PbBfetal goal	Goal for the 95th percentile fetal blood lead concentration	ug/dL	10.0	USEPA, 2003
PbB_o	Baseline blood concentration in absence of site exposure	ug/dL	2.2	USEPA, 2003 [b]
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	USEPA, 2003
SF_{inh}	Inhalation Slope Factor	ug/dL per ug/m^3	1.64	USEPA, 1986
GSD	Geometric standard deviation of PbBadult in U. S. population	--	1.8	USEPA, 2003
K	Dust Resuspension Factor	cm^{-1}	1.0E-07	Linsley, 1978; Royal Society, 2002
CF	Conversion Factor	cm^3/m^3	1.E+06	--
EF	Exposure Frequency	days/yr	250	USEPA, 1989
AT	Averaging Time	days/yr	365	--
Surface Wipe Model Result for Shaft 36 [c]				
			PbBadult = PbB0 + (Pbsw*(EF/AT)*SFinh*K*CF) =	**2.2E+00**
			PbB fetal = PbBadult * R =	**2.0E+00**
			PbBfetal, 0.95 = PbBfetal * (GSD$^{1.645}$) =	**5.3E+00**
			P(PbBfetal > PbBfetal,goal) [b] (%) =	**0.3%**
Surface Wipe Model Result for Shaft 37 [c]				
			PbBadult = PbB0 + (Pbsw*(EF/AT)*SFinh*K*CF) =	**2.2E+00**
			PbB fetal = PbBadult * R =	**2.0E+00**
			PbBfetal, 0.95 = PbBfetal * (GSD$^{1.645}$) =	**5.3E+00**
			P(PbBfetal > PbBfetal,goal) [b] (%) =	**0.3%**

Footnotes

[a] Surface wipe concentrations are reported in units of µg/100cm^2
[b] Upper value of plausible range reported for U. S. women ages 20 to 49 years.
[c] Equations based on Equations 1-3 in USEPA (2003)

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