LANL TA 50

Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

SEP 2 0 2004

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NMED Hazardous
Waste Bureau

John Kieling, Manager
RCRA Permits Management Program
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2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Dear Mr. Kieling:

Subject: Transmittal of the U.S. Department of Energy-National Nuclear Security Administration (DOE-NNSA)/University of California (UC) Closure Certification Report for Technical Area 50, Building 114 (TA-50-114)

The purpose of this letter is to transmit for your review three copies of the DOE-NNSA/UC Closure Certification Report for the hazardous waste management unit located at Los Alamos National Laboratory (LANL), TA-50-114. Activities associated with these closures were conducted in accordance with an amended closure plan approved in correspondence from your office dated March 24, 2004. DOE-NNSA/UC request that this unit be removed from the permit subsequent to your approval.
If you have any comments or questions regarding this submittal, please contact either myself at (505) 667-5794 or Jack Ellvinger, UC, at (505) 667-0633.

Sincerely,

Gene Turner

Gene Turner
Environmental Permitting Manager

EM:5GT-012

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CLOSURE CERTIFICATION REPORT

Technical Area 50, Building 114
Container Storage Unit

Revision 0.0

LA-UR-04-6556
September 2004

Prepared For:
Risk Reduction and Environmental Stewardship Division,
Solid Waste Regulatory Compliance Group
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

CLOSURE CERTIFICATION REPORT

Technical Area 50, Building 114
Container Storage Unit

Revision 0.0

LA-UR-04-6556

Facility ID No.: NM0890010515

Facility Name: Los Alamos National Laboratory

Legal Owner: U.S. Department of Energy

Legal Operators: U.S. Department of Energy
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Date: September 2004

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LIST OF ACRONYMS/ABBREVIATIONS

20.4.1.500 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CFR	Code of Federal Regulations
cm^2	square centimeter(s)
COPC	contaminant of potential concern
CSU	container storage unit
DI	deionized
EPA	U.S. Environmental Protection Agency
ft	feet/foot
HEPA	high efficiency particulate air
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
LANL	Los Alamos National Laboratory
MSSL	Medium-Specific Screening Level
NIOSH	National Institute of Occupational Safety and Health
NMED	New Mexico Environment Department
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SVOC	semivolatile organic compound
SW-846	*"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"*
SWRC	Solid Waste Regulatory Compliance
TA	technical area
TSDF	treatment, storage, and disposal facility
VOC	volatile organic compound
WTCIATWG	World Trade Center Indoor Air Taskforce Working Group

EXECUTIVE SUMMARY

The purpose of the attached Closure Certification Report is to describe the closure activities implemented to complete closure of the Resource Conservation and Recovery Act permitted container storage unit (CSU) located at the Los Alamos National Laboratory (LANL) Technical Area (TA) 50, Building 114 (TA-50-114). The closure was witnessed by an independent, registered professional engineer or a designated inspector under the engineer's direct supervision. The closure activities were implemented in accordance with the approved closure plan.

The TA-50-114 CSU was decontaminated in August 2002. The effectiveness of the decontamination procedure was verified through rinse/wash water and swipe sampling conducted in August 2002 and July 2004, respectively. The samples were analyzed for total metals, semi-volatile organic compounds, and volatile organic compounds based upon the composition of waste items known to have been stored in the CSU. The performance standard for closure was no residual hazardous constituent concentrations above baseline results, quality assurance/quality control results, U.S. Environmental Protection Agency (EPA) Region 6 Human Health Medium Specific Screening Levels, and/or EPA guidance for occupational risk exposure.

All surfaces of the TA-50-114 CSU were able to meet a performance standard for closure after decontamination. LANL is seeking approval of the attached Closure Certification Report by the New Mexico Environment Department as an adequate demonstration of closure in accordance with the approved Closure Plan.

CLOSURE CERTIFICATION REPORT

Technical Area 50, Building 114
Container Storage Unit

1.0 INTRODUCTION

The information provided in this Closure Certification Report is submitted to describe the closure activities implemented to close the Technical Area (TA) 50, Building 114 (TA-50-114) container storage unit (CSU) at the Los Alamos National Laboratory (LANL). These closure activities will minimize the need for further maintenance, preclude the release of hazardous constituents to environmental media, and be protective of human heath in accordance with the closure performance standards specified in New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart V (20.4.1.500 NMAC) (incorporating Code of Federal Regulations [CFR], Title 40 §264.115), revised October 1, 2003.

The closure activities described in this report were implemented in accordance with the procedures outlined in the following documents:

- *LANL Hazardous Waste Facility Permit*, Amended Closure Plan Attachment E.3, NM0890010515, August 2003, hereinafter referred to as the Closure Plan (Appendix A).
- Martin, Sandra Y., Letter to Nanos, G. Pete and Erickson, Ralph, *Approval of Class I Permit Modification – Technical Area 50 Closure Plans: TA-50-114 Container Storage Unit, Permit Attachment E.3; TA-50-37, Room 117 Container Storage Unit, Permit Attachment E.5; TA-50-37, Controlled Air Incinerator Exhaust System, Permit Attachment E.4. Resource Conservation and Recovery Act (RCRA) Hazardous Waste Facility Permit Los Alamos National Laboratory*, EPA ID# NM0890010515, HWB-LANL-02-014, March 24, 2004 (Appendix B).

1.1 Background

TA-50 is located at the northeast corner of the intersection of Pajarito Drive and Pecos Road, on the mesa bounded by Mortandad Canyon to the north and Two-Mile Canyon to the south (Figure 1-1 and 1-2). Figure 1-1 shows the location of TA-50 at LANL and Figure 1-2 provides the location of the TA-50-114 CSU addressed in this Closure Certification Report.

The TA-50-114 CSU stored waste generated from various research activities, material processing and recovery operations, and decontamination and decommissioning operations

conducted at various TAs throughout LANL. The maximum total inventory of waste previously stored at the TA-50-114 CSU at any one time is estimated as 1,210 gallons.

1.2 Purpose

The purpose of this Closure Certification Report is to document the implementation of closure activities for the TA-50-114 CSU as described in the Closure Plan. Additionally, this report presents the independent registered professional engineer's closure certification as required by 20.4.1.500 NMAC (incorporating 40 CFR §264.115), revised October 1, 2003.

2.0 PERFORMANCE OF CLOSURE AT THE TA-50-114 CONTAINER STORAGE UNIT

The information provided in this section documents the implementation and completion of the closure activities for the Technical Area (TA) 50, Building 114 (TA-50-114) container storage unit (CSU). Closure was performed in accordance with the Closure Plan provided in Appendix A. The operating record, field logbook, analytical data, chain of custody documentation, and decontamination waste disposal records in support of the completed closure activities at the TA-50-114 CSU will be maintained by the Los Alamos National Laboratory (LANL) Risk Reduction and Environmental Stewardship Division Solid Waste Regulatory Compliance Group (SWRC) and the certifying engineer for this report.

2.1 Description

The TA-50-114 CSU consists of a storage locker located south of the eastern wing of TA-50-1. The locker is a prefabricated metal building approximately 9-feet (ft) wide, 23-ft-long, and 9-ft high. It has three doors and is anchored to a concrete pad with the long dimension oriented east/west. The CSU is divided by a metal wall into two separate cells, labeled Cell #1 and Cell #2 for the purposes of this report (Figure 2-1). Each cell has a grated metal floor suspended on steel supports above a recessed containment area (~775 gallons/cell). Waste containers were placed on the grated floor during storage. The CSU was used for hazardous and mixed waste storage of 5-, 30-, 55-, 83-, and 85- gallon drums/containers; fiber/cardboard boxes; and equipment packaged in plastic bags in support of operations at the Radioactive Liquid Waste Treatment Facility.

The TA-50-114 CSU received its final waste containers for storage on April 19, 2002. On that date, the unit contained 30- and 55-gallon drums of solid waste that carried the U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers D003 and D008. Each of these containers were either shipped to the treatment, storage, and disposal facility (TSDF) in Bear Creek, Tennessee or moved to the TA-50-1, Room 59 CSU prior to being sent to the LANL TSDF at TA-54. The last date of waste storage at the TA-50-114 CSU was July 1, 2002.

2.2 Pre-Closure Inspection

The TA-50-114 CSU was inspected by LANL and contract personnel prior to the commencement of closure activities. This inspection was conducted with the steel grating and supports in place. Figures 2-2 and 2-3 of this Closure Report provide a photographic record of

the pre-closure inspection and show that dust and debris had accumulated in the recessed containment area of both Cell #1 and Cell #2. These photos also show that an opaque plastic liner was installed in the recessed containment area of each cell.

The liner in each cell consisted of several pieces connected together and sealed with clear epoxy caulking at the seams. The liner covered the entire floor of the recessed area and up the sides of each cell approximately 6 inches. Pieces of metal flashing were used to cover the top edge of the plastic on the sides to prevent leaks from dripping under the liner. This flashing was bolted into the metal sides of the building and the wall between each cell. The plastic liner was covered with dust and debris and appeared to be intact.

2.3 Closure Activities

Closure activities at the TA-50-114 CSU consisted of decontamination, verification sampling, and swipe sampling of the large and small containment area surfaces. Decontamination and verification activities at the TA-50-114 CSU began on August 23, 2002 and were completed on July 1, 2004. The following sections provide a detailed description of the steps taken to decontaminate each cell of the CSU and collect the necessary samples to verify closure as described in the Closure Plan.

2.3.1 Decontamination

Decontamination of the TA-50-114 CSU involved a five-step process: 1) removal of the floor grating in Cell #1 and Cell #2 to gain access to the recessed containment area; 2) removal of dust and debris from the supports, walls, and floor of the containment area; 3) removal of paint and rust on surfaces of the floors in Cell #1 and Cell #2; 4) inspection of the CSU for loss of containment and removal of the plastic liner; and 5) sequential washing and scrubbing of the walls and floors of the containment areas.

2.3.1.1 Steel Grating Removal

The floor grating located in both Cell #1 and Cell #2 of the CSU was removed to gain access to the recessed containment area. There were several sections of grating associated with each cell. Each section was removed, wrapped in plastic, and labeled with its location (Figure 2-4). The wrapped grating was then loaded onto a pallet and moved to a nearby location for temporary storage pending characterization based upon the analytical results of the decontamination wash solutions (Figure 2-5).

2.3.1.2 Dust and Debris Removal

Dust and debris removal from the cells was accomplished with the supports still in place using brushes, brooms, and a dustpan (Figures 2-6 to 2-7). The supports were first swept off and then the material was picked up using the dustpan to transfer it to a plastic bag. After the majority of the material was removed, the supports were unbolted and turned on their side. A high efficiency particulate air (HEPA) filter vacuum was utilized to remove the finer dust and particles from the floor of each cell and from the surfaces of each support.

The supports for the grating were located in the containment area of each cell and were swept and vacuumed to remove any dust or particles (Figures 2-8 and 2-10). The supports were then removed and wrapped in plastic pending characterization based upon the analytical results of the decontamination wash water. The supports were moved to the same temporary storage location as the grating (Figure 2-11).

As described in Section 2.2, a plastic liner was discovered in the recessed containment area of Cell #1 and Cell #2 of the TA-50-114 CSU. As the dust and debris was removed from each recessed containment area, the decontamination personnel noted that liquid had collected underneath the liner. Additional inspection provided evidence of pooled liquid located between the liner and the metal floor of each cell (Figures 2-12 and 2-13) which indicated that the liner failed either to provide adequate containment or prevent run-on into the CSU. The water had also caused the paint to peel and rust (Figures 2-14 and 2-15). At this point, work was stopped, and the closure approach reevaluated.

2.3.1.3 Liner Inspection and Removal

A detailed inspection of the CSU and its surrounding environment was conducted by LANL and contract personnel. This inspection was used to determine if the loss of containment by the liner had resulted in the failure of the metal floor of the CSU and a potential release of hazardous constituents to the environment. Inspection of the asphalt pad underneath the CSU revealed no evidence (i.e., discolored asphalt) of a release from the CSU. Rust stains were discovered inside the CSU, which started at several of the holes used to bolt the metal stripping over the edge of the liner (described in Section 2.2) and ended at the metal floor of the CSU. This indicated that the water had come into the structure via storm run-on.

The decontamination personnel, in cooperation with LANL SWRC personnel, determined that the liner in each cell would have to be removed and the rusted metal and paint scraped up and removed prior to a third inspection and decontamination of the CSU surfaces. These new activities constituted a deviation in the closure plan. The New Mexico Environment Department (NMED) was notified by the SWRC. The NMED agreed with the change and verbally approved the continuation of closure on August 26, 2002 (Appendix B).

Closure activities at the CSU recommenced on August 28, 2002 with removal of the liner. The liner was removed by cutting/pulling it up and breaking it into pieces (Figures 2-16 and 2-17). The pieces of liner were packaged in plastic and removed from the CSU for storage in a B25 waste container pending characterization sampling and analysis (Figure 2-18).

2.3.1.4 Surfaces

The pooled water between the liner and the painted metal surface of each cell had caused the paint to peel and rust (Figures 2-19 and 2-20). Decontamination personnel removed the paint and rust using scrapers, brooms, and a dustpan prior to decontamination. The floor of each containment area was scraped until no additional paint or rust could be removed and the resulting debris was then packaged into plastic bags pending characterization sampling and analysis. The liquid in Cell #1 evaporated during the removal process. Cell #2 had more water located in the containment area then Cell #1. This water was vacuumed out of the containment area prior to removal of the peeled paint and rust. Figures 2-21 to 2-23 provide photographs of these activities in both Cell #1 and Cell #2.

The scraping of the floor in each cell provided a debris-free surface to decontaminate using the wash water solution described in the Closure Plan. Prior to commencing decontamination, the floor of each cell was inspected to ensure that the integrity was sufficient to contain decontamination liquids that might accumulate in the containment area, if any. A third inspection by the LANL and contract personnel verified the containment capability of the floor and decontamination of each cell was begun.

2.3.1.5 Washing and Scrubbing of Walls and Floors

Decontamination of the CSU surfaces was conducted using an Alconox® and deionized (DI) water solution. Each cell was decontaminated twice (Figures 2-24 and 2-25). The first time, sponges were submerged into the solution, squeezed out, and then used to wipe down the floor

and walls of each cell. The second time, cheese cloth was submerged into the solution, squeezed out, and then used to wipe down the surface. This process was repeated until the entire surface had been wiped down twice. The walls in each cell were decontaminated to a minimum height of 5 ft above the recessed containment area and the entire floor was wiped down. Figures 2-26 and 2-27 provide photographs of each cell after the decontamination was completed and just prior to verification sampling.

2.3.2 Verification Sampling

Verification of closure at the TA-50-114 CSU was conducted using wash water sampling as described in Section E.3.4 of the Closure Plan. This included the wipe down of discrete surfaces within each cell using a sponge wetted with a solution of Alconox® and DI water. New Tyvek® coveralls were used by verification personnel for each cell and gloves were changed prior to each surface verification wipe down and subsequent sample collection. The following steps were followed for each surface:

1. A clean 5-gallon bucket containing approximately 2 gallons of DI water, Alconox®, and a sponge was placed into the cell.
2. The sponge was submerged into the bucket and squeezed out.
3. The surface was wiped down using the sponge.
4. Steps 2 and 3 were repeated (Figures 2-28 and 2-29).
5. The wash water solution was sampled by pouring the water into the sample containers (Figures 2-30, 2-31, and 2-32).
6. The sample containers were labeled and placed in a cooler pending shipment to the laboratory for analysis.

Table 2-1 identifies the verification samples collected for closure including the sample numbers, locations, descriptions, and requested analysis.

2.3.2.1 Baseline Samples

Baseline samples were also collected from three of the 5-gallon buckets used to contain the wash water from which the verification samples were collected. These buckets were allowed to sit overnight with a nitrile glove and sponge submerged in the wash water solution of DI water and Alconox® to determine if these materials contributed any contaminants to the samples. Table 2-1 identifies the baseline samples collected in the TA-50-114 CSU.

2.3.2.2 Quality Assurance/Quality Control Samples

The requisite quality assurance (QA)/quality control (QC) samples were prepared and/or collected in accordance with Section E.3.8 of the Closure Plan. Trip blanks were prepared for each of the five sample shipping coolers and a field duplicate set of samples was collected from the floor of Cell #1 during verification sampling on August 29, 2002. A crane that emitted a significant amount of exhaust when operating was moved into the vicinity of the TA-50-114 CSU while the verification sampling was in progress, potentially contaminating the samples. Figure 2-33 is a photograph of the crane and its proximity to the TA-50-114 and the verification sampling. A field blank was prepared for August 29, 2002 and was exposed to the crane exhaust present at the site during sampling.

2.3.2.3 Waste Characterization Samples

Samples of the used decontamination wash water solution were collected for waste characterization of the decontamination solution, personal protective equipment (PPE), sponges, cheese cloth, and other waste items generated during closure activities (Figure 2-34). In addition, composite samples of dust and debris, the plastic liner, and the paint/rust scrapings described in Sections 2.3.1.2, 2.3.1.3, and 2.3.1.4, respectively, were submitted to the laboratory for analysis. Figure 2-35 is a photograph of the sample collection process. Section 2.7 provides the waste characterization results including additional detail regarding waste management.

2.3.3 Swipe Sampling

Analytical results from the verification samples collected in August 2002 indicated that several of the CSU surfaces did not meet the criteria specified for closure (Section 2.4.8). The analytical data from these locations were not directly related to a reasonable risk-based scenario for exposure (i.e., inhalation, dermal absorption) to an occupational worker. Therefore, the data were used to identify locations where subsequent swipe samples were collected. The swipe samples were collected from each location on July 1, 2004. Figures 2-36 through 2-44 provide a photographic record of the swipe sampling. Table 2-2 identifies the swipe samples collected for closure of the TA-50-114 CSU and includes the sample numbers, locations, descriptions, and requested analysis.

Swipe samples were collected using the *National Institute of Occupational Safety and Health Manual of Analytical Methods* (National Institute of Occupational Safety and Health [NIOSH],

1996) for collection of lead swipe samples. This method included wiping a 100 square centimeter (cm^2) area (identified using a template) at each discrete location with a swipe wetted with appropriate collection media (Table 2-3) for the analytes to be sampled. The following steps were followed for each surface:

1. Don a clean pair of gloves.
2. Remove the swipe from its sample jar and/or packaging.
3. Fold the swipe into fourths.
4. Wipe the surface to be sampled with firm pressure using an overlapping "S" pattern to cover the entire surface area with horizontal strokes (approximately 100 cm^2).
5. Fold the swipe, exposed side in, and place into a clean hard-walled sample container.
6. Seal the container and label.
7. Repeat steps 2 - 6 for the other analytes to be sampled for at that location.
8. Discard gloves.

2.3.3.1 Baseline Samples

Three baseline samples were collected (Figure 2-44) to determine if the materials used during sampling and/or the local environment contributed any contaminants to the samples. The baseline samples were collected by handling the swipes wearing nitrile gloves and wiping the swipe on the sample collection equipment. The swipe was then packaged in a container and labeled for analysis. Table 2-2 lists the baseline samples collected during swipe sampling.

2.3.3.2 Quality Assurance/Quality Control Samples

The requisite QA/QC samples were prepared and/or collected in accordance with Section E.3.8 of the Closure Plan. A trip blank was prepared for the sample shipping coolers, a field blank was collected, and one field duplicate sample was collected based on 20 percent of the swipe samples. Table 2-2 summarizes the QA/QC samples collected during swipe sampling.

2.4 Deviations from the Closure Plan

There were no closure plan modifications or amendments as described in New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart V (NMAC 20.4.1.500) (incorporating Code of Federal Regulations, Title 40, §264.112) and Section E.3.8 of the Closure Plan. However, there were several procedural refinements associated with decontamination of the CSU and the collection of verification samples. The following sections provide a detailed

description of all deviations from the Closure Plan and procedures as submitted to the NMED in August 2003.

2.4.1 Dust and Debris

The pre-closure inspection identified the presence of a significant amount of dust and debris located in the recessed containment area of Cell #1 and Cell #2 of the CSU. The Closure Plan assumed, based upon the operating record, that the containment areas of the CSU were free of any solid or liquid material. Due to this assumption, the Closure Plan did not include procedures for the removal of dust and debris from the CSU during decontamination. Upon completion of the pre-closure inspection, the decontamination procedure was refined to include the use of brooms, brushes, dustpans, and a vacuum to remove all of the dust and debris from the CSU prior to decontamination. This was accomplished as described in Section 2.3.1.2. A single composite sample of the material was collected for waste management purposes. The waste was determined to be non-hazardous.

2.4.2 Plastic Liner

The pre-closure inspection identified the presence of a plastic liner in the recessed containment area of Cell #1 and Cell #2 of the CSU. As the dust and debris was removed from the containment, it was discovered that liquid had collected beneath the liner causing the painted surface of the floor to peel and rust. Further inspection provided evidence that the liquid had entered the unit through the bolt holes used to secure the liner in the containment area of each cell. The decontamination personnel, in cooperation with LANL SWRC personnel, determined that the liner in each cell would have to be removed. This constituted a deviation of the decontamination procedures in the Closure Plan and the NMED was notified by SWRC. The NMED verbally approved the continuation of closure on August 26, 2003 (Appendix B) as described in Section 2.3.1.3.

The liner in each cell was broken up into pieces and put into plastic bags as described in Section 2.3.1.3. The liquid in Cell #1 evaporated during the removal process. The liquid in Cell #2 was removed using the HEPA filter vacuum as described in Section 2.3.1.4. The plastic was characterized for waste management purposes and was determined to be non-hazardous.

2.4.3 Paint and Rust Removal

The removal of the liner and liquid left behind a floor surface in the containment area of each cell that was unsuitable (due to peeling paint and rust) for decontamination in accordance with Section E.3.3 of the Closure Plan (Figures 2-19 and 2-20). The decontamination personnel refined the decontamination procedure to include the removal of the paint and rust using scrapers, brushes, and a dustpan as described in Section 2.3.1.4. The paint and rust scrapings were removed from each cell and put into plastic bags (Figures 2-21 and 2-23). A single composite sample of the removed material was collected for waste management purposes and was determined to be non-hazardous.

2.4.4 Baseline Verification Samples

Section E.3.4 of the Closure Plan called for the collection of a baseline sample prior to the wipe down of each discrete surface to undergo verification sampling. This was excessive given the number of discrete sample locations associated with verification of closure and the use of identical sampling equipment and media. Therefore, LANL and contract personnel collected three baseline samples of unused verification wash water solution.

2.4.5 Swipe Samples

Verification samples collected from the wash water in August 2002 were not sufficient to demonstrate closure in accordance with the criteria specified in the Closure Plan. In addition, the analytical data from the verification samples were not sufficient to support an alternative demonstration of closure using risk assessment because the samples are not representative of chemical concentrations remaining on the CSU surfaces and to which personnel/workers will be exposed. The Closure Plan did not specify procedures or methods for the collection of samples capable of providing data directly relatable to a reasonable risk-based scenario for exposure (i.e., inhalation, dermal absorption) to an occupational worker. The sampling procedures in the Closure Plan were subsequently refined to include the collection of swipe samples. Swipe samples were collected and analyzed for constituents detected in verification samples at discrete locations using the *National Institute of Occupational Safety and Health Manual of Analytical Methods* (NIOSH, 1996); a method developed for collection of lead swipe samples.

2.4.6 Closure Demonstration Criteria

Section E.3.4 of the Closure Plan indicates that an alternative demonstration of decontamination may be proposed and justified at the time of closure as circumstances indicate. The letter to

NMED dated August 25, 2003 and provided in Appendix B describes the implementation of an alternate demonstration of closure as follows.

- Detectable hazardous waste or hazardous waste constituent concentrations from container storage activities that do not significantly decrease after several wash downs will be allowed to remain if they pose an acceptable risk, as mutually agreed upon with the NMED.
- Analytical results will be compared to the EPA Region 6 Medium Specific Screening Levels (MSSL) for tap water (EPA, 2004). If the result is below the MSSL, closure will be considered complete.
- If residual contamination levels found in the CSU are above the MSSLs, an assessment will be conducted using an occupational risk-based scenario.

To remain consistent between closure certification reports, an equivalent set of demonstration criteria was used as listed below:

1. No detectable Resource Conservation and Recovery Act (RCRA)-regulated constituent residues from the management of stored, authorized RCRA-regulated wastes are identified in samples collected during closure activities.
2. Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
3. Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
4. 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 RCRA-regulated constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED.

Alternative demonstration of closure for this certification report was interpreted to be either comparison of detected levels to EPA Region 6 Human Health MSSLs (criterion 3) or a human health risk assessment (criterion 4).

2.4.7 Performance of Risk Assessment

The Closure Plan did not specify procedures or methods for the performance of a human health risk assessment (HHRA) (criterion 4) using swipe sample results that exceeded baseline or QA/QC sample results. The HHRA was conducted for the maximum detected concentration of

each contaminant using methods provided by the World Trade Center Indoor Air Taskforce Working Group (WTCIATWG) (WTCIATWG, 2002) and *EPA Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A), Interim Final* (EPA, 1989). The assessment included an evaluation of health risks to occupational workers from exposure to contaminated indoor surfaces. The exposure pathways used to estimate an occupational worker's chronic daily intake of chemicals were ingestion, inhalation, and dermal exposure to chemicals on indoor surfaces. The results of this risk assessment are summarized in Section 3.0 of this Closure Certification Report and detailed in Appendix C.

2.5 Analytical Data

2.5.1 Verification Sampling Results

The samples collected for verification were analyzed by Assaigai Laboratories, Inc., in Albuquerque, New Mexico, which operates under a QA Plan and implements QC procedures that meet the requirements of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) (EPA, 1986). Table 2-4 provides a summary of the detected analytical results for the verification samples collected on August 28-29, 2002 at TA-50-114. Appendix D provides the applicable reporting limits and uncertainties as required by Section E.3.8 of the Closure Plan. Closure for the TA-50-114 CSU is demonstrated in accordance with at least one of the criteria shown in the logic diagram provided as Figure 2-45 and described in Section 2.4.8:

As indicated in Table 2-4, verification samples from several of the surfaces at the TA-50-114 CSU had detections of metals, volatile organic compounds (VOC), and semivolatile organic compounds (SVOC). For the purpose of closure, it was assumed that these contaminants were the result of storage activities at the CSU.

To demonstrate closure for these surfaces in accordance with criterion two, detected concentrations of each constituent were compared against the sample results from baseline samples and QA/QC samples. This comparison was used to eliminate constituents from additional sampling requirements by determining one of the following:

- **Baseline Samples** – Materials used to conduct the decontamination and verification sampling contributed to the detected level of the constituent.

- **QA/QC Samples** – Environmental or laboratory conditions contributed to the detected level of the constituent.

Table 2-5 provides a comparison of the detected verification sample concentrations against the baseline and QA/QC sample results. The constituents that were not eliminated due to the baseline or QA/QC sample results were then considered for an alternative demonstration of closure in accordance with criterion 3. The proposed alternative demonstration of closure included comparison of the verification analytical data to the EPA Region 6 Human Health MSSLs for tap water (EPA, 2004). Constituents at detected levels below the MSSL met criterion 3. Surfaces with detected constituent concentrations above baseline, QA/QC and MSSLs underwent swipe sampling to allow for a risk-based analysis in accordance with criterion 4.

2.5.2 Swipe Sampling Results

Swipe samples were analyzed by Assaigai Laboratories, Inc., which operates under a QA Plan and implements QC procedures that meet the requirements of SW-846 (EPA, 1986). Table 2-6 provides a summary of the analytical results for the swipe samples that were collected on July 1, 2004. The results from swipe sampling are used to demonstrate closure in accordance with criteria 2 or 4 as specified in Section 2.5.1 and Figure 2-45.

As shown in Table 2-6, several of the CSU surfaces that were swipe sampled had analytical results that indicated detections for VOC contamination. To demonstrate closure for these surfaces in accordance with criterion 2, each of the detected constituent concentrations was compared against the sample results from the baseline sample and QA/QC samples. This comparison was used to eliminate constituents from the HHRA by determining one of the following:

- **Baseline Samples** - Materials used to conduct the decontamination and verification sampling contributed to the detected level of the constituent.
- **QA/QC Samples** - Environmental or laboratory conditions contributed to the detected level of the constituent.

Table 2-7 provides a comparison of the detected constituents against the baseline and QA/QC sample results. Toluene was detected in the investigative swipe samples at concentrations less than 10 times the method blank concentration and was, therefore, considered a result of

laboratory contamination. The remaining constituents that were not eliminated due to the baseline or QA/QC sample results were then considered for an alternative demonstration of closure in accordance with criterion 4. This demonstration includes the use of risk assessment modeling and is described in Section 3.0 of this report.

2.6 Statement of Quality Assurance/Quality Control Adequacy

QA/QC activities during the closure were conducted in accordance with Section E.3.8 of the Closure Plan. This included the collection of QA/QC samples to assess data quality and evaluate field sampling procedures and laboratory analyses. Appendix D provides the reporting limits and uncertainty associated with all of the analytical data from the sampling activities in August 2002 and July 2004. A review of the sampling procedures, shipping procedures, and analytical data has determined that the analytical data related to closure are of acceptable quality and should, therefore, be accepted as valid.

2.7 Waste Management

The decontamination and verification of the TA-50-114 CSU were conducted with waste minimization goals in mind. The wash water solutions generated from decontamination were transferred to 5-gallon Carboy bottles and stored on a secondary containment pallet pending the results of decontamination wash water analysis. The PPE, sweepings, scrapings, liner pieces, sponges, cheese cloth, and other trash generated during closure activities were packaged into 55-gallon plastic drum liners and stored in a metal storage container pending characterization based on the results of debris sampling. Laboratory analysis determined the material was non-hazardous. Table 2-8 provides the analytical results for the samples collected from the wash water and debris. Table 2-9 provides a list of the waste materials generated during closure and includes the estimated quantity, waste type, and final disposal destination.

3.0 RISK ASSESSMENT

Swipe sample results from the Technical Area (TA) 50, Building 114 (TA-50-114) container storage unit (CSU) indicated two locations/surfaces with detected residual contaminants above baseline and/or quality assurance data. These results are summarized in Table 3-1. A human health risk assessment (HHRA) was conducted for the maximum detected concentration of each contaminant using methods developed by the World Trade Center Indoor Air Taskforce Working Group (WTCIATWG) (WTCIATWG, 2002) and U.S. Environmental Protection Agency (EPA) (EPA, 1989).

The risk assessment included an evaluation of health risks to occupational workers from exposure to the contaminated indoor surfaces. The exposure assessment of an HHRA addresses how long human receptors will be exposed to chemicals in the environment, how much of the chemical they will be exposed to, and how they will be exposed. This information is expressed by factors such as ingestion rates and daily activity patterns to estimate a chemical dose or chronic daily intake for an individual. The exposure pathways used to estimate an occupational worker's chronic daily intake of chemicals were ingestion, inhalation, and dermal exposure to chemicals on indoor surfaces. Table 3-2 provides a summary of the risk assessment results and Appendix C provides a detailed description of the HHRA methodology, results, and conclusions. The potential for adverse health effects is estimated separately for carcinogens and noncarcinogens. The following sections summarize the risk assessment approach and results.

3.1 Noncarcinogenic Constituents

Noncarcinogenic health effects (e.g., developmental problems in children, kidney effects, neurological effects) are quantified assuming a threshold, or estimated level of exposure, below which adverse effects are not expected to occur. Noncarcinogenic risk is quantified by comparing the actual, worst-case chemical dose received by occupational workers to a level that is not expected to cause adverse effects (or reference levels). To be protective, the health reference levels are typically 100 to 10,000 times lower than levels of exposure observed to have no adverse effects in animal studies. The ratio of actual exposure to reference levels for individual chemicals is computed as a hazard quotient (HQ). Because there is potential for exposure to multiple chemicals via multiple exposure pathways, HQs are summed for all chemicals and exposure pathways to produce a hazard index (HI). HIs above unity indicate

there is a potential for adverse health effects. The residual contaminants of potential concern (COPC) in the TA-50-114 CSU evaluated quantitatively include:

- 1,2,4-trimethylbenzene
- bromomethane
- chloromethane
- methylene chloride

The noncarcinogenic HI for the CSU is 10 due mainly to bromomethane. The maximum concentration of bromomethane (8.2 µg/100 cm^2) only slightly exceeded the maximum concentration detected in the baseline sample (6.8 µg/100 cm^2). However, as a conservative measure, bromomethane was retained as a COPC. Although this HI exceeds the target HI of 1.0, the noncarcinogenic health risk was estimated assuming immediate vaporization of volatile organic chemicals (VOC) and maintenance of that concentration for 30 years. A more reasonable assumption is that VOCs vaporize over time. If the HI is adjusted by a factor of 365 days assuming vaporization over time, the resulting HI is 0.04, which is below the target HI of 1.0. In addition, chemicals were not segregated by target organ (EPA, 1989).

3.2 Carcinogenic Constituents

For chemicals that cause cancer, the assumption in risk assessment is that there are no exposures that have “zero risk.” That is, a cancer-causing chemical may produce cancer in an exposed individual at any dose (there is no threshold). Human health risks for carcinogens are quantified as a unitless probability of developing an additional cancer as a result of exposure to COPCs. Because there is potential for exposure to multiple chemicals via multiple exposure pathways, risks are summed for all chemicals and exposure pathways to produce a cumulative risk. The COPCs in the TA-50-114 CSU evaluated quantitatively for carcinogenic risk are chloromethane and methylene chloride. The cumulative carcinogenic risk for the CSU is 3E-05 (or 5×10^{-5}), which is within the acceptable 10^{-6} to 10^{-4} (one in one million to one in ten thousand) range of risks specified by Code of Federal Regulations, Title 40, §300.430.

4.0 CONCLUSIONS

Tables 4-1 and 4-2 provide the analytical results from the sampling of each surface associated with storage activities in the Technical Area (TA) 50, Building 114 (TA-50-114) container storage unit (CSU). Table 4-1 lists each constituent detected during verification sampling and compares the results to the baseline samples, quality assurance/quality control samples, and U.S. Environmental Protection Agency Region 6 Human Health Medium Specific Screening Levels to demonstrate closure in accordance with criteria 2 or 3 as outlined in Section 2.4.8. Chemicals that were not detected above the detection limit met criterion 1 and are not presented in the tables for demonstration of closure. Ranges of chemical-specific reporting limits are provided in Appendix D. Those detected constituents that could not meet criteria 2 or 3 were used to identify locations for the collection of swipe samples. Swipe samples were collected because the analytical results from verification sampling (wash water samples) could not be related to a reasonable risk-based scenario for exposure (i.e., inhalation, dermal absorption) to an occupational worker (to demonstrate closure in accordance with criterion 4). Table 4-2 provides a summary of the swipe sampling results. The swipe sampling results were also compared to blank/baseline sample results to identify those detections and subsequent locations that required further evaluation during risk assessment.

A human health risk assessment (HHRA), described in Section 3.0 of this report and further detailed in Appendix C, was performed for the contaminants of potential concern identified on the CSU surfaces by swipe sampling. This HHRA determined that the potential risk to future occupational site workers in TA-50-114 is below the applicable criteria specified in Code of Federal Regulations, Title 40, §300.430. Based upon the demonstration of closure provided in Tables 4-1 and 4-2 and the results of the HHRA, the TA-50-114 CSU is closed in accordance with the Closure Plan.

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 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.

_____ _____

Beverly A. Ramsey Date
Division Director
Risk Reduction and Environmental Stewardship Division
Los Alamos National Laboratory

_____ _____

Edwin L. Wilmot Date
Manager, Los Alamos Site Office
U.S. Department of Energy
Albuquerque Operations
Owner/Operator

CERTIFICATION
Los Alamos National Laboratory
Closure Certification Report for Technical Area 50, Building 114 Container Storage Unit

I certify under penalty of law that this document and 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 reviewing, 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.

_____ _____

Anthony R. Griggs Date Signed
Group Leader
Risk Reduction and Environmental Stewardship Division,
Solid Waste Regulatory Compliance Group
Los Alamos National Laboratory

CERTIFICATION
Los Alamos National Laboratory
Closure Certification Report for Technical Area 50, Building 114 Container Storage Unit

I certify under penalty of law that this document and attachments were reviewed and approved for consistency 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 reviewing, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete as it applies to operations at Technical Area 50. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____ _____

Dennis McLain Date Signed
Facility Manager
Facility and Waste Operations – Waste Facility Management
Radioactive Liquid Waste
Los Alamos National Laboratory

5.2 Closure Certification for the TA-50-114 Container Storage Unit

This certification was prepared in accordance with the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart V (20.4.1.500 NMAC) (incorporating Code of Federal Regulations, Title 40, §264.115), revised October 1, 2003, 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. We make no other warranty either expressed or implied. The finding and certification are based on 1) reviewing the closure plan submitted on August 29, 2003 and approved by the New Mexico Environment Department (NMED) on March 24, 2004; 2) discussion with the Shaw Environmental, Inc. field engineer who was present during closure and sampling activities; 3) reviewing the analytical results.

With the signature and seal below, I certify that, except for the deviations presented in Section 2.4 of the attached Closure Certification Report, the closure of the **Technical Area 50, Building 114 Container Storage Unit** was conducted in accordance with the closure plan submitted to the NMED on August 29, 2003 and approved on March 24, 2004. The information presented in this report is, to the best of my knowledge and belief, true, accurate, and complete.

Respectfully,

Shaw Environmental, Inc.

P. Scott den Baars
New Mexico Registered Professional Engineer No.: 10653
Expires: 12/31/05

Date:

6.0 REFERENCES

EPA, 2004, *EPA Region 6 Human Health Medium-Specific Screening Levels,* Dallas, TX, January, 2004, Online at http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm.

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

EPA, 1989, *Risk Assessment Guidance for Superfund, Vol. I, Human Health Evaluation Manual (Part A), Interim Final*, Office of Emergency and Remedial Response, Washington, DC, EPA/540/1-89/002.

NIOSH, 1996, *National Institute of Occupational Safety and Health Manual of Analytical Methods,* National Institute of Occupational Safety and Health.

WTCIATWG, 2002, *World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks*, Peer Review Draft, September, 2002.

MASTER - VERIFCATION SAMPLE RESULTS (wash water)

Sample No.	Location	Requested Analysis	Analyte	Result (µg/L)	Qualifier
114-01	Baseline #1	VOC	Acetone	15	
114-01	Baseline #1	SVOC	Benzyl alcohol	71	2
114-01	Baseline #1	SVOC	bis(2-Ethylhexyl)phthalate	49	2
114-01	Baseline #1	SVOC	Butylbenzylphthalate	13	2
114-01	Baseline #1	SVOC	di-n-Butylphthalate	1.3	2
114-02	Baseline #2	VOC	Acetone	45	1
114-02	Baseline #2	SVOC	bis(2-Ethylhexyl)phthalate	16	2
114-02	Baseline #2	VOC	Toluene	1.9	1
114-03	Baseline #3	VOC	Acetone	29	
114-03	Baseline #3	SVOC	bis(2-Ethylhexyl)phthalate	47	2
114-10	Decontamination Solution - Cell #1	VOC	Acetone	22	
114-10	Decontamination Solution - Cell #1	SVOC	bis(2-Ethylhexyl)phthalate	6.2	
114-10	Decontamination Solution - Cell #1	SVOC	Butylbenzylphthalate	6.3	
114-10	Decontamination Solution - Cell #1	SVOC	Diethylphthalate	1.5	
114-11	Decontamination Solution - Cell #2	VOC	Acetone	36	
114-11	Decontamination Solution - Cell #2	SVOC	Butylbenzylphthalate	7.4	
114-12	Cell #1 West Wall	VOC	1,2-Dichlorobenzene	1.1	
114-13	Cell #1 South Wall	VOC	1,2-Dichlorobenzene	1	
114-13	Cell #1 South Wall	SVOC	bis(2-Ethylhexyl)phthalate	72	2
114-13	Cell #1 South Wall	SVOC	di-n-Octylphthalate	23	2
114-13	Cell #1 South Wall	Total Metals	Silver	40	
114-14	Cell #1 East Wall	VOC	1,2-Dichlorobenzene	1	
114-14	Cell #1 East Wall	SVOC	bis(2-Ethylhexyl)phthalate	10	
114-14	Cell #1 East Wall	Total Metals	Silver	50	
114-15	Cell #1 North Wall	VOC	1,2-Dichlorobenzene	1.1	
114-15	Cell #1 North Wall	Total Metals	Barium	200	
114-15	Cell #1 North Wall	SVOC	Butylbenzylphthalate	68	2 3
114-15	Cell #1 North Wall	SVOC	Diethylphthalate	4.1	2 3
114-16	Cell #1 Floor	Total Metals	Barium	100	
114-17	Cell #1 Floor (Duplicate)	VOC	1,2-Dichlorobenzene	1.1	
114-17	Cell #1 Floor (Duplicate)	Total Metals	Barium	100	
114-17	Cell #1 Floor (Duplicate)	SVOC	bis(2-Ethylhexyl)phthalate	19	2
114-17	Cell #1 Floor (Duplicate)	SVOC	Diethylphthalate	1.3	2
114-18	Cell #2 West Wall	VOC	1,2-Dichlorobenzene	1.1	
114-18	Cell #2 West Wall	VOC	Acetone	14	
114-18	Cell #2 West Wall	SVOC	Butylbenzylphthalate	100	2
114-18	Cell #2 West Wall	SVOC	di-n-Butylphthalate	1.5	2
114-18	Cell #2 West Wall	Total Metals	Selenium	160	B
114-19	Cell #2 South Wall	VOC	Acetone	11	
114-19	Cell #2 South Wall	SVOC	Butylbenzylphthalate	84	2
114-19	Cell #2 South Wall	SVOC	di-n-Butylphthalate	1.6	2
114-19	Cell #2 South Wall	Total Metals	Selenium	150	B
114-20	Cell #2 East Wall	Total Metals	Barium	200	B
114-20	Cell #2 East Wall	SVOC	Butylbenzylphthalate	75	2
114-20	Cell #2 East Wall	SVOC	Diethylphthalate	4.7	2
114-20	Cell #2 East Wall	SVOC	di-n-Butylphthalate	1.8	2
114-20	Cell #2 East Wall	Total Metals	Selenium	210	B
114-21	Cell #2 North Wall	VOC	Acetone	18	
114-21	Cell #2 North Wall	Total Metals	Barium	100	B
114-21	Cell #2 North Wall	SVOC	Butylbenzylphthalate	75	2
114-21	Cell #2 North Wall	SVOC	Diethylphthalate	1.4	2
114-21	Cell #2 North Wall	VOC	Naphthalene	7.8	
114-21	Cell #2 North Wall	Total Metals	Selenium	190	B
114-22	Cell #2 Floor	Total Metals	Barium	100	B
114-22	Cell #2 Floor	Total Metals	Selenium	170	B
114-27	Field Blank	VOC	1,2-Dichlorobenzene	1.2	1
Method Blank	Method Blank	Total Metals	Barium	200	
Method Blank	Method Blank	Total Metals	Selenium	70	
Method Blank	Method Blank	Total Metals	Selenium	120	

Definition of Qualifiers

B = Analyte detected in method blank.

1 = Sample was received with headspace.

2 = Several surrogate recoveries were outside of QC criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.

3 = This sample was utilized for the matrix spike and duplicate. Please note that several recoveries were outside of QC criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.

Definition of Acronyms

SVOC = semivolatile organic compounds

VOC = volatile organic compounds

µg/L = micrograms per liter

MASTER - DEBRIS SAMPLE RESULTS

Sample No.	Location	Requested Analysis	Analyte	Result [a] (mg/kg)	Qualifier
114-23	Dust and Debris	TCLP Metals	Barium	1.1	
114-23	Dust and Debris	TCLP Metals	Cadmium	0.113	
114-23	Dust and Debris	TCLP Metals	Chromium	0.08	
114-23	Dust and Debris	TCLP Metals	Lead	1.79	
114-23	Dust and Debris	VOC	1,2,4-Trimethylbenzene	0.008	
114-23	Dust and Debris	VOC	4-Methyl-2-pentanone (MIBK)	620	
114-23	Dust and Debris	VOC	Benzene	0.007	
114-23	Dust and Debris	VOC	Ethylbenzene	63	
114-23	Dust and Debris	VOC	Methylene chloride	0.056	
114-23	Dust and Debris	VOC	o-Xylene	120	
114-23	Dust and Debris	VOC	p/m-Xylenes	280	
114-23	Dust and Debris	VOC	Styrene	0.11	
114-23	Dust and Debris	VOC	Toluene	0.04	
114-23	Dust and Debris	SVOC	Benzo(a)anthracene	0.65	4
114-23	Dust and Debris	SVOC	Benzo(a)pyrene	0.72	4
114-23	Dust and Debris	SVOC	Benzo(b&k)fluoranthene	1.5	4
114-23	Dust and Debris	SVOC	Benzyl alcohol	4300	4
114-23	Dust and Debris	SVOC	bis(2-Ethylhexyl)phthalate	65	4
114-23	Dust and Debris	SVOC	Butylbenzylphthalate	17	4
114-23	Dust and Debris	SVOC	Chrysene	0.88	4
114-23	Dust and Debris	SVOC	Dimethylphthalate	2.3	4
114-23	Dust and Debris	SVOC	Fluoranthene	1.3	4
114-23	Dust and Debris	SVOC	Phenanthrene	0.63	4
114-23	Dust and Debris	SVOC	Pyrene	1.3	4
114-24	Paint and Rust Scrapings	TCLP Metals	Barium	4.3	
114-24	Paint and Rust Scrapings	VOC	1,2,4-Trimethylbenzene	0.031	2
114-24	Paint and Rust Scrapings	VOC	1,3,5-Trimethylbenzene	0.048	2
114-24	Paint and Rust Scrapings	VOC	Methylene chloride	0.09	2
114-24	Paint and Rust Scrapings	VOC	Naphthalene	0.034	2
114-24	Paint and Rust Scrapings	VOC	o-Xylene	0.015	2
114-24	Paint and Rust Scrapings	VOC	Toluene	0.021	2
114-24	Paint and Rust Scrapings	SVOC	bis(2-Ethylhexyl)phthalate	49	4
114-24	Paint and Rust Scrapings	SVOC	di-n-Octylphthalate	47	4
114-25	Plastic Liner	SVOC	bis(2-Ethylhexyl)phthalate	0.49	3
114-25	Plastic Liner	SVOC	Butylbenzylphthalate	0.043	3
114-25	Plastic Liner	VOC	Methylene chloride	0.054	2 3
114-25	Plastic Liner	VOC	Toluene	0.009	2 3
114-25	Plastic Liner	TCLP Metals	Lead	0.08	

Definition of Qualifiers

2 = Sample was received with headspace.
3 = Sample was received in an improper container.
4 = Several surrogate recoveries were outside of quality control criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.

Definition of Acronyms

SVOC = semivolatile organic compounds
VOC = volatile organic compounds
mg/kg = Milligrams per kilogram.
TCLP = Toxicity characteristic leaching procedure.

[a] Units of measurement for metals are milligrams per liter (mg/L) because the analysis was for toxicity characteristic leaching procedure (TCLP) metals.

MASTER - SWIPE SAMPLE RESULTS

Sample No.	Location	Requested Analysis	Analyte	Result (µg/100 cm^2)	Qualifier
SW114-04	Cell #2 North Wall	VOC	2-Butanone (MEK)	5.2	
SW114-04	Cell #2 North Wall	VOC	Bromomethane	5.8	
SW114-04	Cell #2 North Wall	VOC	Toluene	0.6	B
SW114-05	Cell #2 North Wall	VOC	1,2,4-Trimethylbenzene	0.6	
SW114-05	Cell #2 North Wall	VOC	2-Butanone (MEK)	4.2	
SW114-05	Cell #2 North Wall	VOC	Bromomethane	6	
SW114-05	Cell #2 North Wall	VOC	Chloromethane	2.5	
SW114-05	Cell #2 North Wall	VOC	Methylene chloride	7.2	
SW114-06	Cell #2 North Wall	VOC	1,2,4-Trimethylbenzene	0.6	
SW114-06	Cell #2 North Wall	VOC	1,2-Dichlorobenzene	0.6	
SW114-06	Cell #2 North Wall	VOC	1,3-Dichlorobenzene	0.5	
SW114-06	Cell #2 North Wall	VOC	1,4-Dichlorobenzene	0.6	
SW114-06	Cell #2 North Wall	VOC	2-Butanone (MEK)	5	
SW114-06	Cell #2 North Wall	VOC	Bromomethane	8.2	
SW114-06	Cell #2 North Wall	VOC	Chloromethane	3.2	
SW114-06	Cell #2 North Wall	VOC	Toluene	0.9	B
SW114-09	Baseline #1	VOC	1,2-Dichlorobenzene	0.8	
SW114-09	Baseline #1	VOC	1,3-Dichlorobenzene	0.7	
SW114-09	Baseline #1	VOC	1,4-Dichlorobenzene	0.7	
SW114-09	Baseline #1	VOC	2-Butanone (MEK)	5.8	
SW114-09	Baseline #1	VOC	Bromomethane	6.8	
SW114-09	Baseline #1	VOC	Chloromethane	2.8	
SW114-09	Baseline #1	VOC	Toluene	0.7	B
FB114-02	Field Blank	VOC	2-Butanone (MEK)	5	

Table 2-1
Waste Characterization and Verification Samples Collected from Building 114, August 2002

Sample No.	Location	Requested Analysis
114-01	Baseline #1	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-02	Baseline #2	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-03	Baseline #3	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-04	Field Blank	VOC (SW846 Method 8260B)
114-05	Trip Blank	VOC (SW846 Method 8260B)
114-06	Trip Blank	VOC (SW846 Method 8260B)
114-07	Trip Blank	VOC (SW846 Method 8260B)
114-08	Trip Blank	VOC (SW846 Method 8260B)
114-09	Trip Blank	VOC (SW846 Method 8260B)
114-10	Decontamination Solution - Cell #1	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-11	Decontamination Solution - Cell #2	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-12	Cell #1 West Wall	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-13	Cell #1 South Wall	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-14	Cell #1 East Wall	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-15	Cell #1 North Wall	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-16	Cell #1 Floor	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-17	Cell #1 Floor - Duplicate	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-18	Cell #2 West Wall	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-19	Cell #2 South Wall	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-20	Cell #2 East Wall	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-21	Cell #2 North Wall	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-22	Cell #2 Floor	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-23	Dust and Debris	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-24	Paint and Rust Scrapings	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)
114-25	Plastic Liner	TCLP Metals (SW846 Methods 1311/3010A/6010B and 1311/7471A)
		VOC (SW846 Method 8260B)
		SVOC (SW846 Method 8270C)

Definition of Acronyms
SVOC = semivolatile organic compounds.
VOC = volatile organic compounds.
TCLP = Toxicity characteristic leaching proceudre.

Table 2-2
Swipe Samples Collected from Building 114, July 2004

Sample No.	Location	Requested Analysis
SW114-01	Cell #1 South Wall	SVOC (SW846 Method 8270C)
SW114-02	Cell #1 South Wall	SVOC (SW846 Method 8270C)
SW114-03	Cell #1 South Wall	SVOC (SW846 Method 8270C)
SW114-04	Cell #2 North Wall	VOC (SW846 Method 8260B)
SW114-05	Cell #2 North Wall	VOC (SW846 Method 8260B)
SW114-06	Cell #2 North Wall	VOC (SW846 Method 8260B)
SW114-07	Baseline #1	Total Lead (SW846 Method 3050A/7420)
SW114-08	Baseline #2	SVOC (SW846 Method 8270C)
SW114-09	Baseline #3	VOC (SW846 Method 8260B)
FB114-01	Field Blank - Cell #1	VOC (SW846 Method 8260B)
FB114-02	Field Blank - Cell #2	VOC (SW846 Method 8260B)
TB114-01	Trip Blank	VOC (SW846 Method 8260B)
TB114-02	Trip Blank	VOC (SW846 Method 8260B)

Definition of Acronyms

SVOC = semivolatile organic compounds.

VOC = volatile organic compounds.

Table 2-3
Solvent Medium Used for Collection of Swipe Samples

Requested Analysis	Solvent Medium	Collection Medium
Total Metals	Deionized Water	Gauze Pad
SVOC	Methylene Chloride	Gauze Pad
VOC	Methyl Alcohol (Methanol)	Gauze Pad

Definition of Acronyms

SVOC = semivolatile organic compounds.

VOC = volatile organic compounds.

Table 2-4
Summary of Verification Sample Results for Building 114, August 2002

Sample No.	Location	Requested Analysis	Analyte	Result (µg/L)	Qualifier
114-01	Baseline #1	VOC	Acetone	15	
114-01	Baseline #1	SVOC	Benzyl alcohol	71	2
114-01	Baseline #1	SVOC	bis(2-Ethylhexyl)phthalate	49	2
114-01	Baseline #1	SVOC	Butylbenzylphthalate	13	2
114-01	Baseline #1	SVOC	di-n-Butylphthalate	1.3	2
114-02	Baseline #2	VOC	Acetone	45	1
114-02	Baseline #2	SVOC	bis(2-Ethylhexyl)phthalate	16	2
114-02	Baseline #2	VOC	Toluene	1.9	1
114-03	Baseline #3	VOC	Acetone	29	
114-03	Baseline #3	SVOC	bis(2-Ethylhexyl)phthalate	47	2
114-12	Cell #1 West Wall	VOC	1,2-Dichlorobenzene	1.1	
114-13	Cell #1 South Wall	VOC	1,2-Dichlorobenzene	1	
114-13	Cell #1 South Wall	SVOC	bis(2-Ethylhexyl)phthalate	72	2
114-13	Cell #1 South Wall	SVOC	di-n-Octylphthalate	23	2
114-13	Cell #1 South Wall	TCLP Metals	Silver	40	
114-14	Cell #1 East Wall	VOC	1,2-Dichlorobenzene	1	
114-14	Cell #1 East Wall	SVOC	bis(2-Ethylhexyl)phthalate	10	
114-14	Cell #1 East Wall	TCLP Metals	Silver	50	
114-15	Cell #1 North Wall	VOC	1,2-Dichlorobenzene	1.1	
114-15	Cell #1 North Wall	TCLP Metals	Barium	200	
114-15	Cell #1 North Wall	SVOC	Butylbenzylphthalate	68	2, 3
114-15	Cell #1 North Wall	SVOC	Diethylphthalate	4.1	2, 3
114-16	Cell #1 Floor	TCLP Metals	Barium	100	
114-17	Cell #1 Floor (Duplicate)	VOC	1,2-Dichlorobenzene	1.1	
114-17	Cell #1 Floor (Duplicate)	TCLP Metals	Barium	100	
114-17	Cell #1 Floor (Duplicate)	SVOC	bis(2-Ethylhexyl)phthalate	19	2
114-17	Cell #1 Floor (Duplicate)	SVOC	Diethylphthalate	1.3	2
114-18	Cell #2 West Wall	VOC	1,2-Dichlorobenzene	1.1	
114-18	Cell #2 West Wall	VOC	Acetone	14	
114-18	Cell #2 West Wall	SVOC	Butylbenzylphthalate	100	2
114-18	Cell #2 West Wall	SVOC	di-n-Butylphthalate	1.5	2
114-18	Cell #2 West Wall	TCLP Metals	Selenium	160	B
114-19	Cell #2 South Wall	VOC	Acetone	11	
114-19	Cell #2 South Wall	SVOC	Butylbenzylphthalate	84	2
114-19	Cell #2 South Wall	SVOC	di-n-Butylphthalate	1.6	2
114-19	Cell #2 South Wall	TCLP Metals	Selenium	150	B
114-20	Cell #2 East Wall	TCLP Metals	Barium	200	B
114-20	Cell #2 East Wall	SVOC	Butylbenzylphthalate	75	2
114-20	Cell #2 East Wall	SVOC	Diethylphthalate	4.7	2
114-20	Cell #2 East Wall	SVOC	di-n-Butylphthalate	1.8	2
114-20	Cell #2 East Wall	TCLP Metals	Selenium	210	B
114-21	Cell #2 North Wall	VOC	Acetone	18	
114-21	Cell #2 North Wall	TCLP Metals	Barium	100	B
114-21	Cell #2 North Wall	SVOC	Butylbenzylphthalate	75	2
114-21	Cell #2 North Wall	SVOC	Diethylphthalate	1.4	2
114-21	Cell #2 North Wall	VOC	Naphthalene	7.8	
114-21	Cell #2 North Wall	TCLP Metals	Selenium	190	B
114-22	Cell #2 Floor	TCLP Metals	Barium	100	B
114-22	Cell #2 Floor	TCLP Metals	Selenium	170	B
114-27	Field Blank	VOC	1,2-Dichlorobenzene	1.2	1
Method Blank	Method Blank	TCLP Metals	Barium	200	
Method Blank	Method Blank	TCLP Metals	Selenium	70	
Method Blank	Method Blank	TCLP Metals	Selenium	120	

Definition of Qualifiers

B = Analyte detected in method blank.

1 = Sample was received with headspace.

2 = Several surrogate recoveries were outside of quality control criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.

3 = This sample was utilized for the matrix spike and duplicate. Several recoveries were outside of quality control criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.

Definition of Acronyms

SVOC = semivolatile organic compounds

VOC = volatile organic compounds

µg/L = micrograms per liter

TCLP = Toxicity Characteristic Leaching Procedure

Table 2-5
Building 114 Verification Sample Results - Comparison to Baseline, QA/QC , and EPA Region 6 Human Health MSSLs

Sample No.	Location	Analyte	Result (µg/L)	Qualifier	EPA Region 6 MSSLs (µg/L)	Comparison Results
114-27	Field Blank	1,2-Dichlorobenzene	1.2	1	61	NA
114-12	Cell #1 West Wall	1,2-Dichlorobenzene	1.1		61	The detected levels are equal to or less than the detected level in the Field Blank.
114-15	Cell #1 North Wall	1,2-Dichlorobenzene	1.1		61	The detected levels are equal to or less than the detected level in the Field Blank.
114-17	Cell #1 Floor (Duplicate)	1,2-Dichlorobenzene	1.1		61	The detected levels are equal to or less than the detected level in the Field Blank.
114-18	Cell #2 West Wall	1,2-Dichlorobenzene	1.1		61	The detected levels are equal to or less than the detected level in the Field Blank.
114-13	Cell #1 South Wall	1,2-Dichlorobenzene	1		61	The detected levels are equal to or less than the detected level in the Field Blank.
114-14	Cell #1 East Wall	1,2-Dichlorobenzene	1		61	The detected levels are equal to or less than the detected level in the Field Blank.
114-02	Baseline #2	Acetone	45	1	33,000	NA
114-03	Baseline #3	Acetone	29		33,000	NA
114-21	Cell #2 North Wall	Acetone	18		33,000	The detected levels are equal to or less than the detected level in the Baseline #2 Sample.
114-01	Baseline #1	Acetone	15		33,000	NA
114-18	Cell #2 West Wall	Acetone	14		33,000	The detected levels are equal to or less than the detected level in the Baseline #2 Sample.
114-19	Cell #2 South Wall	Acetone	11		33,000	The detected levels are equal to or less than the detected level in the Baseline #2 Sample.
114-15	Cell #1 North Wall	Barium	200		2,600	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-20	Cell #2 East Wall	Barium	200	B	2,600	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
Method Blank	Method Blank	Barium	200		2,600	NA
114-16	Cell #1 Floor	Barium	100		2,600	The detected levels are equal to or less than the detected level in the Method Blank.
114-17	Cell #1 Floor (Duplicate)	Barium	100		2,600	The detected levels are equal to or less than the detected level in the Method Blank.
114-21	Cell #2 North Wall	Barium	100	B	2,600	The detected levels are equal to or less than the detected level in the Method Blank.
114-22	Cell #2 Floor	Barium	100	B	2,600	The detected levels are equal to or less than the detected level in the Method Blank.
114-01	Baseline #1	Benzyl alcohol	71	2	11,000	NA
114-13	**Cell #1 South Wall**	**bis(2-Ethylhexyl)phthalate**	**72**	**2**	**4.8**	**The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample and is above the MSSL. This sample location must be forwarded to swipe sampling.**
114-01	Baseline #1	bis(2-Ethylhexyl)phthalate	49	2	4.8	NA
114-03	Baseline #3	bis(2-Ethylhexyl)phthalate	47	2	4.8	NA
114-17	Cell #1 Floor (Duplicate)	bis(2-Ethylhexyl)phthalate	19	2	4.8	The detected levels are equal to or less than the detected level in the Baseline #1 Sample.
114-02	Baseline #2	bis(2-Ethylhexyl)phthalate	16	2	4.8	NA
114-14	Cell #1 East Wall	bis(2-Ethylhexyl)phthalate	10		4.8	The detected levels are equal to or less than the detected level in the Baseline #1 Sample.
114-18	Cell #2 West Wall	Butylbenzylphthalate	100	2	7,300	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-19	Cell #2 South Wall	Butylbenzylphthalate	84	2	7,300	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-20	Cell #2 East Wall	Butylbenzylphthalate	75	2	7,300	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-21	Cell #2 North Wall	Butylbenzylphthalate	75	2	7,300	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-15	Cell #1 North Wall	Butylbenzylphthalate	68	2 3	7,300	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-01	Baseline #1	Butylbenzylphthalate	13	2	7,300	NA
114-20	Cell #2 East Wall	Diethylphthalate	4.7	2	29,000	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-15	Cell #1 North Wall	Diethylphthalate	4.1	2, 3	29,000	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-21	Cell #2 North Wall	Diethylphthalate	1.4	2	29,000	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-17	Cell #1 Floor (Duplicate)	Diethylphthalate	1.3	2	29,000	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-20	Cell #2 East Wall	di-n-Butylphthalate	1.8	2	3,700	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-19	Cell #2 South Wall	di-n-Butylphthalate	1.6	2	3,700	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-18	Cell #2 West Wall	di-n-Butylphthalate	1.5	2	3,700	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-01	Baseline #1	di-n-Butylphthalate	1.3	2	3,700	NA
114-13	Cell #1 South Wall	di-n-Octylphthalate	23	2	1,500	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-21	**Cell #2 North Wall**	**Naphthalene**	**7.8**		**6.2**	**The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample and is above the MSSL. This sample location must be forwarded to swipe sampling.**
114-20	Cell #2 East Wall	Selenium	210	B	180	The sample location was not forwarded to swipe sampling because the chemical was detected in the method blank, indicating laboratory contamination. In addition, the chemical was not detected in wastewater samples.
114-21	Cell #2 North Wall	Selenium	190	B	180	The sample location was not forwarded to swipe sampling because the chemical was detected in the method blank, indicating laboratory contamination. In addition, the chemical was not detected in wastewater samples.
114-22	Cell #2 Floor	Selenium	170	B	180	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-18	Cell #2 West Wall	Selenium	160	B	180	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-19	Cell #2 South Wall	Selenium	150	B	180	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
Method Blank	Method Blank	Selenium	120		180	NA
Method Blank	Method Blank	Selenium	70		180	NA
114-14	Cell #1 East Wall	Silver	50		180	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-13	Cell #1 South Wall	Silver	40		180	The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample, however it is below the MSSL.
114-02	Baseline #2	Toluene	1.9	1	720	NA

Definition of Qualifiers
B = Analyte detected in method blank.
1 = Sample was received with headspace.
2 = Several surrogate recoveries were outside of quality control criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.
3 = This sample was utilized for the matrix spike and duplicate. Several recoveries were outside of quality control criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.

Definition of Acronyms
µg/L = micrograms per liter.
MSSL = Medium-Specific Screening Level.
NA = not applicable.
QA/QC = quality assurance/quality control.
EPA = U.S. Environmental Protection Agency.

Table 2-6
Summary of Swipe Sample Results for Building 114, July 2004

Sample No.	Location	Requested Analysis	Analyte	Result (µg/100 cm^2)	Qualifier
SW114-04	Cell #2 North Wall	VOC	2-Butanone (MEK)	5.2	
SW114-04	Cell #2 North Wall	VOC	Bromomethane	5.8	
SW114-04	Cell #2 North Wall	VOC	Toluene	0.6	B
SW114-05	Cell #2 North Wall	VOC	1,2,4-Trimethylbenzene	0.6	
SW114-05	Cell #2 North Wall	VOC	2-Butanone (MEK)	4.2	
SW114-05	Cell #2 North Wall	VOC	Bromomethane	6	
SW114-05	Cell #2 North Wall	VOC	Chloromethane	2.5	
SW114-05	Cell #2 North Wall	VOC	Methylene chloride	7.2	
SW114-06	Cell #2 North Wall	VOC	1,2,4-Trimethylbenzene	0.6	
SW114-06	Cell #2 North Wall	VOC	1,2-Dichlorobenzene	0.6	
SW114-06	Cell #2 North Wall	VOC	1,3-Dichlorobenzene	0.5	
SW114-06	Cell #2 North Wall	VOC	1,4-Dichlorobenzene	0.6	
SW114-06	Cell #2 North Wall	VOC	2-Butanone (MEK)	5	
SW114-06	Cell #2 North Wall	VOC	Bromomethane	8.2	
SW114-06	Cell #2 North Wall	VOC	Chloromethane	3.2	
SW114-06	Cell #2 North Wall	VOC	Toluene	0.9	B
SW114-09	Baseline #1	VOC	1,2-Dichlorobenzene	0.8	
SW114-09	Baseline #1	VOC	1,3-Dichlorobenzene	0.7	
SW114-09	Baseline #1	VOC	1,4-Dichlorobenzene	0.7	
SW114-09	Baseline #1	VOC	2-Butanone (MEK)	5.8	
SW114-09	Baseline #1	VOC	Bromomethane	6.8	
SW114-09	Baseline #1	VOC	Chloromethane	2.8	
SW114-09	Baseline #1	VOC	Toluene	0.7	B
FB114-02	Field Blank	VOC	2-Butanone (MEK)	5	

Definition of Qulifiers

B = Analyte detected in method blank.

Definition of Acronyms

VOC = volatile organic compound.

µg/100 cm^2 = micrograms per 100 square centimeters.

MEK = methyl ethyl ketone.

Table 2-7
Building 114 Swipe Sample Results - Comparison to Baseline and QA/QC Results

Sample No.	Location	Analyte	Result (µg/100 cm^2)	Qualifier	Comparison Results
SW114-05	**Cell #2 North Wall**	**1,2,4-Trimethylbenzene**	**0.6**		**The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample. These sample results will be forwarded to Risk Assessment.**
SW114-06	**Cell #2 North Wall**	**1,2,4-Trimethylbenzene**	**0.6**		**The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample. These sample results will be forwarded to Risk Assessment.**
SW114-09	Baseline #1	1,2-Dichlorobenzene	0.8		NA
SW114-06	Cell #2 North Wall	1,2-Dichlorobenzene	0.6		The detected level is equal to or less than the detected level in Baseline Sample #1.
SW114-09	Baseline #1	1,3-Dichlorobenzene	0.7		NA
SW114-06	Cell #2 North Wall	1,3-Dichlorobenzene	0.5		The detected level is equal to or less than the detected level in Baseline Sample #1.
SW114-09	Baseline #1	1,4-Dichlorobenzene	0.7		NA
SW114-06	Cell #2 North Wall	1,4-Dichlorobenzene	0.6		The detected level is equal to or less than the detected level in Baseline Sample #1.
SW114-09	Baseline #1	2-Butanone (MEK)	5.8		NA
SW114-04	Cell #2 North Wall	2-Butanone (MEK)	5.2		The detected level is equal to or less than the detected level in Baseline Sample #1.
SW114-06	Cell #2 North Wall	2-Butanone (MEK)	5		The detected level is equal to or less than the detected level in Baseline Sample #1.
FB114-02	Field Blank	2-Butanone (MEK)	5		NA
SW114-05	Cell #2 North Wall	2-Butanone (MEK)	4.2		The detected level is equal to or less than the detected level in Baseline Sample #1.
SW114-06	**Cell #2 North Wall**	**Bromomethane**	**8.2**		**The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample. These sample results will be forwarded to Risk Assessment.**
SW114-09	Baseline #1	Bromomethane	6.8		NA
SW114-05	Cell #2 North Wall	Bromomethane	6		The detected level is equal to or less than the detected level in Baseline Sample #1.
SW114-04	Cell #2 North Wall	Bromomethane	5.8		The detected level is equal to or less than the detected level in Baseline Sample #1.
SW114-06	**Cell #2 North Wall**	**Chloromethane**	**3.2**		**The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample. These sample results will be forwarded to Risk Assessment.**
SW114-09	Baseline #1	Chloromethane	2.8		NA
SW114-05	Cell #2 North Wall	Chloromethane	2.5		The detected level is equal to or less than the detected level in Baseline Sample #1.
SW114-05	**Cell #2 North Wall**	**Methylene chloride**	**7.2**		**The detected level cannot be ruled out due to a detected level in a baseline or QA/QC sample. These sample results will be forwarded to Risk Assessment.**
SW114-06	Cell #2 North Wall	Toluene	0.9	B	The detected level is less than 10 times the concentration detected in the associated method blank.
SW114-09	Baseline #1	Toluene	0.7	B	NA
SW114-04	Cell #2 North Wall	Toluene	0.6	B	The detected level is equal to or less than the detected level in Baseline Sample #1.

Definition of Qulifiers
B = Analyte detected in method blank.

Definition of Acronyms
µg/100 cm^2 = micrograms per 100 square centimeters.
N/A = not applicable.
QA/QC = quality assurance/quality control.
MEK = methyl ethyl ketone.

Table 2-8
Waste Characterization Sampling Results for Building 114

Sample No.	Location	Requested Analysis	Analyte	Result (µg/L)	Qualifier
114-10	Decontamination Solution - Cell #1	VOC	Acetone	22	
114-10	Decontamination Solution - Cell #1	SVOC	bis(2-Ethylhexyl)phthalate	6.2	
114-10	Decontamination Solution - Cell #1	SVOC	Butylbenzylphthalate	6.3	
114-10	Decontamination Solution - Cell #1	SVOC	Diethylphthalate	1.5	
114-11	Decontamination Solution - Cell #2	VOC	Acetone	36	
114-11	Decontamination Solution - Cell #2	SVOC	Butylbenzylphthalate	7.4	
114-23	Dust and Debris	TCLP Metals	Barium	1.1	
114-23	Dust and Debris	TCLP Metals	Cadmium	0.113	
114-23	Dust and Debris	TCLP Metals	Chromium	0.08	
114-23	Dust and Debris	TCLP Metals	Lead	1.79	
114-23	Dust and Debris	VOC	1,2,4-Trimethylbenzene	0.008	
114-23	Dust and Debris	VOC	4-Methyl-2-pentanone (MIBK)	620	
114-23	Dust and Debris	VOC	Benzene	0.007	
114-23	Dust and Debris	VOC	Ethylbenzene	63	
114-23	Dust and Debris	VOC	Methylene chloride	0.056	
114-23	Dust and Debris	VOC	o-Xylene	120	
114-23	Dust and Debris	VOC	p/m-Xylenes	280	
114-23	Dust and Debris	VOC	Styrene	0.11	
114-23	Dust and Debris	VOC	Toluene	0.04	
114-23	Dust and Debris	SVOC	Benzo(a)anthracene	0.65	4
114-23	Dust and Debris	SVOC	Benzo(a)pyrene	0.72	4
114-23	Dust and Debris	SVOC	Benzo(b&k)fluoranthene	1.5	4
114-23	Dust and Debris	SVOC	Benzyl alcohol	4,300	4
114-23	Dust and Debris	SVOC	bis(2-Ethylhexyl)phthalate	65	4
114-23	Dust and Debris	SVOC	Butylbenzylphthalate	17	4
114-23	Dust and Debris	SVOC	Chrysene	0.88	4
114-23	Dust and Debris	SVOC	Dimethylphthalate	2.3	4
114-23	Dust and Debris	SVOC	Fluoranthene	1.3	4
114-23	Dust and Debris	SVOC	Phenanthrene	0.63	4
114-23	Dust and Debris	SVOC	Pyrene	1.3	4
114-24	Paint and Rust Scrapings	TCLP Metals	Barium	4.3	
114-24	Paint and Rust Scrapings	VOC	1,2,4-Trimethylbenzene	0.031	2
114-24	Paint and Rust Scrapings	VOC	1,3,5-Trimethylbenzene	0.048	2
114-24	Paint and Rust Scrapings	VOC	Methylene chloride	0.09	2
114-24	Paint and Rust Scrapings	VOC	Naphthalene	0.034	2
114-24	Paint and Rust Scrapings	VOC	o-Xylene	0.015	2
114-24	Paint and Rust Scrapings	VOC	Toluene	0.021	2
114-24	Paint and Rust Scrapings	SVOC	bis(2-Ethylhexyl)phthalate	49	4
114-24	Paint and Rust Scrapings	SVOC	di-n-Octylphthalate	47	4
114-25	Plastic Liner	SVOC	bis(2-Ethylhexyl)phthalate	0.49	3
114-25	Plastic Liner	SVOC	Butylbenzylphthalate	0.043	3
114-25	Plastic Liner	VOC	Methylene chloride	0.054	2, 3
114-25	Plastic Liner	VOC	Toluene	0.009	2, 3
114-25	Plastic Liner	TCLP Metals	Lead	0.08	

Definition of Acronyms

µg/L = micrograms per liter.
SVOC = semivolatile organic compound.
VOC = volatile organic compound.
TCLP = Toxicity characteristic leaching procedure.

Table 2-9
Waste Materials and Disposition for the Building 114 Closure

Waste Material	Estimated Quantity	Type	Disposal Destination
PPE, Sponges, Buckets, Cheese cloth, etc.	<1 cubic meter	Solid	TA-54
Decontamination Wash Water	<55 gallons	Liquid	RLWTF
Verification Wash Water	<30 gallons	Liquid	RLWTF

Definition of Acronyms

PPE = personal protective equipment.

RLWTF = Radioactive Liquid Waste Treatment Facility.

TA = technical area.

Table 3-1
Building 114 Swipe Sample Results Forwarded to Risk Assessment

Sample No.	Location	Analyte	Result ($\mu g/100\ cm^2$)	Qualifier
SW114-05	Cell #2 North Wall	1,2,4-Trimethylbenzene	0.6	
		Methylene chloride	7.2	
SW114-06	Cell #2 North Wall	1,2,4-Trimethylbenzene	0.6	
		Bromomethane	8.2	
		Chloromethane	3.2	

Definition of Qulifiers

B = Analyte detected in method blank.

Definition of Acronyms

$\mu g/100\ cm^2$ = micrograms per 100 square centimeters.

Table 3-2
Summary of Building 114 Risk Assessment Results

Constituent	Maximum Detected Concentration ($\mu g/100cm^2$)	Qualifier	Noncarcinogenic Hazard Quotient [a]	Carcinogenic Risk
1,2,4-Trimethylbenzene	0.6		0.002 (0.8)	n/a
Bromomethane	8.2		0.03 (13)	n/a
Chloromethane	3.2		0.0007 (0.3)	2E-05
Methylene chloride	7.2		0.00005 (0.02)	1E-05
CUMULATIVE HAZARD INDEX AND RISK [b]			**0.04 (10)**	**3E-05**

a. Adjusted hazard quotient (HQ), (Unadjusted HQ): Unadjusted HQ assumes immediate vaporization of volatile organic compounds (VOC) and maintenance of that concentration for 30 years. Adjusted HQ was calculated by dividing the unadjusted HQ by a factor of 365, assuming volatilization over a period of 365 days.

b. Hazard index and cumulative cancer risk presented with one significant figure in accordance with U.S. Environmental Protection Agency (EPA) guidance (EPA, 1989).

Definition of Qulifiers

B = Analyte detected in method blank.

Definition of Acronyms

$\mu g/100\ cm^2$ = micrograms per 100 square centimeters.

n/a = Not applicable.

Table 4-1
Demonstration of Closure for TA-50-114 - Verification Samples

Sample No.	Location	Analyte	Result (µg/L)	Qualifier	Comparison Results
114-12	Cell #1 West Wall	1,2-Dichlorobenzene	1.1		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-15	Cell #1 North Wall	1,2-Dichlorobenzene	1.1		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-17	Cell #1 Floor (Duplicate)	1,2-Dichlorobenzene	1.1		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-18	Cell #2 West Wall	1,2-Dichlorobenzene	1.1		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-13	Cell #1 South Wall	1,2-Dichlorobenzene	1		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-14	Cell #1 East Wall	1,2-Dichlorobenzene	1		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-21	Cell #2 North Wall	Acetone	18		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-18	Cell #2 West Wall	Acetone	14		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-19	Cell #2 South Wall	Acetone	11		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-15	Cell #1 North Wall	Barium	200		**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human
114-20	Cell #2 East Wall	Barium	200	B	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-16	Cell #1 Floor	Barium	100		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-17	Cell #1 Floor (Duplicate)	Barium	100		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-21	Cell #2 North Wall	Barium	100	B	**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-22	Cell #2 Floor	Barium	100	B	**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-13	**Cell #1 South Wall**	**bis(2-Ethylhexyl)phthalate**	**72**	**2**	**Sample location swipe sampled for risk assessment.**
114-17	Cell #1 Floor (Duplicate)	bis(2-Ethylhexyl)phthalate	19	2	**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-14	Cell #1 East Wall	bis(2-Ethylhexyl)phthalate	10		**Criterion #2**: Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above
114-18	Cell #2 West Wall	Butylbenzylphthalate	100	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-19	Cell #2 South Wall	Butylbenzylphthalate	84	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-20	Cell #2 East Wall	Butylbenzylphthalate	75	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-21	Cell #2 North Wall	Butylbenzylphthalate	75	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-15	Cell #1 North Wall	Butylbenzylphthalate	68	2, 3	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-20	Cell #2 East Wall	Diethylphthalate	4.7	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-15	Cell #1 North Wall	Diethylphthalate	4.1	2, 3	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-21	Cell #2 North Wall	Diethylphthalate	1.4	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-17	Cell #1 Floor (Duplicate)	Diethylphthalate	1.3	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-20	Cell #2 East Wall	di-n-Butylphthalate	1.8	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-19	Cell #2 South Wall	di-n-Butylphthalate	1.6	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-18	Cell #2 West Wall	di-n-Butylphthalate	1.5	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-13	Cell #1 South Wall	di-n-Octylphthalate	23	2	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-21	**Cell #2 North Wall**	**Naphthalene**	**7.8**		**Sample location swipe sampled for risk assessment.**
114-20	Cell #2 East Wall	Selenium	210	B	**Criterion #2**: Analytical results of samples collected during decontamination verification activities were also detected in method blank samples indicating laboratory contamination.
114-21	Cell #2 North Wall	Selenium	190	B	**Criterion #2**: Analytical results of samples collected during decontamination verification activities were also detected in method blank samples indicating laboratory contamination.
114-22	Cell #2 Floor	Selenium	170	B	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-18	Cell #2 West Wall	Selenium	160	B	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-19	Cell #2 South Wall	Selenium	150	B	**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-14	Cell #1 East Wall	Silver	50		**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.
114-13	Cell #1 South Wall	Silver	40		**Criterion #3**: Detectable concentrations of RCRA-regulated constituents in samples collected during verification activities are at or below levels agreed upon with the NMED to be protective of human health based on the results of risk assessment methods.

Definition of Qualifiers
B = Analyte detected in method blank.
2 = Several surrogate recoveries were outside of quality control criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.
3 = This sample was utilized for the matrix spike and duplicate. Several recoveries were outside of quality control criteria, suggesting matrix interference problems. This should be taken into account when reviewing the data.

Definition of Acronyms
µg/L = micrograms per liter
NMED = New Mexico Environment Department.
RCRA = Resource Conservation and Recovery Act

Table 4-2
Demonstration of Closure for TA-50-114 - Swipe Samples

Sample No.	Location	Analyte	Result (µg/100 cm^2)	Qualifier	Closure Demonstration Criteria
SW114-04	Cell #2 North Wall	2-Butanone (MEK)	5.2		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-04	Cell #2 North Wall	Bromomethane	5.8		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-04	Cell #2 North Wall	Toluene	0.6	B	**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-05	**Cell #2 North Wall**	**1,2,4-Trimethylbenzene**	**0.6**		**Criterion #4: 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 RCRA-regulated constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED.**
SW114-05	Cell #2 North Wall	2-Butanone (MEK)	4.2		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-05	Cell #2 North Wall	Bromomethane	6		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-05	Cell #2 North Wall	Chloromethane	2.5		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-05	**Cell #2 North Wall**	**Methylene chloride**	**7.2**		**Criterion #4: 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 RCRA-regulated constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED.**
SW114-06	**Cell #2 North Wall**	**1,2,4-Trimethylbenzene**	**0.6**		**Criterion #4: 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 RCRA-regulated constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED.**
SW114-06	Cell #2 North Wall	1,2-Dichlorobenzene	0.6		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-06	Cell #2 North Wall	1,3-Dichlorobenzene	0.5		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-06	Cell #2 North Wall	1,4-Dichlorobenzene	0.6		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-06	Cell #2 North Wall	2-Butanone (MEK)	5		**Crtierion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above baseline data.
SW114-06	**Cell #2 North Wall**	**Bromomethane**	**8.2**		**Criterion #4: 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 RCRA-regulated constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED.**
SW114-06	**Cell #2 North Wall**	**Chloromethane**	**3.2**		**Criterion #4: 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 RCRA-regulated constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED.**
SW114-06	Cell #2 North Wall	Toluene	0.9	B	**Criterion #2:** Analytical results of samples collected during decontamination verification activities identify no statistically significant concentrations of RCRA-regulated constituents above QA/QC data. The concentrations detected in the samples are less than 10 times the associated blank concentration.

Definition of Qualifiers
B = Analyte detected in method blank.

Definition of Acronyms
µg/100 cm^2 = micrograms per 100 square centimeters.
NMED = New Mexico Environment Department.
RCRA = Resource Conservation and Recovery Act.
MEK = methyl ethyl ketone
QA/QC = Quality assurance/quality control.

Document: TA-50-114 Closure Report
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Date: September 2004

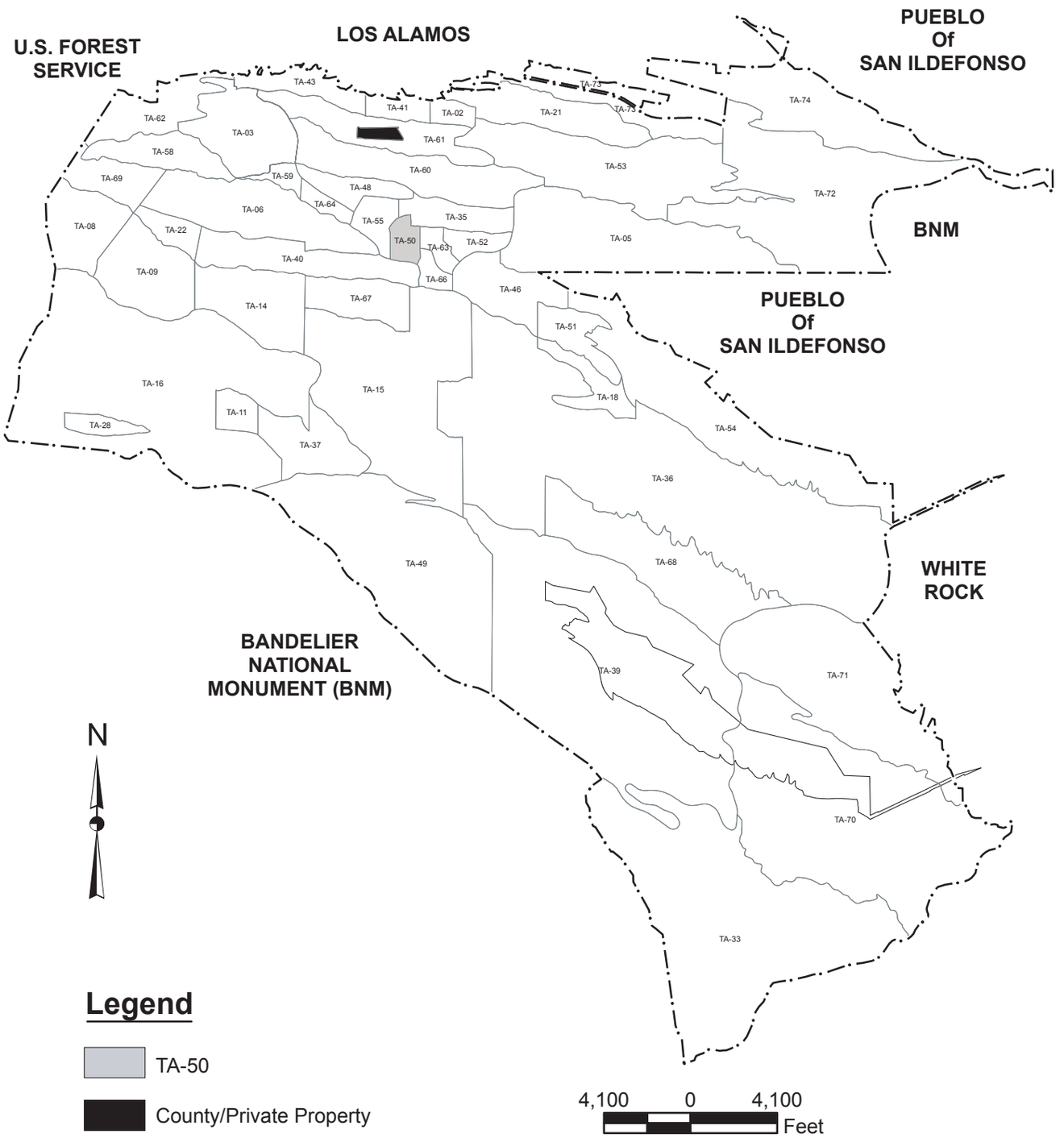

Figure 1-1
Location Map of Technical Area (TA) 50 at Los Alamos National Laboratory (LANL)

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

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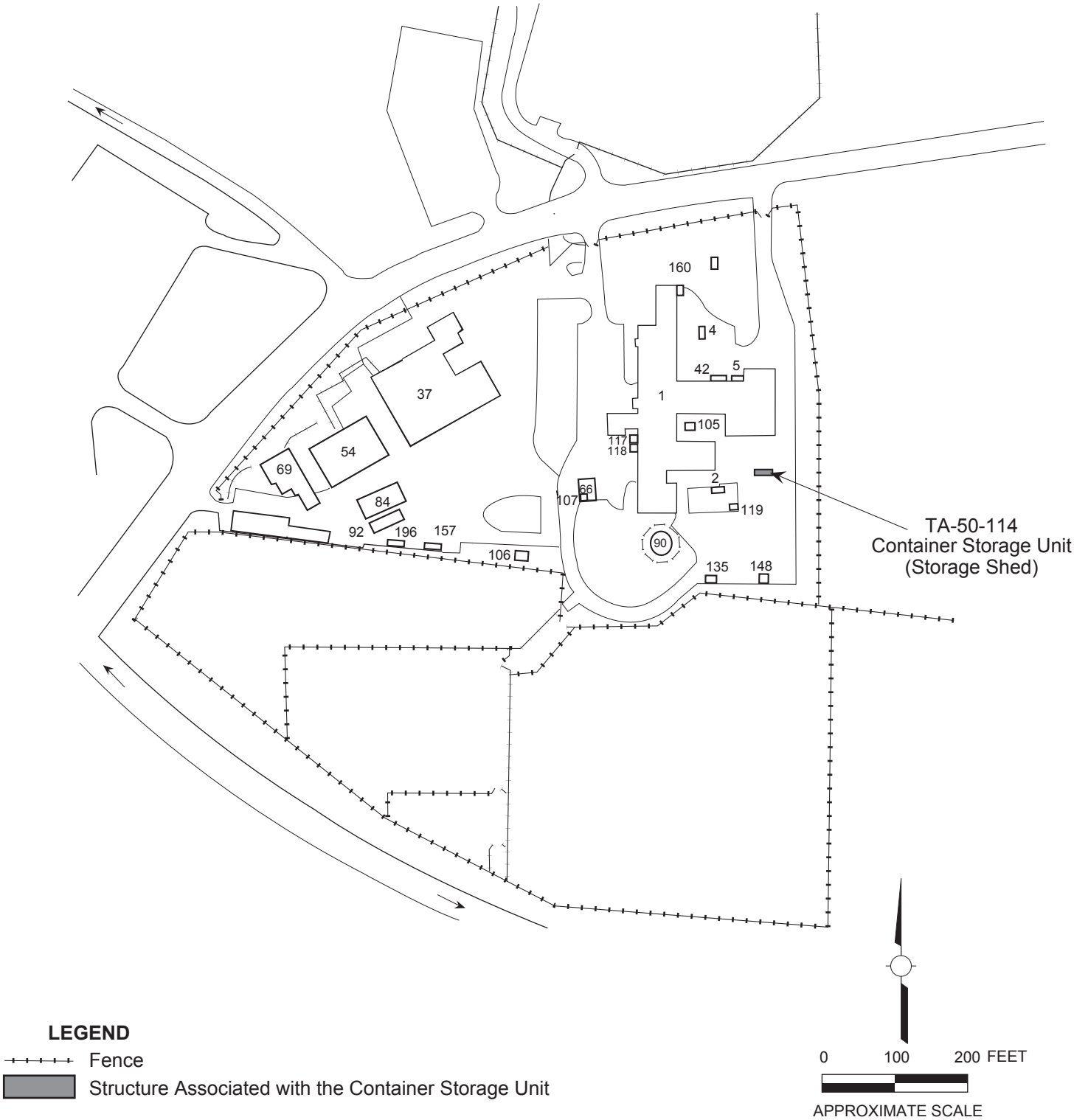

Figure 1-2
Location Map for Technical Area (TA) 50, Building 114 (TA-50-114) Container Storage Unit

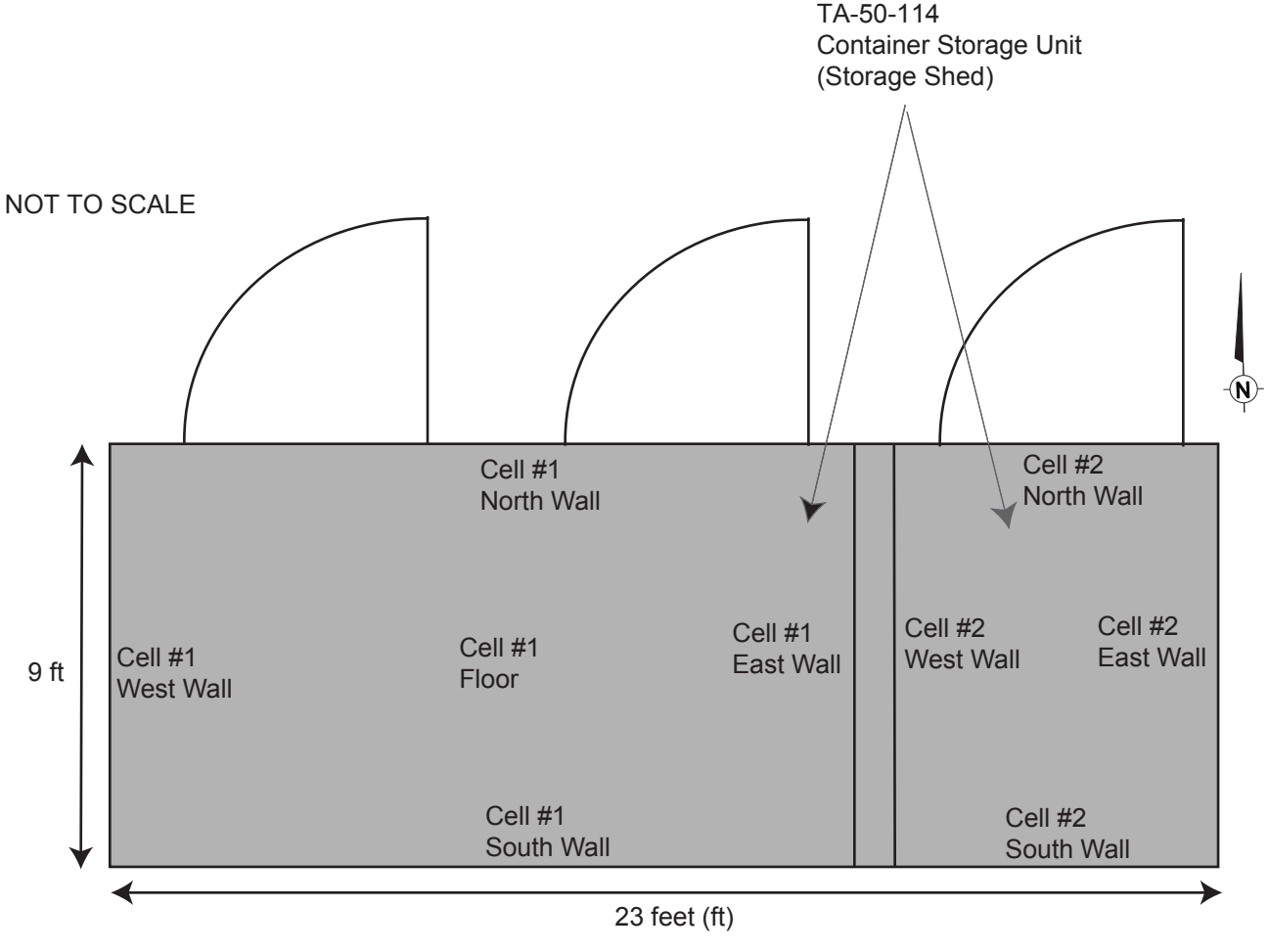

Figure 2-1
Technical Area (TA) 50, Building 114 (TA-50-114) Container Storage Unit

Figure 2-2
Pre-Closure Inspection - Recessed Containment, Grating, and Supports at TA-50-114, Cell #1
[Photograph taken 8-23-02]

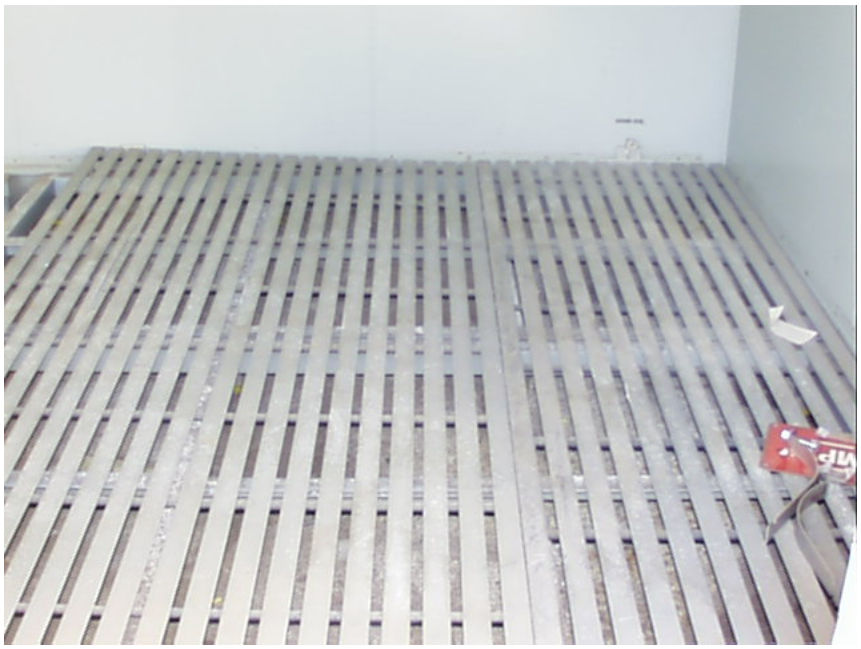

Figure 2-3
Pre-Closure Inspection - Recessed Containment, Grating, and Supports at TA-50-114, Cell #2
[Photograph taken 8-23-02]

Figure 2-4
Removal of Grating from TA-50-114 Cell #1 and Cell #2
[Photograph taken 8-23-02]

Figure 2-5
Wrapped Grating Being Moved to Temporary Storage Pending Characterization
[Photograph taken 8-23-02]

Figure 2-6
Removal of Dust and Debris from Recessed Containment Area of Cell #1
[Photograph taken 8-23-02]

Figure 2-7
Removal of Dust and Debris from Recessed Containment Area of Cell #2
[Photograph taken 8-23-02]

Figure 2-8
Vacuuming to Remove Dust from the Recessed Containment Area of Cell #1
[Photograph Taken 8-23-02]

Figure 2-9
Vacuuming to Remove Dust from Supports in Cell #1
[Photograph Taken 8-23-02]

Figure 2-10
Vacuuming to Removed Dust from Supports in Cell #2
[Photograph 8-23-02]

Figure 2-11
Temporary Storage for Grating and Supports Pending Characterization
[Photograph taken 8-26-02]

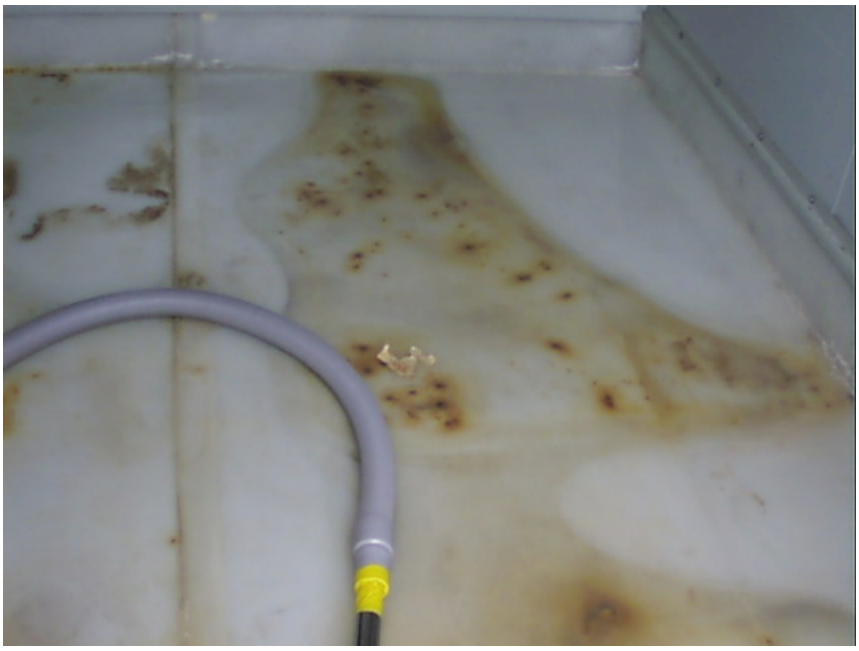

Figure 2-12
Plastic Liner Located in Cell #1 Showing Pooled Water Underneath
[Photograph taken 8-23-02]

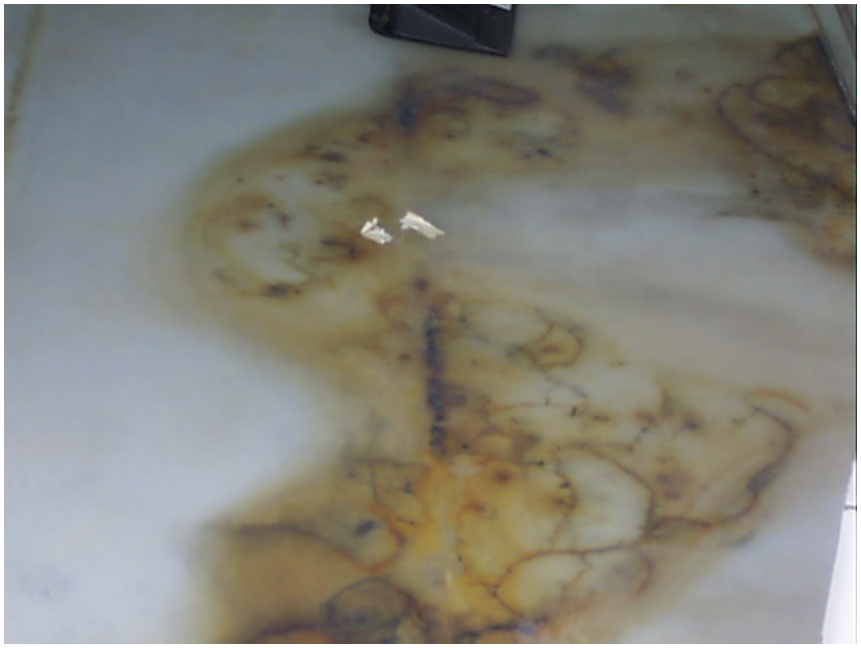

Figure 2-13
Plastic Liner Located In Cell #2 Showing Pooled Water Underneath
[Photograph taken 8-23-02]

Figure 2-14
Condition of Floor Surface Beneath the Plastic Liner in Cell #1
[Photograph taken 8-27-02]

Figure 2-15
Condition of Floor Surface Beneath the Plastic Liner in Cell #2
[Photograph taken 8-27-02]

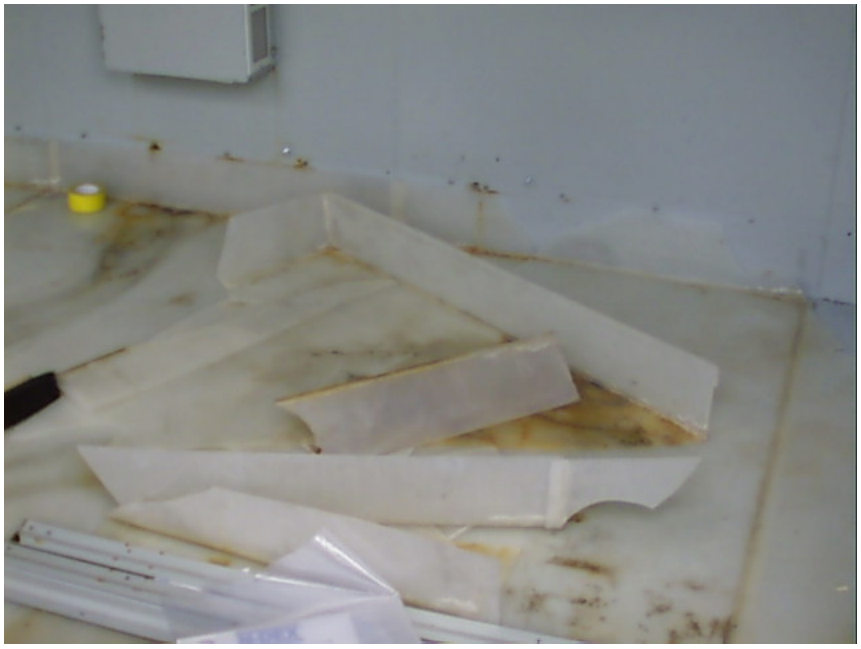

Figure 2-16
Plastic Liner Prior to Removal from Cell #1
[Photograph taken 8-28-02]

Figure 2-17
Removal of Plastic Liner Using Utility Knife
[Photograph taken 8-28-02]

Figure 2-18
Packaging of Plastic Liner During Removal
[Photograph taken 8-28-02]

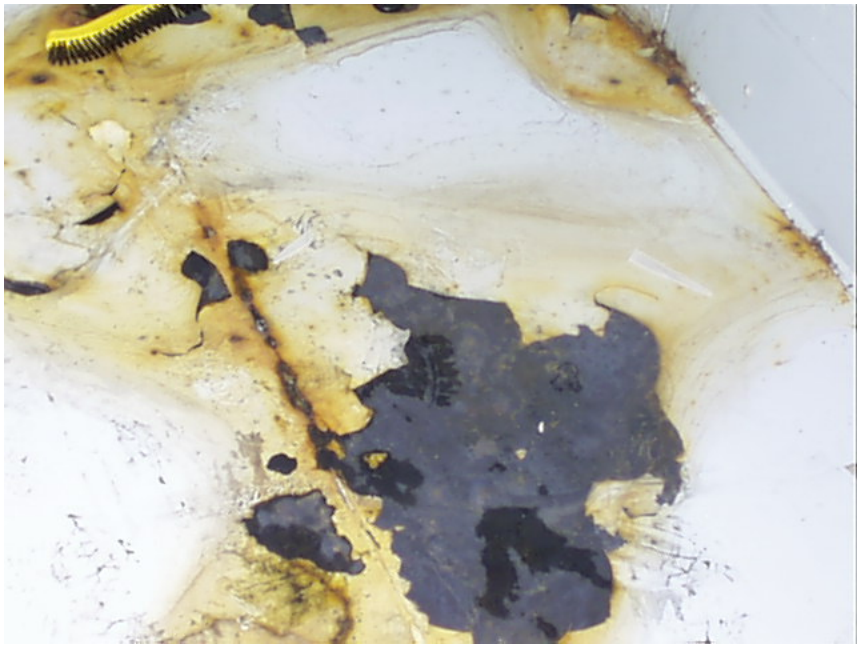

Figure 2-19
Chipped Paint and Rust in Recessed Containment Areas of TA-50-114
[Photograph taken 8-28-02]

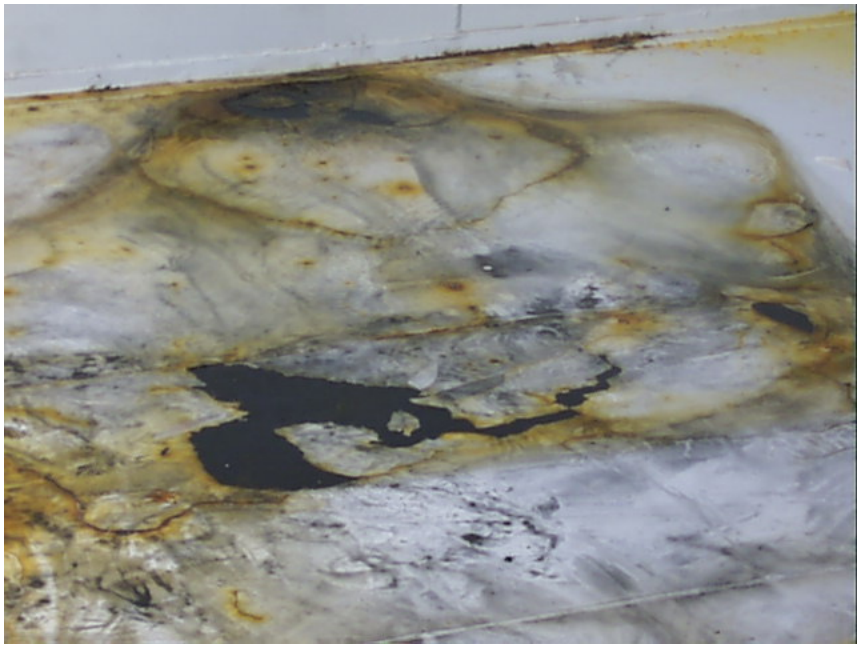

Figure 2-20
Chipped Paint and Rust in Recessed Containment Areas of TA-50-114
[Photograph taken 8-28-02]

Figure 2-21
Removal of Paint and Rust from Recessed Containment Area in Cell #1
[Photograph taken 8-28-02]

Figure 2-22
Removal of Water from Recessed Containment Area of Cell #2
[Photograph taken 8-28-02]

Figure 2-23
Removal of Paint and Rust from Recessed Containment Area of Cell #2
[Photograph taken 8-28-02]

Figure 2-24
Decontamination of Cell #1
[Photograph taken 8-29-02]

Figure 2-25
Decontamination of Cell #2
[Photograph taken 8-29-02]

Figure 2-26
Cell #1 Prior to Verification Wipe Down and Sampling
[Photograph taken 8-29-02]

Figure 2-27
Cell #2 Prior to Verification Wipe Down and Sampling
[Photograph taken 8-29-02]

Figure 2-28
Verification Wipe Down of Cell #1, North Wall
[Photograph taken 8-29-02]

Figure 2-29
Verification Wipe Down of Cell #2, Floor
[Photograph taken 8-29-02]

Figure 2-30
Verification Sampling
[Photograph taken 8-29-02]

Figure 2-31
Verification Sampling
[Photograph taken 8-29-02]

Figure 2-32
Verification Solution Remaining After Sampling
[Photograph taken 8-29-02]

Figure 2-33
Photograph Showing Proximity of Crane to the Verification Sampling Location
[Photograph taken 8-29-02]

Figure 2-34
Segregation of Decontamination Solutions
[Photograph taken 8-29-02]

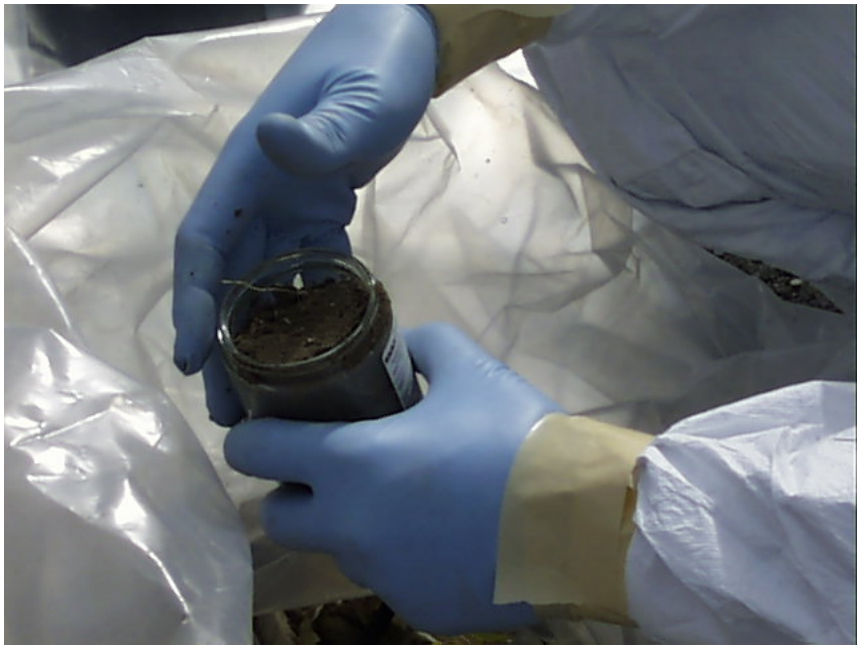

Figure 2-35
Waste Sampling of Paint and Rust Scrapings
[Photograph taken 8-29-02]

Figure 2-36
Surface Swipe Sample SW114-01 Collected from
Damaged Paint on the South Wall, Cell #1
[Photograph taken 7-1-04]

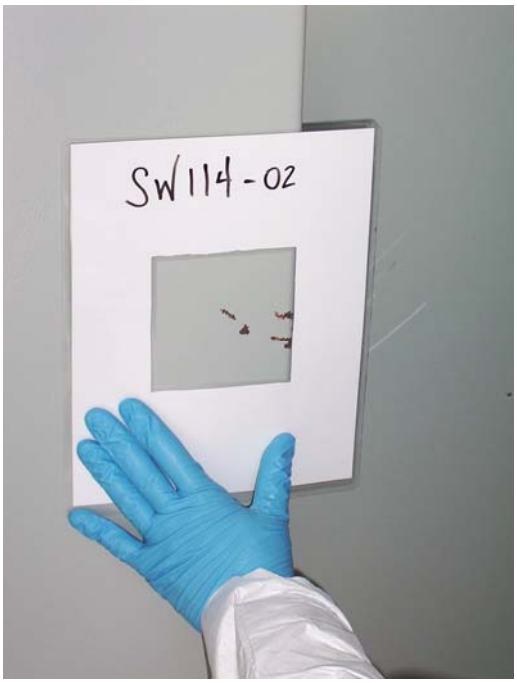

Figure 2-37
Surface Swipe Sample SW114-02 Collected from
Damaged Paint on the South Wall, Cell #1
[Photograph taken 7-1-04]

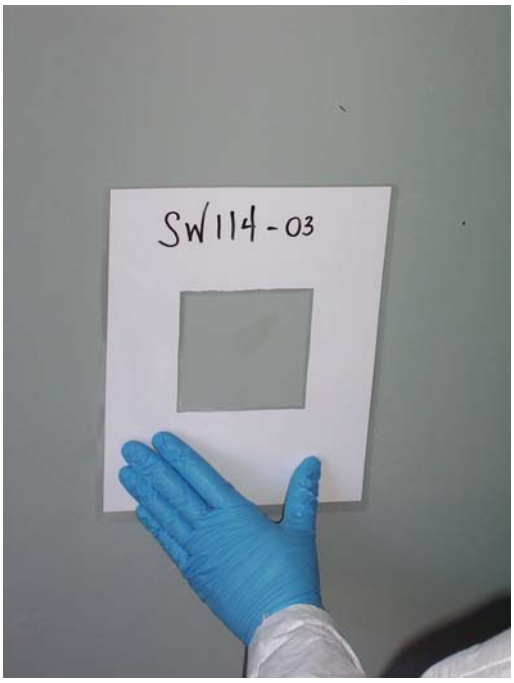

Figure 2-38
Surface Swipe Sample SW114-03 Collected from
Damaged Paint on the South Wall, Cell #1
[Photograph taken 7-1-04]

Figure 2-39
South Wall, Cell #1
[Photograph taken 7-1-04]

Figure 2-40
Surface Swipe Sample SW114-04 Collected from Smudge/Stain on the North Wall/Door, Cell #2
[Photograph taken 7-1-04]

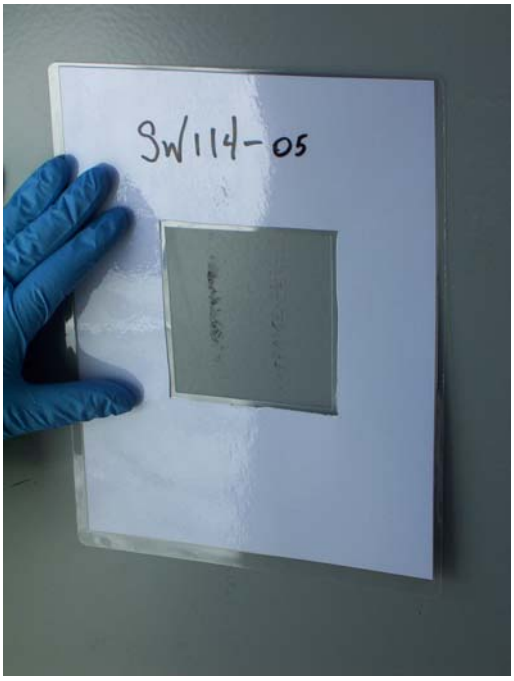

Figure 2-41
Surface Swipe Sample SW114-05 Collected from Smudge/Stain on the North Wall/Door, Cell #2
[Photograph taken 7-1-04]

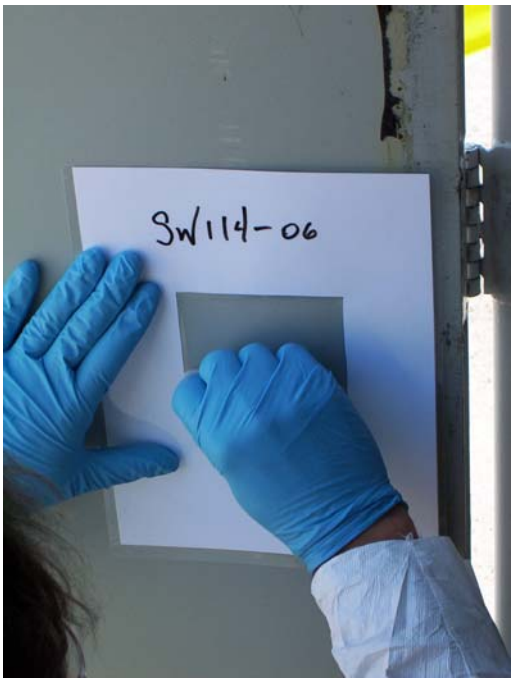

Figure 2-42
Surface Swipe Sample SW114-06 Collected from Smudge/Stain on the North Wall/Door, Cell #2
[Photograph taken 7-1-04]

Figure 2-43
North Wall/Door, Cell #2
[Photograph taken 7-1-04]

Figure 2-44
Baseline Sample Collection at TA-50-114
[Photograph taken 7-1-04]

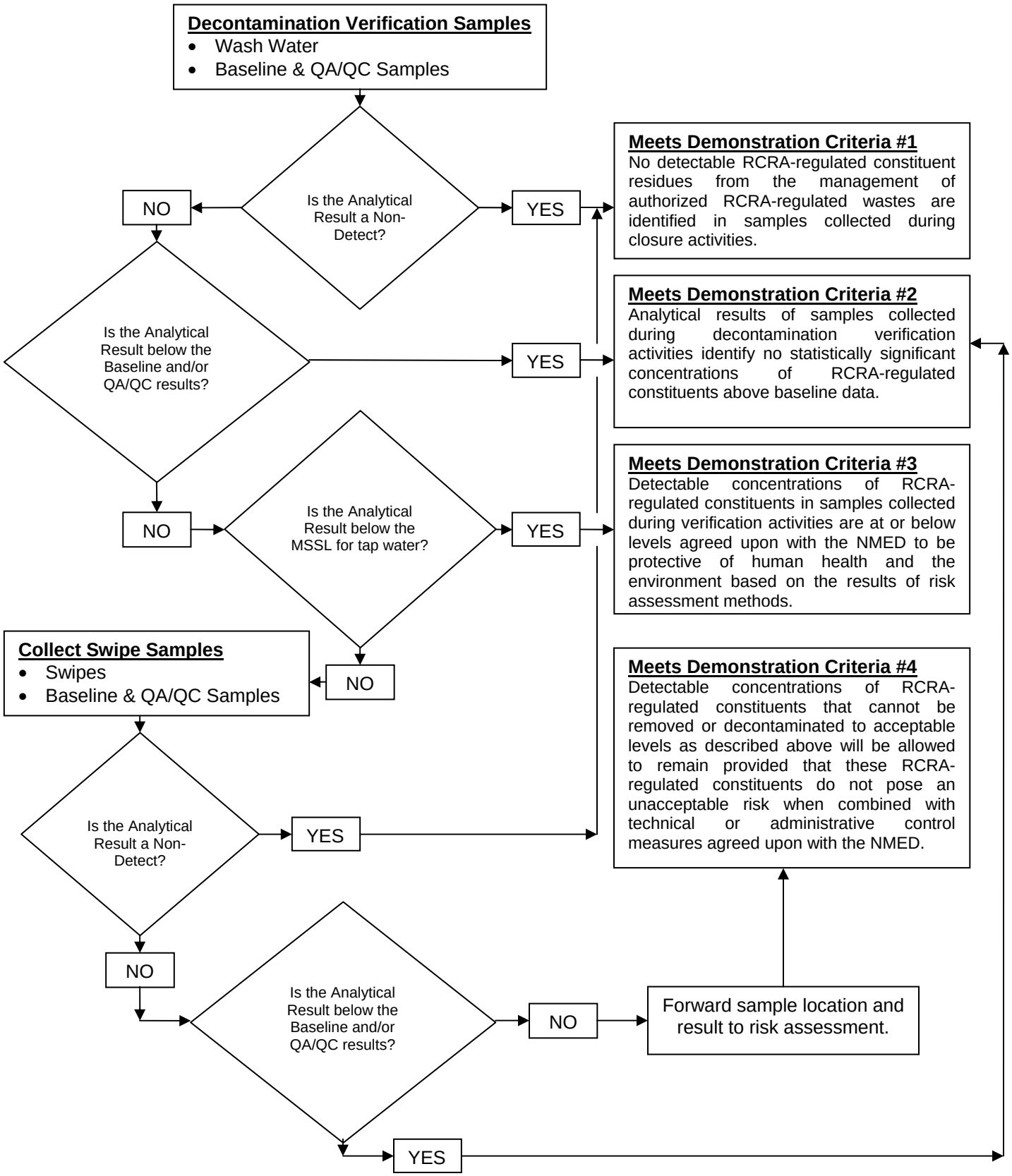

Figure 2-45
Logic Diagram for Demonstration of Closure

APPENDIX A
Amended Closure Plan Attachment E.3,
LANL Hazardous Waste Facility Permit, NM0890010515, July 30, 2003

MODIFIED
CLOSURE PLAN
PERMIT ATTACHMENT E.3
NM 0890010515-1

CLOSURE PLAN
PERMIT ATTACHMENT E.3
NM 0890010515-1

E.3 MODULAR STORAGE UNITS

Some containerized wastes are stored in prefabricated modular storage buildings at various locations in TA-50 and TA-54, Area L. See Figures E.3.1 and E.3.2. These storage units are self-contained and are equipped with chemical resistant walls to provide separation of incompatible wastes, a corrosion resistant fiberglass floor grating, and a polypropylene building sump liner.

E.3.1 Estimate of Maximum Waste in Storage

Each storage unit can store a maximum of thirty 55 gallons drums or a total of 1650 gallons of liquid wastes. The maximum total inventory of waste in storage at any time in the TA-50-114 CSU is 1,210 gallons.

E.3.2 Description of Waste Handled

Three waste streams compose the bulk of the waste stored in the modular units at TA-50, although the system is flexible enough to allow storage of other wastes that may be generated through new Laboratory projects. These streams are an acid/base waste that contains copper, chromate plating waste, and waste cyanide plating solutions. These structures may also be used to store any regulated waste while awaiting lab-packing.

The modular units at TA-54, Area L will be used primarily for the storage of labpacked waste. Since six separate cells are available for storage, there may be up to six different categories of waste stored there while waiting treatment or disposal.

E.3.3 Closure Procedures and Decontamination

E.3.3.1 Partial Closure

Partial closure would consist of closure of one unit or more, while leaving other units in service. In such an event, the following procedures would apply to the unit(s) to be closed.

E.3.3.2 Unit Closure

Personnel involved in disassembly and handling of equipment will wear protective equipment, including: acid/solvent-resistant coveralls, head protection, neoprene coated gloves and boots. Wrists and ankles are to be taped to protect against upward and inward splash. As a minimum protection, face shields will be worn. Full-face respirators will be used if specified by the Laboratory's Industrial Hygiene Group, ~~HSE-5~~HSR-5, following a field inspection.

The inside of the unit will be scrubbed and rinsed with a warm solution of Liquinox(@) or Alconox(@) in water. The cleaning solutions will accumulate in the internal sumps and will be pumped into drums with a small manually operated drum pump. Samples of this solution will be taken from the drum to verify

decontamination. Washdown will be repeated until decontamination is verified. The drummed liquid will be transported to TA-54, Area L for sampling, analysis and off site treatment and/or disposal.

The unit will be disassembled by removing all removable walls, grates etc. and then visually inspected. Any residual matter found will be scraped or brushed off the area where the residue occurred, then washed and rinsed. Dry residues will be placed in drums for transport to TA-54, Area L, for storage, sampling and analysis prior to off site disposal at a permitted facility. Liquids from washing and rinsing will be placed in approved Department of Transportation (DOT) containers and transported to TA-54, Area L for sampling, analysis and off site disposal. Cleaned pieces will be removed from the unit and handled as a unregulated waste or reassembled into the unit after decontamination is verified.

Spills occurring during disassembly will be contained in the unit and will picked up with mops. No decontamination of container handling equipment is anticipated during closure because the wastes are inside containers and no contact is expected between wastes and handling equipment. If breeching of any container of hazardous waste or hazardous material occurs, all contaminated equipment will be decontaminated by washing with appropriate cleaning solutions. Spills occurring outside the unit will be picked up with absorbent material such as vermiculite or commercial absorbent. The absorbed material will be swept up, placed in a DOT approved container and disposed of as hazardous waste. The area will be mopped or flushed with Liquinox(@) or Alconox(@) solution, the wash water picked up with absorbent material as above and placed in a container for disposal as a hazardous waste. Each container may be sampled and analyzed for hazardous constituents as listed in HWMR-5, Part II, Appendix VIII. Containers not containing hazardous constituents may be handled as unregulated waste.

Units emplaced over impervious surfaces, concrete or asphalt, need not have the surface sampled for spill residues from past handling practices. Units emplaced over absorbent surfaces will have a minimum of three soil samples to a depth of six inches taken in the area of each access door. The samples will be separately analyzed for the parameters in Table E.3.2. If contamination is discovered, a three foot grid centered on the locus of contaminated points will be sited and samples taken and analyzed to determine the extent of contamination. Analyses for this investigation can be made for the constituent(s) found in the initial survey. All contaminated soil to a depth of six inches will be removed and disposed of at a permitted facility.

Protective clothing, coveralls, face shields, and boots worn during the wash down will be rinsed in clean water while the items are within the unit. The rinse water will be handled with the dirty water from the external wash down. Following internal and external decontamination, the unit will be considered free from regulated wastes if the washwaters do not show any contamination from the constituents listed in Table E.3.2. Protective clothing will be worn by personnel disassembling the unit. The protective clothing and tools used during disassembly will be washed with detergent and water. The wash waster will be collected and analyzed. If the wash water is nonhazardous, the water will be discharged to the industrial waste water sewer. If the wash water contains hazardous constituents, it will be transported off site to a permitted disposal facility. Mops and rags used for cleanup will be placed in drums for transport to Area L, for ultimate off site disposal at a permitted facility. Nondisposable tools, equipment, etc. which come in contact with the dirty wash water will be decontaminated.

E.3.4 Decontamination Verification

Before the first wash down, two samples will be taken of the clean Liquinox(@) or Alconox(@) solution in water and analyzed for the constituents listed in table E.3.2.

One additional clean solution sample will be taken for each additional washdown event. These analytical results provide background data for decontamination verification.

Dirty washdown solutions will also be analyzed for the constituents listed in Table E.3.2. Analytical procedures will conform to methods found in SW-846. Equipment will be considered to contaminated if the used wash solutions show a significant increase in the listed constituents over the clean wash solution.

The constituents listed in Table E.3.2. include regulated constituents normally stored in the units. A scan for volatile and semivolatile organics is performed to ensure that solvents commonly used within the Laboratory have not contaminated the unit.

Successful decontamination is defined as:

1. No detectable hazardous constituents in the final sample, or

2. Detectable hazardous constituents in the final sample are equal to or less than, at the 0.01 confidence level, their concentration in the unused washwater or background sample.

An alternative demonstration of decontamination may be proposed and justified at the time of closure as circumstances indicate. The Director will evaluate the proposed alternative in accordance with the standards and guidance then in effect and, if approved, incorporate by permit modification the alternative into the closure plan.

E.3.5 Closure Schedule

The year of closure for the modular storage units is ~~2100~~2003 for TA-50-114 and 2100 for the various units located at TA-54 Area L. Closure will observe the schedule given in Table E.3.1.

The contract for closure activities is expected to exceed $100,000. Because Laboratory policy requires that the work be put out for bid, 90 days are required to solicit and process the bids. The selection of a contractor will be made before closure begins. Closure is estimated to take 180 days.

E.3.6 Closure Certification

An independent registered professional engineer and the Permittee shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the facility has been closed in accordance with this plan. The letter shall be dated and signed by each party, stamped by the registered engineer, and the original copy submitted by the DOE to the Director of ~~NMEID~~NMED. One copy shall be maintained at the DOE office and one copy maintained by the ~~HSE-8~~ Risk Reduction and Environmental Stewardship Division's Solid Waste Regulatory Compliance ~~Section~~Group.

E.3.7 Sampling and Analytical Procedure

The following section defines procedures and methods for sampling, analysis and documentation applicable to closure plans. While the procedures and method are specific, any applicable procedure or method given in SW-846 may be used if conditions or experience shows the alternate method to be more

appropriate. All analytical procedures actually used will be annotated in the final closure report. Disposable samplers may be used.

Samples will be taken, placed in bottles, sealed, tagged, and immediately packed in vermiculite, sawdust, or, if refrigeration is required, an insulated container with ice. One sample for every ten samples will be either duplicated or split. The duplicated or split sample will be identified by a code so that its source is not available to the analytical laboratory, but analytical results can be compared to its twin.

Sample containers appropriate for the requested analyses will be used for all samples. Sampling will be conducted in accordance with procedures given in *Samplers and Sampling Procedures for Hazardous Waste Streams*, EPA 600/2-80-0 1 8 and/or SW-846.

E.3.7.1 Soil and Solid Residues Sampling

Under normal circumstances the following soil sampling information will be inapplicable. Should however, spills occur outside the modular unit, sampling of the area will be required to verify that no hazardous constituents remain upon closure. The sampling procedures outlined below are used to determine the amount of hazardous material deposited on a particular area of land, or to determine the leaching rate of the material, or determine the residue level on the soil. Adequate preparation ensures that proper sampling is accomplished.

Surface soil samples will be collected with a trowel or scoop. To sample below 3 in. (8 cm), samples will be collected with a Veihmeyer soil sampler. Drums of solid residues will be sampled with a core sampler or Veihmeyer soil sampler. Drums not capable of being sampled will be assumed to be hazardous waste.

E.3.7.1.1 Cleaning of sampler

It is important to clean the samplers after each site is sampled. An unused disposable sampler may be presumed clean if still in a factory sealed wrapper. Unsealed samplers will be cleaned prior to use. The samplers will be washed with a warm Liquinox(@) or Alconox(@) solution, rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. Prevention of cross contamination is of particular importance in these samples.

E.3.7.1.2 Sampling procedures trowel or scoop

- Take small, equal portions of sample from the surface or near the surface of the material to be sampled.
- Combine the samples in a glass container.
- Cap the container, attach a label and seal, record in field log book, and complete the sample analysis request sheet and chain-of-custody record.

Veihmeyer Sampler

- Assemble the sampler by screwing in the tip and drive head on the sampling tube.
- Insert the tapered handle (drive guide) of the drive hammer through the drive head.

- Place the sampler in a perpendicular position on the material to be sampled.
- With the left hand holding the tube, drive the sampler into the material to the desired sampling depth by pounding the drive head with the drive hammer. Do not drive the tube further than the tip of the hammer's drive guide.
- Record the length of the tube that penetrated the material.
- Move the drive hammer onto the drive head. In this position, the hammer serves as a handle for the sampler.
- Rotate the sampler at least two revolutions to shear off the sample at the bottom.
- Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head and rotate about 90 degrees.
- Withdraw the sampler from the material by pulling the handle (hammer) upwards. When the sampler cannot be withdrawn by hand, as in deep soil sampling, use a pullerjack and grip.
- Dislodge the hammer from the sampler, turn the sampler tube upside down, tap the head gently against the hammer, and carefully recover the sample from the tube. The sample should slip out easily.
- Store the core sample in a 1,000 or 2,000 ml (1 qt or 1/2 gal) sample container.
- Label the sample, affix the seals, record in the field log book, complete the sample analysis request sheet and chain-of-custody record, and deliver the samples to the laboratory for analysis.

E.3.7.2 Liquid Sampling

A Coliwasa sampler or similar device will be used to sample water solutions in order to determine background parameters before washing the area; it will also be used to sample the dirty wash water used in cleaning equipment. The recommended model of the Coliwasa is shown in Figure E.3.3, the main parts consisting of the sampling tube, the closure-locking mechanism, and the closure system. As an alternative to the Coliwasa, glass tubes may be used to sample liquids. The primary advantage in using a glass tube is that the tube will be disposed of as hazardous waste after each sample is collected, thus eliminating the potential for cross contamination.

E.3.7.2.1 Cleaning of sampler

The sampler must be clean before use. An unused disposable sampler may be presumed clean if still in a factory sealed wrapper. Unsealed samplers will be cleaned prior to use. The used sampler must be washed with a warm detergent solution (Liquinox(@) or Alconox(@)), rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. A necessary piece of equipment for cleaning the tube of the Coliwasa is a bottle brush that fits tightly inside the diameter of the tube. The brush is connected to a rod of sufficient length to reach the entire length of the sampler tube. Using the ramrod and fiber reinforced paper towels, the Coliwasa tube may be quickly cleaned. Improper cleaning of sample equipment will cause cross contamination of samples. Prevention of contamination is

of particular importance in these samples. Clean samplers should be stored in polyethylene plastic tubes or bags in a clean an protected area.

E.3.7.2.2 Sampling procedures

- Assemble the Coliwasa sampler.
- Make sure that the Coliwasa sampler is clean.
- Check to make sure the sampler is functioning properly. Adjust the locking mechanism, if necessary, to make sure the neoprene rubber stopper provides a tight closure.
- Wear necessary protective clothing and gear and observe required sampling precautions.
- Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
- Slowly lower the Coliwasa sampler into the liquid at a rate that permits the levels of the Liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sampler tube is lower than that outside the sampler, the sampling rate is too fast and will result in a nonrepresentative sample.
- When the sampler stopper hits the bottom of the liquid container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.
- Slowly withdraw the sampler from the container with one hand while wiping the sampler tube with a disposable cloth with the other hand.
- Carefully discharge the sample into a glass container by slowly opening the sampler. This is done by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in the glass container.
- Cap the glass container, attach a label and seal, record in the field log book, and complete the sample analysis request sheet and chain-of-custody record.
- Unscrew the T-handle of the sampler and disengage the locking block. Clean the sampler on site or store the contaminated parts of the sampler in a plastic storage tube or bag for subsequent cleaning. Store used rags in plastic bags for subsequent disposal.

E.3.7.3 Sample Handling and Documentation

Soil and liquid samples will be analyzed either at LANL or at a commercial laboratory. In either case, each sample will be labeled, sealed, and accompanied by a chain-of-custody and a sample analysis request form.

The sample container must be sealed with a gummed paper seal attached to the container in such a way that the seal must be broken in order to open the container. The seal and sample tag must be completed with a waterproof pen. An example of a sample seal is shown in Figure E.3.4.

The sample label is necessary to prevent misidentification of samples and shall include, if applicable, the grid number referenced to positions staked on the site perimeter. The "field information" in the case of soil sampling, shall include observations such as the soil texture and surface appearance, ambient temperature and cloud cover at time of sampling, and precipitation conditions 24 hours before sampling. An example of a sample label is shown in Figure E.3.5.

The chain-of-custody form is necessary to trace sample possession from the time of collection and must accompany every sample. This record becomes especially important when the sample is to be introduced as evidence in litigation. This is a two-page record with the original accompanying shipment and the "copy" retained by the Laboratory. An example of this form is shown in Figure E.3.6.

A separate closure sampling field log book will be kept and will contain all information pertinent to field surveys and sampling. The log book shall have bound and consecutively numbered pages in 8-1/2 by 11-inch format. Minimum entries include:

a. Purpose of sample (routine sampling, special sampling);

b. Location of sampling (coordinates referenced to staked field points, if soil sample);

c. Name and address of person making log entry;

d. Type of process producing waste;

e. Number and volume of sample;

f. Description of each sampling location, sampling methodology, equipment used, etc.;

g. Date and time of sample collection;

h. Sample destination and transporter's name (name of laboratory, UPS, etc);

i. Map or photograph of the sampling site, if any;

j. Field observations (ambient temperature, sky conditions, past 24-hour precipitation, etc);

k. Field measurements, if any (pH, flammability, conductivity, explosivity, etc);

l. Collector's sample identification number(s); and

m. Signature of person responsible for the log entry.

Sampling situations vary widely. No general rule can be given as to the extent of information that must be entered in the log book. A good rule, however, is to record sufficient information so that someone can reconstruct the sampling situation without relying on the collector's memory.

The sample shipment and chain-of-custody record is accompanied by a sample analysis request sheet. The request sheet has two parts: field and laboratory. The field portion of this form must be completely by the person collecting the sample and include most of the pertinent information noted in the log book. The laboratory portion is intended to be completed by the laboratory personnel when the sample is received.

E.3.8 Quality Assurance/Quality Control

The Permittee shall designate a qualified individual or individuals to independently oversee the closure activities and report directly to senior management on the quality of the performance of this closure. This individual will personally observe a portion of the key activities, assure that sample blanks are used and analyzed and review the analysis reports for accuracy and adequacy. A written QA/QC plan in accordance with SW-846 guidance shall be prepared and followed, with variations from the plan documented and explained. The designated individual shall prepare a written statement for the final report commenting on the adequacy of the analysis showing decontamination.

E.3.9 Final Closure Report

Upon completion of the closure activities, the Permittee shall submit a Final Closure Report to the Director. The report shall document the final closure and contain, at a minimum, the following:

A. The certification described in paragraph E.3.6.

B. Any variance from the approved activities and the reason for the variance.

C. A tabular summary of all sampling results, showing:

1. Sample identification,
2. Sampling location,
3. The datum reported,
4. Detection limit for each datum,
5. A measure of analytical precision (e.g. uncertainty, range, variance),
6. Identification of analytical procedure, and
7. Identification of analytical laboratory.

D. A QA/QC statement on the adequacy of the analyses and the decontamination determination.

E. The location of the file of supporting documentation:

1. Field log books,
2. Laboratory sample analysis reports,

3. The QA/QC documentation, and

4. Chain of custody records.

F. Disposal location of all regulated and nonregulated residues.

G. A certification of accuracy of the report.

TABLE E.3.1.
CLOSURE SCHEDULE

Activity	Maximum Time Required
Notify ~~EID~~NMED of closure	-90 Days
Advertise for proposals	-90 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Begin closure activities	Day 0
Internal wash down complete	Day 30
External wash down complete	Day 50
Unit disassembly as required	Day 80
Floor wash down	Day 100
Final clean up	Day 120
Decontamination verification	Day 150
Submit final report to ~~EID~~NMED	Day 180

NOTES: The calendar days given above are completion dates for each activity. In some cases more than one activity may occur simultaneously.

This schedule is applicable to either partial or final closure.

TABLE E.3.2.
ANALYTICAL PARAMETERS

Metals	Organics	Other
Arsenic	Halogenated volatile organics	Cyanides
Barium	Nonhalogenated volatile organics	Ignitability
Cadmium	Acid-extractable semivolatile organics	Reactivity
Selenium	Base-neutral extractable semivolatile organics	pH
Lead	Phenols	
Mercury	Organochlorine pesticides	
Nickel	Chlorinated herbicides	
Beryllium		
Chromium		
Silver		

NOTES: Analytical methods are taken from *Test Methods for Evaluating Solid Waste*, EPA SW-846, and may be superseded by more current methods from SW-846 or alternate EPA-approved methods.

Metals may be analyzed for total content. Any metal whose total concentration exceeds the standard for Extraction Procedure Toxicity shall be analyzed by Extraction Procedure Toxicity procedures. Both data shall be reported in the final report.

TABLE E.3.3.
SAMPLING SUMMARY

Material Sampled	Metals	Organics	Other
Soil sampling[a]	X	X	X
Solid wastes & residues	X	X	X
Washwater before use	X	X	X
Washwater after use	X	X	X
Protective clothing washwater		X	

NOTES: Analytical parameters are given in Table E.3.2.

[a]For units placed over permeable surfaces.

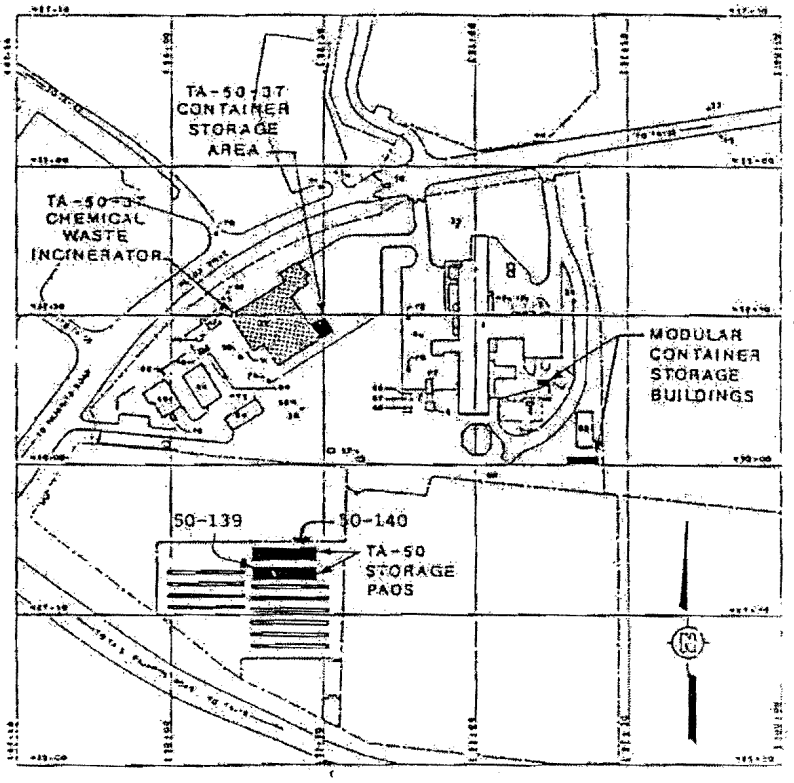

FIGURE E.3.1

LOCATIONS OF TA-50
CHEMICAL WASTE INCINERATOR
AND CONTAINER STORAGE
UNITS

PREPARED FOR

LOS ALAMOS
NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

INTERNATIONAL
TECHNOLOGY
CORPORATION

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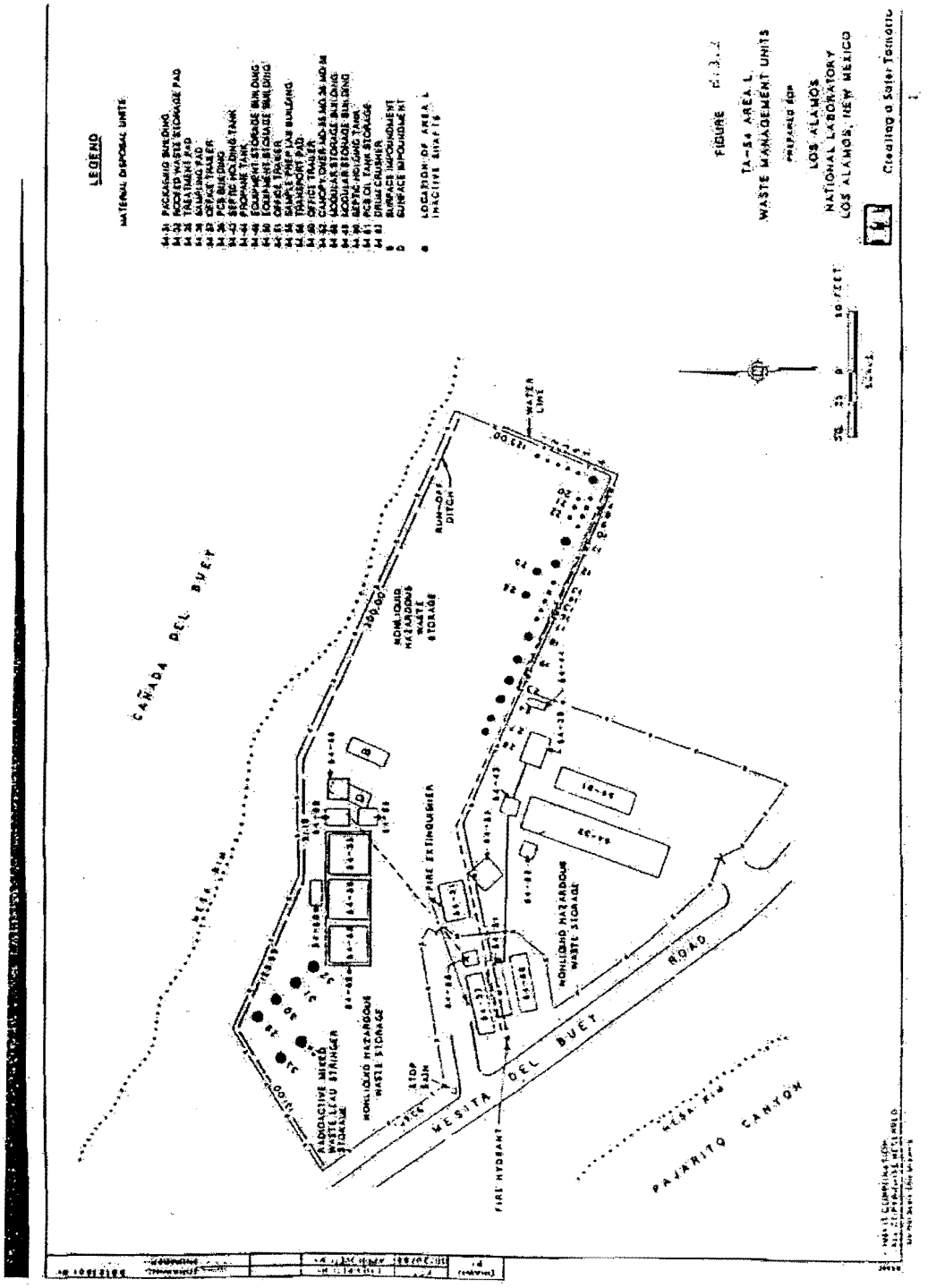
LEGEND
CAÑADA DEL BUEY
MESITA DEL BUEY
ROAD
PAJARITO CANYON
FIRE HYDRANT
FIRE EXTINGUISHER
WATER LINE
RUN-OFF DITCH
NONLIQUID HAZARDOUS WASTE STORAGE
RADIOACTIVE MIXED WASTE LEAD STRINGER STORAGE
TA-54 AREA L
WASTE MANAGEMENT UNITS
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

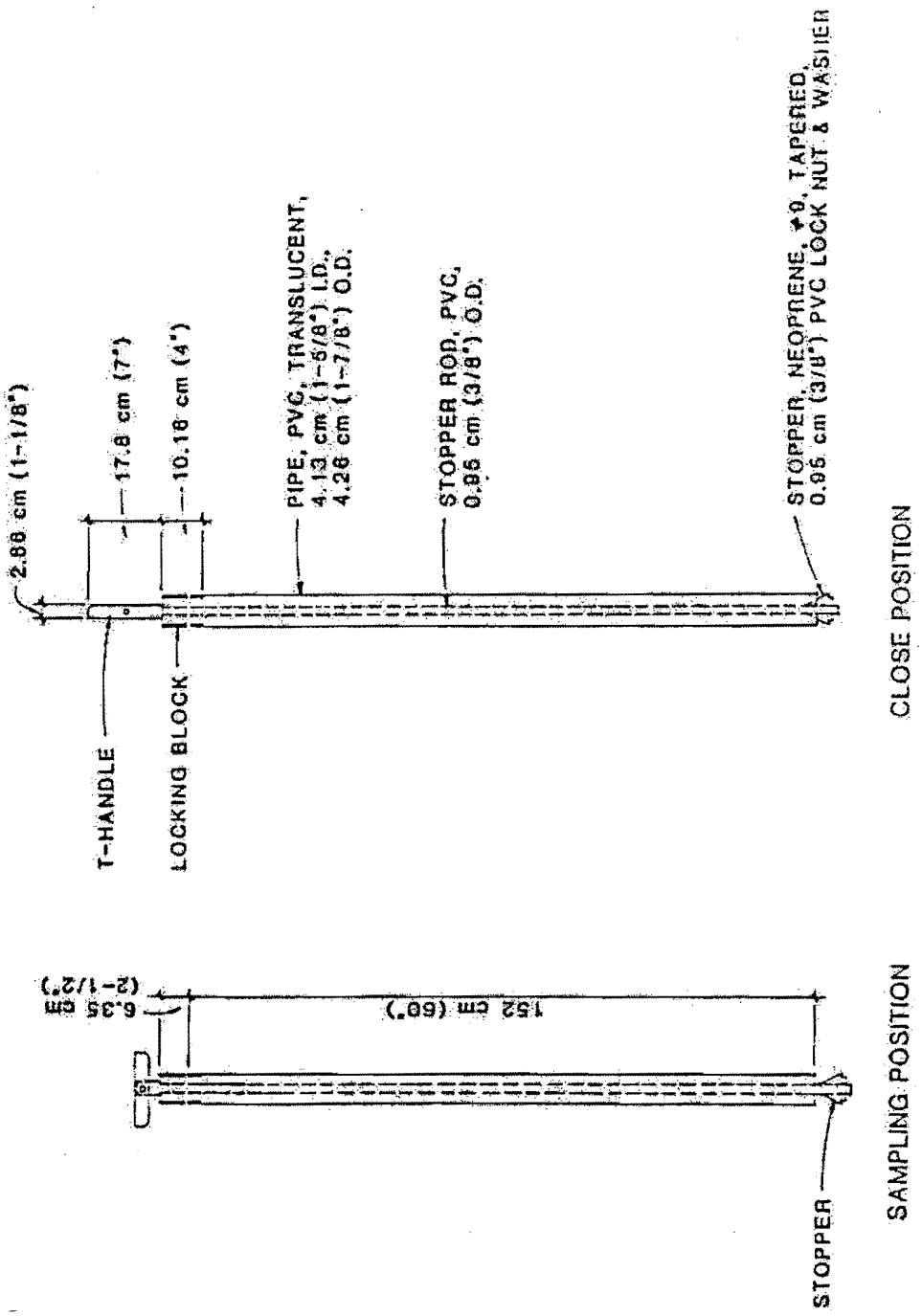

FIGURE E-3.7 COMPOSITE LIQUID WASTE SAMPLER (COLIWASA)

FIGURE E.3.4
EXAMPLE OF SAMPLE SEAL

OFFICIAL SAMPLE SEAL

Collected by _____ Collector's sample No. _____
(Signature)

Date Collected _____ Time Collected _____

Place Collected _____

_____

_____

FIGURE E.3.5
EXAMPLE OF SAMPLE LABEL
OFFICIAL SAMPLE LABEL

OFFICIAL SAMPLE LABEL

Collector _____ Collector's Sample No. _____

Place of Collection _____

_____

Date Sampled _____ Time Sampled _____

Field Information _____

_____

_____

FIGURE E.3.6
EXAMPLE CHAIN OF CUSTODY RECORD

Hazardous Materials
Collector's Sample No.

Location of Sampling: ☐ Producer ☐ Hauler
☐ Disposal Site ☐ Other: _____

Company's Name_____ Telephone (___)_____

Address_____
Number Street City State Zip

Collector's Name_____ Telephone (___)_____

Date Sampled_____ Time Sampled_____

Type of Process Producing Waste_____

Waste Type Code_____ Other_____

Field Information_____

Sample Allocation:

1. _____
(Name of Organization)

2. _____
(Name of Organization)

3. _____
(Name of Organization)

Chain of Possession:

1. _____ _____ _____
Signature Title Inclusive Dates

2. _____ _____ _____
Signature Title Inclusive Dates

3. _____ _____ _____

APPENDIX B
Letters of Agreement/Communication with the New Mexico Environment Department

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone (505) 428-2500
Fax (505) 428-2567
www.nmenv.state.nm.us

BILL RICHARDSON
GOVERNOR

RON CURRY
SECRETARY

DERRITH WATCHMAN-MOORE
DEPUTY SECRETARY

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

March 24, 2004

G. Pete Nanos, Interim Director
Los Alamos National Laboratory
P.O. Box 1663, MS A100
Los Alamos, New Mexico 87545

Mr. Ralph Erickson, Area Manager
Office of Los Alamos Site Operations
Department of Energy
528 35th Street, MS A316
Los Alamos, New Mexico 87544

SUBJECT: APPROVAL OF CLASS I PERMIT MODIFICATION – TECHNICAL AREA 50
CLOSURE PLANS:
TA-50-114 CONTAINER STORAGE UNIT, PERMIT ATTACHMENT E.3;
TA-50-37, ROOM 117 CONTAINER STORAGE UNIT, PERMIT ATTACHMENT E.5;
TA-50-37, CONTROLLED AIR INCINERATOR EXHAUST SYSTEM, PERMIT ATTACHMENT E.4.
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) HAZARDOUS WASTE FACILITY PERMIT
LOS ALAMOS NATIONAL LABORATORY EPA ID# NM0890010515
HWB-LANL-02-014

Dear Mssrs. Nanos and Erickson:

The New Mexico Environment Department (NMED) has reviewed the above-referenced U.S. Department of Energy and University of California (Permittees) requests for a Class 1 permit modification to the Los Alamos National Laboratory (LANL) Hazardous Waste Permit. The modification requests are dated August 25, 2003.

NMED approves the requests as a Class 1 permit modification requiring prior agency approval, pursuant to 20.4.1.900 NMAC (incorporating 40 C.F.R. § 270.42, Appendix I.D.1.a, b, and d).

The modifications revise the above-referenced attachments to the LANL Permit to change maximum inventories, dates of closure, and decontamination procedures, as specified in the modification requests.

This approval is subject to the following two conditions:

1. In addition to the analytes specified in the modified Closure Plan, Permittees shall sample for polychlorinated biphenyls, dioxins, and furans at the TA-50-37 Controlled Air Incinerator ductwork at the locations specified in the modified Closure Plan; and

2. Permittees shall send notice of the permit modification to all persons on the LANL facility mailing list within 90 calendar days after the change is put into effect, in compliance with 20.4.1.900 NMAC (incorporating 40 C.F.R. § 270.42(a)(1)(ii)).

The New Mexico Hazardous Waste Management Fee Regulations, 20.4.2.201.6 NMAC, require assessment of fees for permit modifications. The fee assessment invoice will be sent to you under separate cover. Payment is due within 60 days from the date you receive the invoice.

If you need an extension to the 60-day period, you must submit an extension request to NMED at least 14 days before the end of the 60-day period. If you disagree with the assessed fee, you may file an administrative appeal under provisions of 20.4.2.302.1 NMAC.

If you transmit the fee electronically, you must also submit a letter to Cindy Abeyta, Hazardous Waste Bureau, indicating the invoice number, payment amount, date of payment, and the assessed activity.

If you have any questions or need additional information please contact John Kieling, at (505) 428-2535, or Steve Jetter, at (505) 841-9488.

Sincerely,

Sandra Y. Martin
Acting Chief
Hazardous Waste Bureau

SYM:sj

cc: J. Kieling, NMED HWB
C. Abeyta, NMED HWB
S. Jetter, NMED HWB
C. Will, NMED HWB
L. King, EPA 6PD-N
G. Turner, DOE LASO, MS A316
Jack Ellvinger, LANL RRES-SWRC
G. Bacigalupa, LANL RRES-SWRC

file: reading and LANL TA-50

Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

AUG 25 2003

RECEIVED
AUG 2003
Hazardous
Bureau

Carl Will, RCRA Permits Management Program
Hazardous & Radioactive Materials Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Dear Mr. Will:

Subject: Request for Class 1 Resource Conservation and Recovery Act (RCRA) Permit Modification on Attachment E.3; Closure Plan for Container Storage Unit Technical Area 50, Building 114 (TA-50-114)

The objectives of this letter are to request a Class 1 RCRA Permit Modification to Attachment E.3 of the Department of Energy/University of California (DOE/UC) Hazardous Waste Facility Permit, to transmit the modified Attachment E.3, and to propose a method for alternative demonstration of decontamination as allowed by Section E.3.4 of Attachment E.3. Although Attachment E.3 is written in future tense, decontamination and verification activities at TA-50-114 were conducted from August 23, 2002 to August 29, 2002 in accordance with 20.4.1 NMAC § 264.112(e) [6-14-00] and the "Los Alamos National Laboratory Technical Area 50 Closure Plan for Container Storage Units TA-50-1, Room 59; TA-50-37; and TA-50-114," LA-UR-02-4729, submitted to the New Mexico Environment Department (NMED) in July 2002. Per agreement with NMED, that closure plan was withdrawn in a letter dated June 17, 2003. The closure plans for the interim status units have been separated from those of the permitted units, an individual closure plan is being submitted for the interim status units, and a request for permit modification is being sought together with a notification for implementation of the approved closure plans for the permitted units.

CLOSURE PLAN MODIFICATIONS

Modifications to Attachment E.3 were kept to a minimum. They incorporate a new maximum total inventory of waste in storage, year of closure, and update the names for those that have changed since the closure plan was written. LANL requests that these modifications be a Class 1 permit modification pending NMED approval, according to 20.4.1 NMAC incorporating 40 CFR 270.42. This section states that changes to the expected year of closure and changes to the procedures for decontamination are Class 1 permit modifications with prior approval from NMED.

PROPOSED CLOSURE PROCEDURE

Sampling for nine of the parameters listed in Table E.3.2 was not conducted during the closure of TA-50-114. Those parameters are: Nickel, Beryllium, Phenols, Organochlorine pesticides, Chlorinated herbicides, Cyanides, Ignitability, Reactivity, and pH. It was determined after a review of the unit's operating record that these parameters are not among the hazardous waste constituents of concern at this unit, and therefore not necessary for decontamination verification. Samples collected during the closure were analyzed for RCRA toxic metals, volatile organic compounds, and semi-volatile organic compounds.

As allowed for in Section E.3.4, an alternative demonstration of decontamination is requested to complete the closure of TA-50-114. DOE/UC propose the following alternative demonstrations to complete closure:

- Detectable hazardous waste or hazardous waste constituent concentrations from container storage activities that do not significantly decrease after several wash downs will be allowed to remain if they pose an acceptable risk, as mutually agreed upon with the NMED.
- Analytical results will be compared to the United States Environmental Protection Agency's Region 6 Medium Specific Screening Levels (MSSL) for tap water. If the result is below the MSSL, closure will be considered complete.
- If residual contamination levels found are above the MSSL's, an assessment will be conducted using an occupational risk based scenario.

If you have any comments or questions regarding the information presented in this letter and/or in the enclosure, please contact either Gene Turner, DOE, at (505) 667-5794 or Jack Ellvinger, UC, at (505) 667-0633.

Sincerely,

Joseph C. Vozella
Assistant Manager
Office of Facility Operations

OFO:1GT-018

Enclosure

cc:
See Page 3

cc w/enclosure:
Laurie King, Chief (6PD-N)
New Mexico/Federal Facilities Section
Environmental Protection Agency
Region 6 1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733
Steve Jetter
RCRA Permits Management Program
Hazardous & Radioactive Materials Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

cc w/o enclosure:
Sandra Martin, Bureau Chief
Hazardous & Radioactive Materials Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303
John E. Kieling, Manager
RCRA Permits Management Program
Hazardous & Radioactive Materials Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303
J. Stetson, PWT, LASO
G. Turner, OFO, LASO
D. McLain, FWO-WFM, LANL, MS-J593
B. Ramsey, RRES-DO, LANL, MS-J591
A. Stanford, FWO-DO, LANL, MS-K492
D. Stavert, RRES-EP, LANL, MS-J591
E. Louderbough, LC-ESH, LANL, MS-A187
S. French, FWO-WFM, LANL, MS-J595
R. Lechel, FWO-WFM, LANL, MS-J593
J. Ellvinger, RRES-SWRC, LANL, MS-K490
L. Vigil-Holterman, RRES-SWRC, LANL, MS-K490

MODIFIED
CLOSURE PLAN
PERMIT ATTACHMENT E.3
NM 0890010515-1

CLOSURE PLAN
PERMIT ATTACHMENT E.3
NM 0890010515-1

E.3 MODULAR STORAGE UNITS

Some containerized wastes are stored in prefabricated modular storage buildings at various locations in TA-50 and TA-54, Area L. See Figures E.3.1 and E.3.2. These storage units are self-contained and are equipped with chemical resistant walls to provide separation of incompatible wastes, a corrosion resistant fiberglass floor grating, and a polypropylene building sump liner.

E.3.1 Estimate of Maximum Waste in Storage

Each storage unit can store a maximum of thirty 55 gallons drums or a total of 1650 gallons of liquid wastes. The maximum total inventory of waste in storage at any time in the TA-50-114 CSU is 1,210 gallons.

E.3.2 Description of Waste Handled

Three waste streams compose the bulk of the waste stored in the modular units at TA-50, although the system is flexible enough to allow storage of other wastes that may be generated through new Laboratory projects. These streams are an acid/base waste that contains copper, chromate plating waste, and waste cyanide plating solutions. These structures may also be used to store any regulated waste while awaiting lab-packing.

The modular units at TA-54, Area L will be used primarily for the storage of labpacked waste. Since six separate cells are available for storage, there may be up to six different categories of waste stored there while waiting treatment or disposal.

E.3.3 Closure Procedures and Decontamination

E.3.3.1 Partial Closure

Partial closure would consist of closure of one unit or more, while leaving other units in service. In such an event, the following procedures would apply to the unit(s) to be closed.

E.3.3.2 Unit Closure

Personnel involved in disassembly and handling of equipment will wear protective equipment, including: acid/solvent-resistant coveralls, head protection, neoprene coated gloves and boots. Wrists and ankles are to be taped to protect against upward and inward splash. As a minimum protection, face shields will be worn. Full-face respirators will be used if specified by the Laboratory's Industrial Hygiene Group, ~~HSE-5~~HSR-5, following a field inspection.

The inside of the unit will be scrubbed and rinsed with a warm solution of Liquinox(@) or Alconox(@) in water. The cleaning solutions will accumulate in the internal sumps and will be pumped into drums with a small manually operated drum pump. Samples of this solution will be taken from the drum to verify

decontamination. Washdown will be repeated until decontamination is verified. The drummed liquid will be transported to TA-54, Area L for sampling, analysis and off site treatment and/or disposal.

The unit will be disassembled by removing all removable walls, grates etc. and then visually inspected. Any residual matter found will be scraped or brushed off the area where the residue occurred, then washed and rinsed. Dry residues will be placed in drums for transport to TA-54, Area L, for storage, sampling and analysis prior to off site disposal at a permitted facility. Liquids from washing and rinsing will be placed in approved Department of Transportation (DOT) containers and transported to TA-54, Area L for sampling, analysis and off site disposal. Cleaned pieces will be removed from the unit and handled as a unregulated waste or reassembled into the unit after decontamination is verified.

Spills occurring during disassembly will be contained in the unit and will picked up with mops. No decontamination of container handling equipment is anticipated during closure because the wastes are inside containers and no contact is expected between wastes and handling equipment. If breeching of any container of hazardous waste or hazardous material occurs, all contaminated equipment will be decontaminated by washing with appropriate cleaning solutions. Spills occurring outside the unit will be picked up with absorbent material such as vermiculite or commercial absorbent. The absorbed material will be swept up, placed in a DOT approved container and disposed of as hazardous waste. The area will be mopped or flushed with Liquinox(@) or Alconox(@) solution, the wash water picked up with absorbent material as above and placed in a container for disposal as a hazardous waste. Each container may be sampled and analyzed for hazardous constituents as listed in HWMR-5, Part II, Appendix VIII. Containers not containing hazardous constituents may be handled as unregulated waste.

Units emplaced over impervious surfaces, concrete or asphalt, need not have the surface sampled for spill residues from past handling practices. Units emplaced over absorbent surfaces will have a minimum of three soil samples to a depth of six inches taken in the area of each access door. The samples will be separately analyzed for the parameters in Table E.3.2. If contamination is discovered, a three foot grid centered on the locus of contaminated points will be sited and samples taken and analyzed to determine the extent of contamination. Analyses for this investigation can be made for the constituent(s) found in the initial survey. All contaminated soil to a depth of six inches will be removed and disposed of at a permitted facility.

Protective clothing, coveralls, face shields, and boots worn during the wash down will be rinsed in clean water while the items are within the unit. The rinse water will be handled with the dirty water from the external wash down. Following internal and external decontamination, the unit will be considered free from regulated wastes if the washwaters do not show any contamination from the constituents listed in Table E.3.2. Protective clothing will be worn by personnel disassembling the unit. The protective clothing and tools used during disassembly will be washed with detergent and water. The wash waster will be collected and analyzed. If the wash water is nonhazardous, the water will be discharged to the industrial waste water sewer. If the wash water contains hazardous constituents, it will be transported off site to a permitted disposal facility. Mops and rags used for cleanup will be placed in drums for transport to Area L, for ultimate off site disposal at a permitted facility. Nondisposable tools, equipment, etc. which come in contact with the dirty wash water will be decontaminated.

E.3.4 Decontamination Verification

Before the first wash down, two samples will be taken of the clean Liquinox(@) or Alconox(@) solution in water and analyzed for the constituents listed in table E.3.2.

One additional clean solution sample will be taken for each additional washdown event. These analytical results provide background data for decontamination verification.

Dirty washdown solutions will also be analyzed for the constituents listed in Table E.3.2. Analytical procedures will conform to methods found in SW-846. Equipment will be considered to contaminated if the used wash solutions show a significant increase in the listed constituents over the clean wash solution.

The constituents listed in Table E.3.2. include regulated constituents normally stored in the units. A scan for volatile and semivolatile organics is performed to ensure that solvents commonly used within the Laboratory have not contaminated the unit.

Successful decontamination is defined as:

1. No detectable hazardous constituents in the final sample, or

2. Detectable hazardous constituents in the final sample are equal to or less than, at the 0.01 confidence level, their concentration in the unused washwater or background sample.

An alternative demonstration of decontamination may be proposed and justified at the time of closure as circumstances indicate. The Director will evaluate the proposed alternative in accordance with the standards and guidance then in effect and, if approved, incorporate by permit modification the alternative into the closure plan.

E.3.5 Closure Schedule

The year of closure for the modular storage units is ~~2100~~2003 for TA-50-114 and 2100 for the various units located at TA-54 Area L. Closure will observe the schedule given in Table E.3.1.

The contract for closure activities is expected to exceed $100,000. Because Laboratory policy requires that the work be put out for bid, 90 days are required to solicit and process the bids. The selection of a contractor will be made before closure begins. Closure is estimated to take 180 days.

E.3.6 Closure Certification

An independent registered professional engineer and the Permittee shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the facility has been closed in accordance with this plan. The letter shall be dated and signed by each party, stamped by the registered engineer, and the original copy submitted by the DOE to the Director of ~~NMEID~~NMED. One copy shall be maintained at the DOE office and one copy maintained by the ~~HSE-8~~ Risk Reduction and Environmental Stewardship Division's Solid Waste Regulatory Compliance ~~Section~~Group.

E.3.7 Sampling and Analytical Procedure

The following section defines procedures and methods for sampling, analysis and documentation applicable to closure plans. While the procedures and method are specific, any applicable procedure or method given in SW-846 may be used if conditions or experience shows the alternate method to be more

appropriate. All analytical procedures actually used will be annotated in the final closure report. Disposable samplers may be used.

Samples will be taken, placed in bottles, sealed, tagged, and immediately packed in vermiculite, sawdust, or, if refrigeration is required, an insulated container with ice. One sample for every ten samples will be either duplicated or split. The duplicated or split sample will be identified by a code so that its source is not available to the analytical laboratory, but analytical results can be compared to its twin.

Sample containers appropriate for the requested analyses will be used for all samples. Sampling will be conducted in accordance with procedures given in *Samplers and Sampling Procedures for Hazardous Waste Streams*, EPA 600/2-80-0 1 8 and/or SW-846.

E.3.7.1 Soil and Solid Residues Sampling

Under normal circumstances the following soil sampling information will be inapplicable. Should however, spills occur outside the modular unit, sampling of the area will be required to verify that no hazardous constituents remain upon closure. The sampling procedures outlined below are used to determine the amount of hazardous material deposited on a particular area of land, or to determine the leaching rate of the material, or determine the residue level on the soil. Adequate preparation ensures that proper sampling is accomplished.

Surface soil samples will be collected with a trowel or scoop. To sample below 3 in. (8 cm), samples will be collected with a Veihmeyer soil sampler. Drums of solid residues will be sampled with a core sampler or Veihmeyer soil sampler. Drums not capable of being sampled will be assumed to be hazardous waste.

E.3.7.1.1 Cleaning of sampler

It is important to clean the samplers after each site is sampled. An unused disposable sampler may be presumed clean if still in a factory sealed wrapper. Unsealed samplers will be cleaned prior to use. The samplers will be washed with a warm Liquinox(@) or Alconox(@) solution, rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. Prevention of cross contamination is of particular importance in these samples.

E.3.7.1.2 Sampling procedures trowel or scoop

- Take small, equal portions of sample from the surface or near the surface of the material to be sampled.
- Combine the samples in a glass container.
- Cap the container, attach a label and seal, record in field log book, and complete the sample analysis request sheet and chain-of-custody record.

Veihmeyer Sampler

- Assemble the sampler by screwing in the tip and drive head on the sampling tube.
- Insert the tapered handle (drive guide) of the drive hammer through the drive head.

- Place the sampler in a perpendicular position on the material to be sampled.
- With the left hand holding the tube, drive the sampler into the material to the desired sampling depth by pounding the drive head with the drive hammer. Do not drive the tube further than the tip of the hammer's drive guide.
- Record the length of the tube that penetrated the material.
- Move the drive hammer onto the drive head. In this position, the hammer serves as a handle for the sampler.
- Rotate the sampler at least two revolutions to shear off the sample at the bottom.
- Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head and rotate about 90 degrees.
- Withdraw the sampler from the material by pulling the handle (hammer) upwards. When the sampler cannot be withdrawn by hand, as in deep soil sampling, use a pullerjack and grip.
- Dislodge the hammer from the sampler, turn the sampler tube upside down, tap the head gently against the hammer, and carefully recover the sample from the tube. The sample should slip out easily.
- Store the core sample in a 1,000 or 2,000 ml (1 qt or 1/2 gal) sample container.
- Label the sample, affix the seals, record in the field log book, complete the sample analysis request sheet and chain-of-custody record, and deliver the samples to the laboratory for analysis.

E.3.7.2 Liquid Sampling

A Coliwasa sampler or similar device will be used to sample water solutions in order to determine background parameters before washing the area; it will also be used to sample the dirty wash water used in cleaning equipment. The recommended model of the Coliwasa is shown in Figure E.3.3, the main parts consisting of the sampling tube, the closure-locking mechanism, and the closure system. As an alternative to the Coliwasa, glass tubes may be used to sample liquids. The primary advantage in using a glass tube is that the tube will be disposed of as hazardous waste after each sample is collected, thus eliminating the potential for cross contamination.

E.3.7.2.1 Cleaning of sampler

The sampler must be clean before use. An unused disposable sampler may be presumed clean if still in a factory sealed wrapper. Unsealed samplers will be cleaned prior to use. The used sampler must be washed with a warm detergent solution (Liquinox(@) or Alconox(@)), rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. A necessary piece of equipment for cleaning the tube of the Coliwasa is a bottle brush that fits tightly inside the diameter of the tube. The brush is connected to a rod of sufficient length to reach the entire length of the sampler tube. Using the ramrod and fiber reinforced paper towels, the Coliwasa tube may be quickly cleaned. Improper cleaning of sample equipment will cause cross contamination of samples. Prevention of contamination is

of particular importance in these samples. Clean samplers should be stored in polyethylene plastic tubes or bags in a clean an protected area.

E.3.7.2.2 Sampling procedures

- Assemble the Coliwasa sampler.
- Make sure that the Coliwasa sampler is clean.
- Check to make sure the sampler is functioning properly. Adjust the locking mechanism, if necessary, to make sure the neoprene rubber stopper provides a tight closure.
- Wear necessary protective clothing and gear and observe required sampling precautions.
- Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
- Slowly lower the Coliwasa sampler into the liquid at a rate that permits the levels of the Liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sampler tube is lower than that outside the sampler, the sampling rate is too fast and will result in a nonrepresentative sample.
- When the sampler stopper hits the bottom of the liquid container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.
- Slowly withdraw the sampler from the container with one hand while wiping the sampler tube with a disposable cloth with the other hand.
- Carefully discharge the sample into a glass container by slowly opening the sampler. This is done by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in the glass container.
- Cap the glass container, attach a label and seal, record in the field log book, and complete the sample analysis request sheet and chain-of-custody record.
- Unscrew the T-handle of the sampler and disengage the locking block. Clean the sampler on site or store the contaminated parts of the sampler in a plastic storage tube or bag for subsequent cleaning. Store used rags in plastic bags for subsequent disposal.

E.3.7.3 Sample Handling and Documentation

Soil and liquid samples will be analyzed either at LANL or at a commercial laboratory. In either case, each sample will be labeled, sealed, and accompanied by a chain-of-custody and a sample analysis request form.

The sample container must be sealed with a gummed paper seal attached to the container in such a way that the seal must be broken in order to open the container. The seal and sample tag must be completed with a waterproof pen. An example of a sample seal is shown in Figure E.3.4.

The sample label is necessary to prevent misidentification of samples and shall include, if applicable, the grid number referenced to positions staked on the site perimeter. The "field information" in the case of soil sampling, shall include observations such as the soil texture and surface appearance, ambient temperature and cloud cover at time of sampling, and precipitation conditions 24 hours before sampling. An example of a sample label is shown in Figure E.3.5.

The chain-of-custody form is necessary to trace sample possession from the time of collection and must accompany every sample. This record becomes especially important when the sample is to be introduced as evidence in litigation. This is a two-page record with the original accompanying shipment and the "copy" retained by the Laboratory. An example of this form is shown in Figure E.3.6.

A separate closure sampling field log book will be kept and will contain all information pertinent to field surveys and sampling. The log book shall have bound and consecutively numbered pages in 8-1/2 by 11-inch format. Minimum entries include:

a. Purpose of sample (routine sampling, special sampling);

b. Location of sampling (coordinates referenced to staked field points, if soil sample);

c. Name and address of person making log entry;

d. Type of process producing waste;

e. Number and volume of sample;

f. Description of each sampling location, sampling methodology, equipment used, etc.;

g. Date and time of sample collection;

h. Sample destination and transporter's name (name of laboratory, UPS, etc);

i. Map or photograph of the sampling site, if any;

j. Field observations (ambient temperature, sky conditions, past 24-hour precipitation, etc);

k. Field measurements, if any (pH, flammability, conductivity, explosivity, etc);

l. Collector's sample identification number(s); and

m. Signature of person responsible for the log entry.

Sampling situations vary widely. No general rule can be given as to the extent of information that must be entered in the log book. A good rule, however, is to record sufficient information so that someone can reconstruct the sampling situation without relying on the collector's memory.

The sample shipment and chain-of-custody record is accompanied by a sample analysis request sheet. The request sheet has two parts: field and laboratory. The field portion of this form must be completely by the person collecting the sample and include most of the pertinent information noted in the log book. The laboratory portion is intended to be completed by the laboratory personnel when the sample is received.

E.3.8 Quality Assurance/Quality Control

The Permittee shall designate a qualified individual or individuals to independently oversee the closure activities and report directly to senior management on the quality of the performance of this closure. This individual will personally observe a portion of the key activities, assure that sample blanks are used and analyzed and review the analysis reports for accuracy and adequacy. A written QA/QC plan in accordance with SW-846 guidance shall be prepared and followed, with variations from the plan documented and explained. The designated individual shall prepare a written statement for the final report commenting on the adequacy of the analysis showing decontamination.

E.3.9 Final Closure Report

Upon completion of the closure activities, the Permittee shall submit a Final Closure Report to the Director. The report shall document the final closure and contain, at a minimum, the following:

A. The certification described in paragraph E.3.6.

B. Any variance from the approved activities and the reason for the variance.

C. A tabular summary of all sampling results, showing:

1. Sample identification,
2. Sampling location,
3. The datum reported,
4. Detection limit for each datum,
5. A measure of analytical precision (e.g. uncertainty, range, variance),
6. Identification of analytical procedure, and
7. Identification of analytical laboratory.

D. A QA/QC statement on the adequacy of the analyses and the decontamination determination.

E. The location of the file of supporting documentation:

1. Field log books,
2. Laboratory sample analysis reports,

3. The QA/QC documentation, and

4. Chain of custody records.

F. Disposal location of all regulated and nonregulated residues.

G. A certification of accuracy of the report.

TABLE E.3.1.
CLOSURE SCHEDULE

Activity	Maximum Time Required
Notify ~~EID~~NMED of closure	-90 Days
Advertise for proposals	-90 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Begin closure activities	Day 0
Internal wash down complete	Day 30
External wash down complete	Day 50
Unit disassembly as required	Day 80
Floor wash down	Day 100
Final clean up	Day 120
Decontamination verification	Day 150
Submit final report to ~~EID~~NMED	Day 180

NOTES: The calendar days given above are completion dates for each activity. In some cases more than one activity may occur simultaneously.

This schedule is applicable to either partial or final closure.

TABLE E.3.2.
ANALYTICAL PARAMETERS

Metals	Organics	Other
Arsenic	Halogenated volatile organics	Cyanides
Barium	Nonhalogenated volatile organics	Ignitability
Cadmium	Acid-extractable semivolatile organics	Reactivity
Selenium	Base-neutral extractable semivolatile organics	pH
Lead	Phenols	
Mercury	Organochlorine pesticides	
Nickel	Chlorinated herbicides	
Beryllium		
Chromium		
Silver		

NOTES: Analytical methods are taken from *Test Methods for Evaluating Solid Waste*, EPA SW-846, and may be superseded by more current methods from SW-846 or alternate EPA-approved methods.

Metals may be analyzed for total content. Any metal whose total concentration exceeds the standard for Extraction Procedure Toxicity shall be analyzed by Extraction Procedure Toxicity procedures. Both data shall be reported in the final report.

TABLE E.3.3.
SAMPLING SUMMARY

Material Sampled	Metals	Organics	Other
Soil sampling[a]	X	X	X
Solid wastes & residues	X	X	X
Washwater before use	X	X	X
Washwater after use	X	X	X
Protective clothing washwater		X	

NOTES: Analytical parameters are given in Table E.3.2.

[a]For units placed over permeable surfaces.

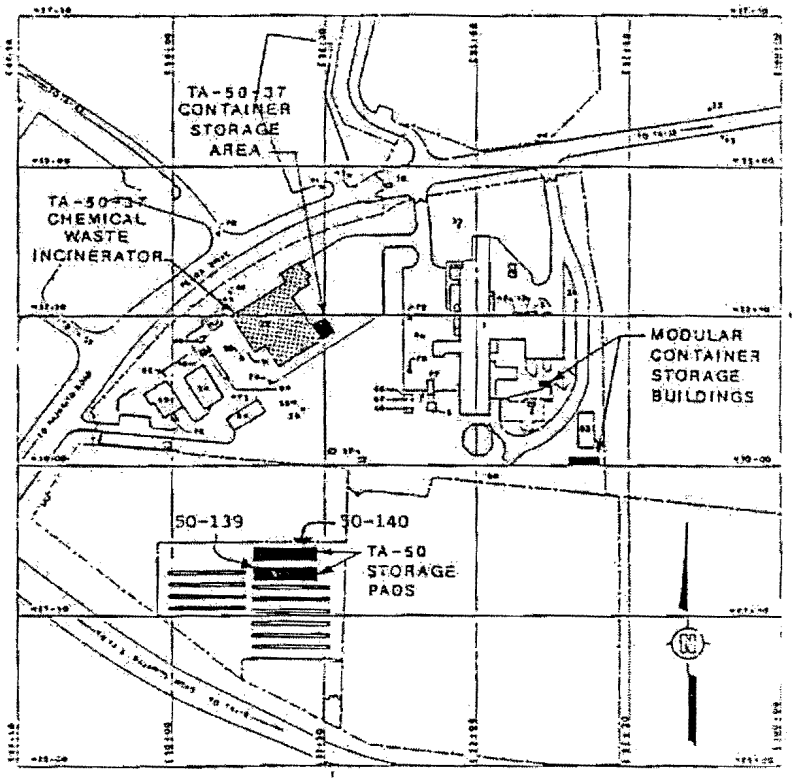

FIGURE E.3.1

LOCATIONS OF TA-50
CHEMICAL WASTE INCINERATOR
AND CONTAINER STORAGE
UNITS

PREPARED FOR

LOS ALAMOS
NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

INTERNATIONAL
TECHNOLOGY
CORPORATION

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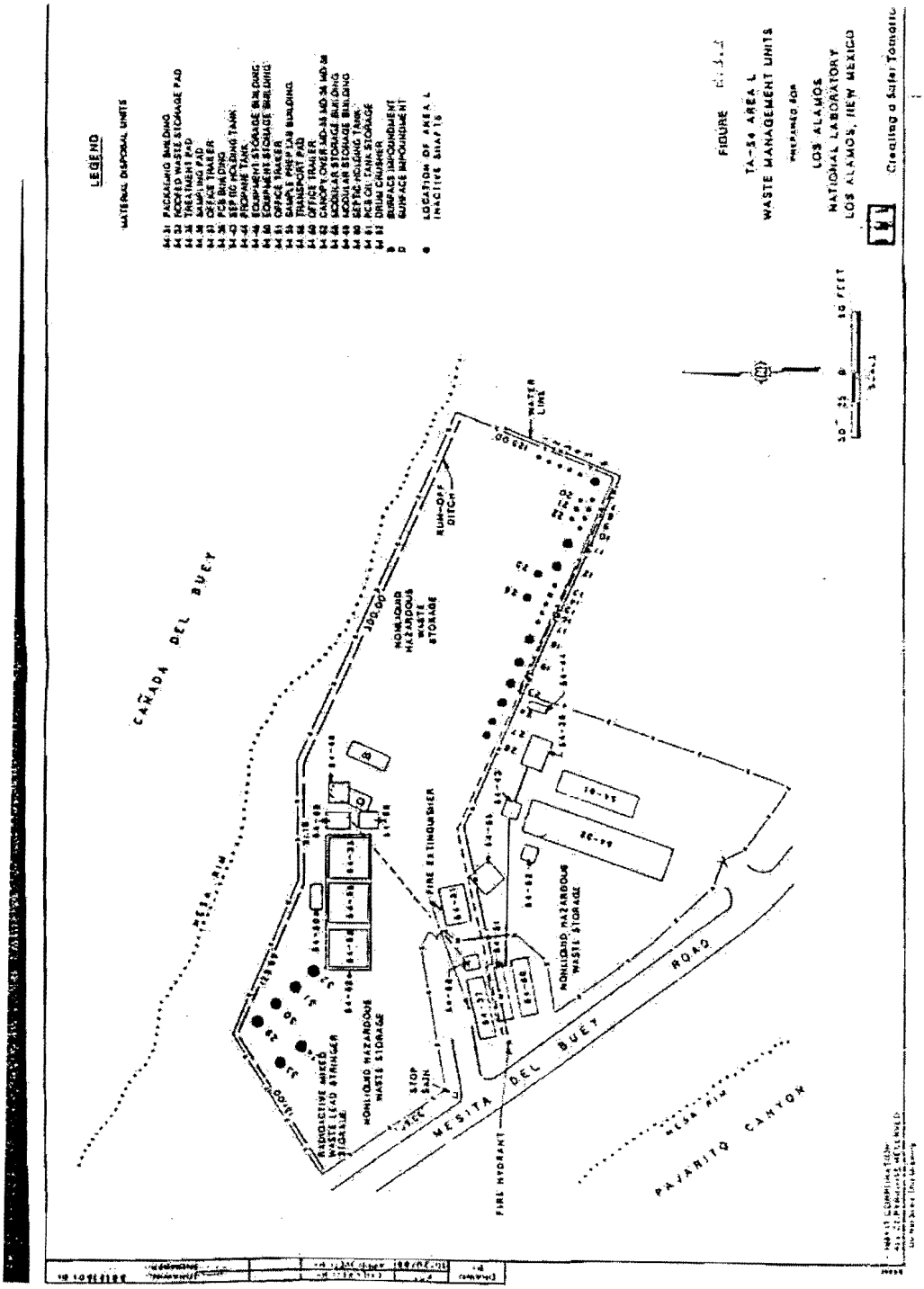
LEGEND
MATERIAL DISPOSAL UNITS
CAÑADA DEL BUEY
MESITA DEL BUEY
PAJARITO CANYON
ROAD
NONLIQUID HAZARDOUS WASTE STORAGE
RUN-OFF DITCH
WATER LINE
FIRE EXTINGUISHER
FIRE HYDRANT
STOP SIGN
RADIOACTIVE MIXED WASTE LEAD STRINGER STORAGE
FIGURE
TA-54 AREA L
WASTE MANAGEMENT UNITS
LOS ALAMOS
NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

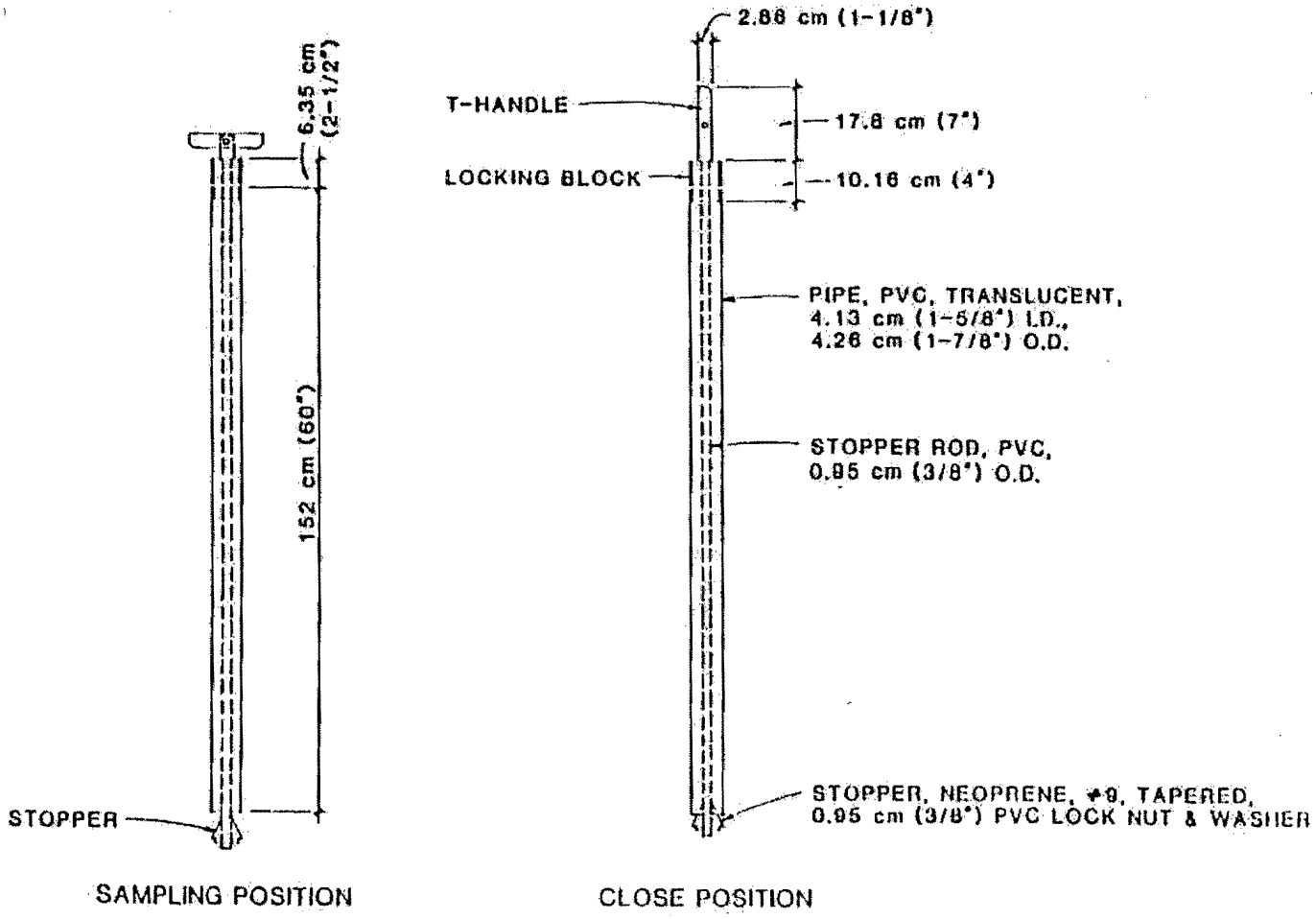

FIGURE E-3.3 COMPOSITE LIQUID WASTE SAMPLER (COLIWASA)

FIGURE E.3.4
EXAMPLE OF SAMPLE SEAL

OFFICIAL SAMPLE SEAL

Collected by _____ Collector's sample No._____
(Signature)

Date Collected_____ Time Collected_____

Place Collected_____

_____

_____

FIGURE E.3.5
EXAMPLE OF SAMPLE LABEL
OFFICIAL SAMPLE LABEL

OFFICIAL SAMPLE LABEL

Collector_____ Collector's Sample No._____

Place of Collection_____

_____

Date Sampled_____ Time Sampled _____

Field Information_____

_____

_____

FIGURE E.3.6
EXAMPLE CHAIN OF CUSTODY RECORD

Hazardous Materials
Collector's Sample No.

Location of Sampling: ☐ Producer ☐ Hauler
☐ Disposal Site ☐ Other: _____

Company's Name_____ Telephone (____)_____

Address_____
Number Street City State Zip

Collector's Name_____ Telephone (____)_____

Date Sampled_____ Time Sampled_____

Type of Process Producing Waste_____

Waste Type Code_____ Other_____

Field Information_____

_____

Sample Allocation:

1. _____
(Name of Organization)

2. _____
(Name of Organization)

3. _____
(Name of Organization)

Chain of Possession:

1. _____ _____ _____
Signature Title Inclusive Dates

2. _____ _____ _____
Signature Title Inclusive Dates

3. _____ _____ _____

ENTRY_DATE	AUTHOR	SUBJECT	CORRESPONDENCE_DATE	SUBJECT_SUMMARY
28-Aug-02	098910 - ELLVINGER JACK E	PROGRAM TO DISCUSS AN ISSUE THAT HAD ARISEN AT THE CLOSURE FOR THE TA-50-114 STORAGE SITE. I STARTED THE CONVERSATION WITH CARL CONFIRMING THAT HE WAS AWARE THAT LANL WOULD BE CLOSING A NUMBER OF STORAGE UNITS AT RISK AND TA-50-114 WOULD BE ONE OF THEM. HE SAID THAT HE WAS AWARE OF THIS. I NEXT INFORMED HIM THAT WHILE IN THE INITIAL STAGES OF THE CLOSURE OF TA-50-114 LANL HAD DISCOVER THAT THERE WAS A PLASTIC LINER IN THE SUMP OF THE STORAGE SHED. I ALSO INFORMED HIM THAT THERE WAS LIQUID UNDER THAT LINER THAT IS THOUGHT TO BE CONDENSATION. I TOLD HIM WE PLANNED ON PICKING UP THE LINER AND THE LIQUID, CHARACTERIZING THEM AND THEM HANDLING THEM APPROPRIATELY. I TOLD HIM THAT THE REASON THAT WE WERE CALLING WAS THAT THE CLOSURE PLAN HAD NOT ANTICIPATED THIS ACTIVITY AND THAT WE WANTED TO KEEP HIM IN THE LOOP. HE SAID THAT WE SHOULD PROCEED AS I HAD PREVIOUSLY DESICRIBED AND TO BE SURE AND INCLUDE IT IN THE CLOSURE REPORT. I TOLD HIM WE HAD PLANNED ON THAT. NO OTHER ACTION WOULD NEED TO BE TAKEN ACCORDING TO HIM.	28-Aug-02	Phone conversation with Carl Will (NMED) re: Closure of TA-50-114

APPENDIX C
Technical Area 50, Building 114 Container Storage Unit
Human Health Risk Assessment

CLOSURE CERTIFICATION REPORT

Technical Area 50, Building 114
Container Storage Unit

Human Health Risk Assessment

Revision 0.0
September 2004

Prepared For:
Risk Reduction and Environmental Stewardship Division,
Solid Waste Regulatory Compliance Group
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

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335 Central Park Square
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LIST OF ACRONYMS/ABBREVIATIONS

CDI	chronic daily intake
CFR	Code of Federal Regulations
COPC	contaminant of potential concern
CSF	cancer slope factor
CSU	container storage unit
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
LANL	Los Alamos National Laboratory
kg	kilogram(s)
MDC	maximum detected concentration
mg	milligram(s)
OPP	Office of Pesticides Programs
RfD	reference dose
RME	reasonable maximum exposure
TA	technical area
VOC	volatile organic compound
WTCIATWG	World Trade Center Indoor Air Taskforce Working Group

APPENDIX C
HUMAN HEALTH RISK ASSESSMENT METHODOLOGY
Technical Area 50, Building 114
Container Storage Unit

C1.0 INTRODUCTION

A human health risk assessment (HHRA) was conducted on Technical Area (TA) 50, Building 114 (TA-50-114) container storage unit (CSU) using methods developed by the U.S. Environmental Protection Agency (EPA) (EPA, 1989) and World Trade Center Indoor Air Taskforce Working Group (WTCIATWG) (WTCIATWG, 2002). The assessment included an evaluation of health risk to occupational workers from exposure to contaminated indoor surfaces. The HHRA, in accordance with EPA guidance (EPA, 1989), involved data evaluation and identification of contaminants of potential concern (COPC), exposure assessment, toxicity assessment, and risk characterization. Because the risk assessment was conducted on an indoor environment, a background evaluation was not conducted as part of the COPC selection process.

C1.1 Data Evaluation and Identification of COPCs

Analytical data for TA-50-114 CSU are presented in Table C1.1. Surface swipe samples were collected from TA-50-114 CSU following decontamination activities. The results of the laboratory analyses are summarized in Table C1.2.

Data qualifiers assigned by Assaigai Analytical Laboratories, Inc. were examined during the data review process. Qualifier codes are placed next to analytical results so that the reliability of the results can be assessed during the HHRA. The definitions of the qualifier codes that were assigned during laboratory validation include:

B = Analyte detected in method blank.

Toluene was assigned a data qualifier code of “B” indicating that toluene detections in investigative swipe samples may be due to method blank contamination.

The concentrations of toluene detected in the investigative swipe samples are less than 10 times the method blank concentration and are considered a result of laboratory contamination (EPA, 1989). Therefore, as described in Section 2.5.2, toluene was not carried forward to the HHRA.

Table C1.1
Analytical Data for TA-50-114 Container Storage Unit

SAMPLE	1,2,4-TRIMETHYLBENZENE		1,2-DICHLOROBENZENE		1,3-DICHLOROBENZENE		1,4-DICHLOROBENZENE		2-BUTANONE (MEK)		BROMOMETHANE		CHLOROMETHANE		METHYLENE CHLORIDE		TOLUENE	
Building 114 (µg/100cm^2):																		
SW114-01			5	U	5	U	5	U										
SW114-02			5	U	5	U	5	U										
SW114-03			5	U	5	U	5	U										
SW114-04	0.25	U	0.25	U	0.25	U	0.25	U	***5.2***		***5.8***		1.25	U	2.5	U	***0.6***	***B***
SW114-05	***0.6***		0.25	U	0.25	U	0.25	U	***4.2***		***6***		***2.5***		***7.2***		0.25	U
SW114-06	***0.6***		***0.6***		***0.5***		***0.6***		***5***		***8.2***		***3.2***		2.5	U	***0.9***	***B***
Number of Samples	3		6		6		6		3		3		3		3		3	
Number of Detects	2		1		1		1		3		3		2		1		2	
Frequency of Detection	67%		17%		17%		17%		100%		100%		67%		33%		67%	
Minimum Detect	0.6		0.6		0.5		0.6		4.2		5.8		2.5		7.2		0.6	B
Maximum Detect	0.6		0.6		0.5		0.6		5.2		8.2		3.2		7.2		0.9	B
Average	0.48		2.7		2.7		2.7		4.8		6.7		2.3		4.1		0.58	
Standard Deviation	0.20		2.5		2.6		2.5		0.53		1.3		1.0		2.7		0.33	

Definition of Qualifier

U = Chemical was not detected. Value shown is one-half the reporting limit (qualifier code not provided by laboratory).
B = Analyte detected in method blank.

Definition of Acronyms

µg/100 cm^2 = micrograms per 100 square centimeters

Table C1.2
Summary of Analytical Results for TA-50-114 Container Storage Unit

CAS Number	Parameter	Minimum Concentration [a]	Maximum Concentration [b]	Units	Location of Maximum Concentration	Detection Frequency [c]	Range of Reporting Limits (min-max)	Background Value [d]	COPC?
Method 8260B - Volatile Organic Chemicals (VOCs)									
95-63-6	1,2,4-Trimethylbenzene	0.6	0.6	µg/100cm^2	SW114—05/-06	2/3	0.5 - 0.5	n/a	Yes
95-50-1	1,2-Dichlorobenzene	0.6	0.6	µg/100cm^2	SW114-06	1/6	0.5 - 10	n/a	No [e]
541-73-1	1,3-Dichlorobenzene	0.5	0.5	µg/100cm^2	SW114-06	1/6	0.5 - 10	n/a	No [e]
106-46-7	1,4-Dichlorobenzene	0.6	0.6	µg/100cm^2	SW114-06	1/6	0.5 - 10	n/a	No [e]
78-93-3	2-Butanone (MEK)	4.2	5.2	µg/100cm^2	SW114-04	3/3	2.5 - 2.5	n/a	No [e]
74-83-9	Bromomethane	5.8	8.2	µg/100cm^2	SW114-06	3/3	2.5 - 2.5	n/a	Yes
74-87-3	Chloromethane	2.5	3.2	µg/100cm^2	SW114-06	2/3	2.5 - 2.5	n/a	Yes
75-09-2	Methylene chloride	7.2	7.2	µg/100cm^2	SW114-05	1/3	5 - 5	n/a	Yes
108-88-3	Toluene	0.6 B	0.9 B	µg/100cm^2	SW114-06	2/3	0.5 - 0.5	n/a	No[f]

a. Minimum detected concentration.
b. Maximum detected concentration.
c. Number of detects/Number of samples (see Table C1.1).
d. Background comparison is not applicable for this risk assessment.
e. Chemical is not a COPC because all detected values are less than the highest concentration detected in the associated baseline, trip, field, or method blanks.
f. Maximum detected concentration is less than 10 times the method blank concentration of 0.7 µg/100 cm^2.

Definition of Qualifier

B = Analyte detected in method blank.

Definition of Acronyms

COPC = Chemical of Potential Concern.
µg/100 cm^2 = micrograms per 100 square centimeters.
n/a = not applicable.
CAS = Chemical Abstract Service.

Laboratory control spike samples quantify accuracy (closeness of agreement between an observed value and an accepted reference value) in terms of percent recovery of the added spike. For swipe samples, laboratory control sample recoveries listed in Table C1.3 were outside control limits.

Table C1.3
Laboratory Control Sample Recoveries Outside of Control Limits

Parameter	LCS (LCSD) [a] Percent Recovery	Recovery Limits	Potential Bias
2-Fluorobiphenyl [b]	106%	44 – 104%	High
1,2,4-Trichlorobenzene	111% (121%)	60 – 103%	High
1,4-Dichlorobenzene	102% (103%)	63 – 100%	High
4-Chloro-3-methylphenol	113% (121%)	72 – 105%	High
n-Nitroso-di-n-propylamine	103% (105%)	65 – 100%	High

a. Laboratory Control Spike Duplicate results are within acceptable limits for precision.
b. Surrogate compound.

Definition of Acronyms
LCS = laboratory control spike.
LCSD = laboratory control spike duplicate.

All chemicals detected at least once in swipe samples were evaluated in the COPC identification stage of the HHRA. Detected concentrations in investigative samples were compared with detected concentrations in trip blanks, field blanks, method blanks, and baseline samples (see Section 2.5). The final list of COPCs includes chemicals detected in investigative swipe samples at concentrations above the maximum detected blank or baseline concentration.

Table C1.2 summarizes detected chemicals and COPC selection for the TA-50-114 CSU. There were nine chemicals detected in swipe samples from the TA-50-114 CSU. Of the nine detected chemicals, four volatile organic compounds (VOC) were eliminated because the detected concentrations were below the maximum concentration detected in the associated blank or baseline samples (see Section 2.5.2). Toluene from the HHRA was not included as a COPC because the maximum detected concentration is less than 10 times the method blank concentration (EPA, 1989). The maximum concentration of bromomethane (8.2 µg/100 cm^2) only slightly exceeded the maximum concentration detected in the baseline sample (6.8 µg/100 cm^2). However, as a conservative measure, bromomethane was retained as a COPC. The final

COPCs evaluated for TA-50-114 are 1,2,4-trimethylbenzene, bromomethane, chloromethane, and methylene chloride.

C1.2 Exposure Assessment

The purpose of the exposure assessment is to evaluate pathways for chemical exposure and to produce an estimate of the reasonable maximum exposure (RME), or the maximum exposure that is reasonably expected to occur at a site (EPA, 1989). The RME is expressed as a chronic daily intake (CDI), which is defined as the mass of a substance contacted per unit body weight per unit time, averaged over a long period of time and expressed in units of milligrams per unit body weight-day. The following steps were included as part of the exposure assessment for TA-50-114 CSU:

1. Characterization of exposure setting and receptors.
2. Identification of exposure pathways.
3. Estimation of exposure point concentrations (EPC).
4. Estimation of CDI.

C1.2.1 Characterization of Exposure Setting and Receptors

The future use of TA-50-114 was assumed to be office space, the closest and most conservative exposure scenario, where no personal protective equipment will be used. Therefore, future occupational workers were identified as the only potential receptors for TA-50-114 in the exposure assessment.

C1.2.2 Identification of Exposure Pathways

The assessment of exposure to chemicals on interior surfaces involves identification of complete exposure pathways. A complete exposure pathway is defined by:

- Source of contaminated media.
- Contaminant release mechanisms.
- Contaminant transport pathways.
- Intermediate or transport media.
- Exposure media.

- Receptors.
- Routes of exposure.

The following exposure pathways are considered complete for TA-50-114:

- Ingestion of chemicals on indoor surfaces through hand-to-mouth contact.
- Dermal contact with indoor surfaces.
- Inhalation of VOCs.

C1.2.3 Estimation of Exposure Point Concentrations

For this HHRA, the maximum detected concentrations (MDC) of COPCs detected in swipe samples were used as the EPCs. For inhalation of VOCs, the MDC was manipulated with working area volume to estimate a worst case air concentration (Pannell, 2001). Table C1.4 provides the dimensions.

Table C1.4
Estimation of Air Concentration for Volatile Organic Compounds Based on Swipe Sample Results and Room Dimensions

Room Dimensions (feet)	Room Dimensions (cm)	Room Surface Area (cm^2)	Room Volume (cm^3)	Room Volume (m^3)
L = 23 W = 9 H = 9	701 274 274	9.2E+05	5.3E+07	5.3E+01
CAS Number	**Parameter**	**Maximum Swipe Content (µg/100 cm^2)**	**Room Surface Content (µg)**	**Room Air Concentration (µg/m^3)**
95-63-6	1,2,4-Trimethylbenzene	0.6	5.5E+03	1.1E+02
74-83-9	Bromomethane	8.2	7.5E+04	1.4E+03
74-87-3	Chloromethane	3.2	2.9E+04	5.6E+02
75-09-2	Methylene chloride	7.2	6.6E+04	1.3E+03

Definition of Acronyms

CAS = Chemical Abstract Service.
cm = centimeters.
cm^2 = square centimeters.
Cm^3 = cubic centimeters
m^3 = cubic meters.
µg/100 cm^2 = micrograms per 100 square centimeters.
µg/m^3 = micrograms per cubic meter.
L = length.
W = width.
H = height.

C1.2.4 Estimation of Chronic Daily Intakes

The methodology used to evaluate oral and dermal exposure to chemicals deposited on indoor surfaces was developed by the WTCIATWG (WTCIATWG, 2002) and is based on EPA Office of Pesticides Programs (OPP) *Standard Operating Procedures (SOPs) for Residential Exposure Assessment* (EPA, 2001a). Evaluation of the inhalation exposure pathway is based on EPA *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A) Interim Final* (EPA, 1989).

Exposure factors (e.g., ingestion rates and exposure frequency and duration) are used to estimate CDI for each exposure pathway. The estimates of CDI are combined with toxicity information in the toxicity assessment of an HHRA to characterize the potential risk to human health.

CDIs were estimated by selecting values for exposure variables to provide the RME for an individual working at the site. Tables C1.5 through C1.7 present equations for calculating CDI for carcinogenic and noncarcinogenic chemicals for occupational workers from ingestion, dermal, and inhalation exposure to chemicals on indoor surfaces.

Table C1.5
Chronic Daily Intake for Ingestion of Chemicals on Indoor Surfaces

$$CDI\ (mg/kg-d) = \frac{EPC \times SA_h \times CF \times F_{s-s} \times F_{s-m} \times ED \times EF}{BW \times AT} \qquad Eq\,(1)$$

Exposure Parameter	Value	Reference
Exposure Point Concentration (EPC), mg/m^2	c-s	---
Skin Surface Area for Male Hands (SA_h), m^2/event =	0.099	EPA, 2001b
Contact Frequency (CF), events/day =	2	Assumed
Fraction Surface-to-Skin Transfer (F_{s-s}), unitless =	0.5	WTCIATWG, 2002
Exposure Duration (ED), years =	30	EPA, 1989; LANL, 2000
Exposure Frequency (EF), days/year =	250	EPA, 1989; LANL, 2000
Fraction Skin-to-Mouth Transfer (F_{s-m}), unitless =	0.1	WTCIATWG, 2002
Adult Body Weight (BW), kilograms =	70	EPA 1997a; LANL, 2000
Averaging Time (AT), days		
Noncarcinogens =	10,950	EPA, 1989; LANL, 2000
Carcinogens =	25,550	EPA, 1989; LANL, 2000

Definition of Acronyms

c-s = chemical-specific.
EPA = U.S. Environmental Protection Agency.
LANL = Los Alamos National Laboratory.
mg = milligram.
m^2 = square meter.
WTCIATWG = World Trade Center Indoor Air Taskforce Working Group

Table C1.6
Chronic Daily Intake for Dermal Contact with Chemicals on Indoor Surfaces

$$CDI\ (mg/kg-d) = \frac{EPC \times SA_h \times CF \times F_{s-s} \times ED \times EF \times ABS_d}{BW \times AT} \qquad Eq(2)$$

Exposure Parameter	Value	Reference
Exposure Point Concentration (EPC), mg/m^2	c-s	---
Skin Surface Area for Male Hands (SA_h), m^2/event =	0.099	EPA, 2001b
Contact Frequency (CF), events/day =	2	Assumed
Fraction Surface-to-Skin Transfer (F_{s-s}), unitless =	0.5	WTCIATWG, 2002
Exposure Duration (ED), years =	30	EPA, 1989; LANL, 2000
Exposure Frequency (EF), days/year =	250	EPA, 1989; LANL, 2000
Dermal Absorption Factor (ABS_d), unitless =	c-s	EPA, 2001b
Adult Body Weight (BW), kilograms =	70	EPA, 1997a; LANL, 2000
Averaging Time (AT), days		
Noncarcinogens =	10,950	EPA, 1989; LANL, 2000
Carcinogens =	25,550	EPA, 1989; LANL, 2000

Definition of Acronyms

c-s = chemical-specific.
EPA = U.S. Environmental Protection Agency.
LANL = Los Alamos National Laboratory.
m^2 = square meter.
mg = milligram.
WTCIATWG = World Trade Center Indoor Air Taskforce Working Group.

Table C1.7
Chronic Daily Intake for Inhalation of Volatile Organic Compounds on Indoor Surfaces

$$CDI\ (mg/kg-d) = \frac{EPC_a \times ED \times EF \times ET \times InhR}{BW \times AT} \qquad Eq(3)$$

Exposure Parameter	Value	Reference
Exposure Point Concentration, Air (EPC_a), mg/m^3	c-s	---
Exposure Duration (ED), years =	30	EPA, 1989; LANL, 2000
Exposure Frequency (EF), days/year =	250	EPA, 1989; LANL, 2000
Exposure Time, hours/day	2	Assumed
Adult Inhalation Rate, m^3/hour	0.63	EPA, 1997a
Adult Body Weight (BW), kilograms =	70	EPA, 1997a; LANL, 2000
Averaging Time (AT), days =		
Noncarcinogens =	10,950	EPA, 1989; LANL, 2000
Carcinogens =	25,550	EPA, 1989; LANL, 2000

Definition of Acronyms

c-s = chemical-specific.
m^3 = cubic meters.
mg = milligram.
EPA = U.S. Environmental Protection Agency.
LANL = Los Alamos National Laboratory.

The guidance documents used to compile exposure factors primarily include *EPA Risk Assessment Guidance for Superfund, Part A* (EPA, 1989); E*PA Exposure Factors Handbook* (EPA, 1997a)*; and Risk Assessment Guidance for Superfund, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance* (EPA, 2001b). Professional judgment and information from the WTCIATWG (WTCIATWG, 2002) were also used where EPA guidance was not available.

Body Weight

The EPA default adult body weight of 70 kilograms (kg) was used as the dose-response relationships on which the carcinogenic risk estimates are based assume a body weight of 70 kg (EPA, 1997a; Los Alamos National Laboratory [LANL], 2000).

Averaging Time

The averaging time for carcinogens of 25,550 days, is averaged over a 70-year lifetime (EPA, 1989). For noncarcinogens, the averaging time is the exposure duration multiplied by 365 days (EPA, 1989; LANL, 2000).

Contact Frequency

Based on professional judgment, the contact frequency assumed for TA-50-114 is 2 events per day to reflect work during the forenoon, washing during a lunch break, and work during the afternoon.

Dermal Absorption Factor

EPA (EPA, 2001b) does not provide dermal absorption values for VOCs. As recommended by EPA (EPA, 2001b), the dermal exposure pathway was not evaluated for chemicals lacking chemical-specific dermal absorption factors because VOCs would tend to be volatilized and should be accounted for via inhalation routes. None of the COPCs evaluated in this HHRA have chemical-specific dermal absorption factors recommended by EPA. Therefore, the dermal exposure pathway was not evaluated.

Skin Surface Area

The skin surface area used is based on recommendations in Exhibit C-1 of the EPA's Supplemental Guidance for Dermal Risk Assessment (EPA, 2001b). This Exhibit provides

body part-specific adult surface area calculations and recommends a value of 990 square centimeters for an adult male.

Exposure Duration

Because of the nature of the area, it is assumed that exposure duration in the work environment corresponds with residence time (LANL, 2000). LANL has evaluated exposure conditions for the area and has determined that the turnover rate of LANL employees is such that the exposure duration of occupation workers can be equated to the residential exposure duration. The default exposure duration of 30 years is the National upper bound time (90th percentile) at one residence (EPA, 1991; LANL, 2000).

Exposure Frequency

The EPA-recommended exposure frequency for occupational workers is 250 days per year. This assumes five working days per week for 50 weeks per year (EPA, 1991; LANL, 2000).

Exposure Time

The number of hours per day a worker is inside the CSU is relevant for the inhalation exposure pathway. Because workers are unlikely to remain in the CSU for long periods of time, an exposure time of two hours per day was assumed.

Fraction Skin-to-Mouth Transfer

The value of 10 percent (or 0.1) used by the WTCIATWG (WTCIATWG, 2002) is based on studies by Michaud et al. (Michaud et. al.,1994), the EPA OPP guidelines, and Kim and Hawley (Kim and Hawley, 1985).

Fraction Surface-to-Skin Transfer

According to the evaluation by the WTCIATWG (WTCIATWG, 2002), this factor should vary depending on the type of surface, type of residue, hand condition, and force of contact. Literature values range from 5 percent for carpets (EPA, 1997b) to 50 percent for hard surfaces (Rodes et al., 2001). EPA OPP recommends a value of 10 percent. A value of 50 percent (or 0.5 for hard surfaces) (WTCIATWG, 2002) was used for this assessment.

Inhalation Rate

The inhalation rate of 15.2 cubic meters per day is the EPA-recommended daily average inhalation rate for long term exposures for men ages 19 to 65+ years (EPA, 1997a).

C1.3 Toxicity Assessment

The purpose of the toxicity assessment is to "weigh available evidence regarding the potential for particular contaminants to cause adverse effects in exposed individuals and to provide, where possible, an estimate of the relationship between the extent of exposure to a contaminant and the increased likelihood and/or severity of adverse effects" (EPA, 1989). Most EPA cancer slope factors (CSF) are upper estimates of the probability of a response per unit intake of a chemical over a lifetime (EPA, 1989). CSFs are based on mathematical extrapolation from experimental animal data and epidemiological studies, when available. CSFs are expressed in units of risk per milligram (mg) of chemical per kg body weight-day $(mg/kg\text{-}day)^{-1}$. Carcinogens with EPA-derived CSFs are also given EPA weight-of-evidence classifications whereby potential carcinogens are grouped according to the likelihood that the chemical is a human carcinogen, depending on the quality and quantity of carcinogenic potency data the chemical. The weight-of-evidence classifications include:

Group A Human Carcinogen (sufficient evidence of carcinogenicity in humans).

Group B Probable Human Carcinogen (B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans).

Group C Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data).

Group D Not classifiable as to Human Carcinogenicity (inadequate or no evidence).

Group E Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies).

CSFs for use in the HHRA are presented in Table C1.8. Table C1.9 summarizes cancer weight of evidence classification for chemicals with carcinogenic effects.

The evaluation of noncarcinogens is based on the presumption of a threshold, where a specific dose must be received in order for an adverse effect to occur. The reference dose (RfD) is an estimate of a daily chemical intake per unit body weight that is likely to be without deleterious effects (EPA, 1989). EPA has developed chronic RfDs to evaluate long-term exposures (7 years to a lifetime), and subchronic values to evaluate exposures of shorter duration (2 weeks to 7 years). Chronic RfDs were used in this HHRA (Table C1.8).

Table C1.8
Toxicity Values[a] for Human Health Risk Assessment

Parameter	Oral Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$		Inhalation Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$		Oral Reference Dose (mg/kg-d)		Inhalation Reference Dose (mg/kg-d)	
1,2,4-Trimethylbenzene	n/a		n/a		5.0E-02	p	1.7E-03	p
Bromomethane	n/a		n/a		1.4E-03	i	1.4E-03	i
Chloromethane	1.3E-02	h	6.3E-03	h	n/a		2.6E-02	i
Methylene chloride	7.5E-03	i	1.6E-03	i	6.0E-02	i	8.6E-01	h

a. Toxicity values were taken from EPA Region 6 Human Health Medium-Specific Screening Levels Table and are referenced as follows (EPA, 2004, accessed online).

i = Integrated Risk Information System (IRIS)
h = Health Effects Assessment Summary Tables (HEAST)
p = Provisional Peer-Reviewed Toxicity Values (PPRTV) Database

Definition of Acronyms

mg/kg-d = milligrams per kilogram-day.
n/a = not available.

Table C1.9
Weight of Evidence Classifications for Carcinogens

Chemical of Potential Concern	Weight of Evidence Classification	Source
Chloromethane	C	HEAST
Methylene chloride	B2	IRIS

Definition of Acronyms

B2 = Probable Human Carcinogen (sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans).
C = Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data).
IRIS = Integrated Risk Information System (http://www.epa.gov/iris/).
HEAST = Health Effects Assessment Summary Tables (EPA 1997c)

Toxicity values are those used to develop the EPA Region 6 Human Health Medium Specific Screening Levels (EPA, 2004). Toxicity values were obtained by EPA Region 6 from the

Integrated Risk Information System, the EPA Health Effects Assessment Summary Tables (EPA, 1997c), or EPA's National Center for Environmental Assessment. Route-to-route extrapolations were used when there were no toxicity values available for a given route of exposure. That is, in accordance with EPA Region 6 guidance (EPA, 2004), oral CSFs and oral RfDs were used for both oral and inhaled exposures for chemicals lacking inhalation values. Because no chemical-specific dermal absorption factors are available for the COPCs at TA-50-114 (Table C1.2) (EPA, 2001b), the dermal exposure pathway was not quantitatively evaluated. Therefore, the adjustment of oral toxicity values to reflect an absorbed dose was not necessary.

C1.4 Risk Characterization

In the risk characterization stage of the HHRA, the toxicity and exposure assumptions are combined to produce a quantitative estimate of risk to human health. Risk is a unitless probability of an RME individual developing cancer as a result of a lifetime of exposure to a particular level of a potential carcinogen (EPA, 1989). Hazard quotients (HQ) are ratios of CDIs to RfDs and represent the potential for noncarcinogencic toxicity to occur in an individual. The overall potential for carcinogenic and noncarcinogenic effects is estimated by summing risks to produce a cumulative risk and summing HQs across chemicals and across exposure pathways to produce a hazard index (HI).

The linear low-dose cancer risk equation is as follows:

$$Risk_i = CDI \times CSF \qquad Eq\ (4)$$

Cumulative cancer risks are subsequently estimated as:

$$Risk_T = \sum Risk_i \qquad Eq\ (5)$$

where,

$Risk_i$ = Risk estimate for chemical i.
$Risk_T$ = Total cancer risk.
CDI = Chronic daily intake (mg/kg-day).
CSF = Cancer slope factor $(mg/kg\text{-}day)^{-1}$.

Calculation of the chemical-specific HQ is as follows:

$$Hazard\ Quotient = \frac{CDI}{RfD} \qquad Eq(6)$$

The chronic noncarcinogenic HI is estimated as:

$$Hazard\ Index = \frac{CDI_1}{RfD_1} + \frac{CDI_2}{RfD_2} + \cdots \frac{CDI_i}{RfD_i} \qquad Eq(7)$$

where,

CDI_i = Chronic daily intake for chemical i (mg/kg-day).
RfD_i = Reference dose for chemical i (mg/kg-day).

In accordance with Code of Federal Regulations (CFR), Title 40 §300.430, carcinogenic risk within the range of 10^{-4} (probability of 1 in 10,000 of an individual developing cancer) to 10^{-6} (probability of 1 in 1,000,000 of an individual developing cancer) is considered acceptable. Per EPA guidance, when the HI exceeds 1, there is a potential for adverse noncarcinogenic health effects (EPA, 1989). When the HI exceeds 1, and multiple chemicals contribute to the exceedance, the HI may be segregated on the basis of toxic effects and target organs (e.g., hepatic, renal, respiratory, cardiovascular, etc.). However, COPCs were not segregated by target organs for this HHRA.

The results of the noncarcinogenic and carcinogenic risk characterization for the TA-50-114 CSU are presented in Tables C1.10 and C1.11, respectively.

Table C1.10
Risk Characterization for Noncarcinogens for TA-50-114

Parameter	Building 114 EPC (mg/m^2)	Building 114 Air EPC (mg/m^3)	Dermal Absorption Factor (unitless)	Oral Chronic Daily Intake (mg/kg-d)	Dermal Chronic Daily Intake (mg/kg-d)	Inhalation Chronic Daily Intake (mg/kg-d)	Oral Reference Dose (mg/kg-d)	Dermal Reference Dose (mg/kg-d)	Inhalation Reference Dose (mg/kg-d)	Hazard Quotient
Volatile Organic Compounds (Method 8260B):										
1,2,4-Trimethylbenzene	6.0E-02	1.0E-01	0.0E+00	5.8E-06	0.0E+00	1.3E-03	5.0E-02	5.0E-02	1.7E-03	0.8
Bromomethane	8.2E-01	1.4E+00	0.0E+00	7.9E-05	0.0E+00	1.8E-02	1.4E-03	1.4E-03	1.4E-03	12.5
Chloromethane	3.2E-01	5.6E-01	0.0E+00	3.1E-05	0.0E+00	6.9E-03	---	---	2.6E-02	0.3
Methylene chloride	7.2E-01	1.3E+00	0.0E+00	7.0E-05	0.0E+00	1.6E-02	6.0E-02	6.0E-02	8.6E-01	0.02
									HAZARD INDEX:	10 [a]

a. EPA (1989) recommends reporting HIs with one significant figure.

Definition of Acronyms

EPC = exposure point concentration.
mg/kg-d = milligrams per kilogram-day.
mg/m^2 = milligrams per square meter.
mg/m^3 = milligrams per cubic meter.
--- = Not applicable or not available.

Table C1.11
Risk Characterization for Carcinogens for TA-50-114

Parameter	Building 114 EPC (mg/m^2)	Building 114 Air EPC (mg/m^3)	Dermal Absorption Factor (unitless)	Oral Chronic Daily Intake (mg/kg-d)	Dermal Chronic Daily Intake (mg/kg-d)	Inhalation Chronic Daily Intake (mg/kg-d)	Oral Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Dermal Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Air Cancer Slope Factor $(mg/kg\text{-}d)^{-1}$	Risk
Volatile Organic Compounds (Method 8260B):										
1,2,4-Trimethylbenzene	6.0E-02	1.0E-01	0.0E+00	2.5E-06	0.0E+00	5.6E-04	---	---	---	n/a
Bromomethane	8.2E-01	1.4E+00	0.0E+00	3.4E-05	0.0E+00	7.6E-03	---	---	---	n/a
Chloromethane	3.2E-01	5.6E-01	0.0E+00	1.3E-05	0.0E+00	3.0E-03	1.3E-02	1.3E-02	6.3E-03	1.9E-05
Methylene chloride	7.2E-01	1.3E+00	0.0E+00	3.0E-05	0.0E+00	6.7E-03	7.5E-03	7.5E-03	1.6E-03	1.1E-05
									CARCINOGENIC RISK:	**3E-05**

a. EPA (1989) recommends reporting carcinogenic risks with one significant figure.

Definition of Acronyms

mg/kg-d = milligrams per kilogram-day.
mg/m^2 = milligrams per square meter.
mg/m^3 = milligrams per cubic meter.
EPC = exposure point concentration.
CSF = cancer slope factor.
--- = Not applicable or not available.
n/a = Not applicable.

The exposure pathways quantified for occupational workers were ingestion and inhalation. Dermal exposure to chemicals on indoor surfaces is a complete exposure pathway but was not evaluated for VOCs in accordance with EPA guidance (EPA, 2001b) which states that VOCs will tend to be volatilized and should be accounted for via inhalation routes. The COPCs in the TA-50-114 CSU were evaluated quantitatively for noncarcinogenic effects are 1,2,4-trimethylbenzene, bromomethane, chloromethane, and methylene chloride.. The COPCs in TA-50-114 CSU evaluated quantitatively for carcinogenic risk are chloromethane and methylene chloride. EPA (EPA, 1989) recommends reporting the HI at one significant figure. Therefore, the noncarcinogenic HI for TA-50-114 is 10. This HI was calculated assuming immediate vaporization of VOCs and maintenance of that concentration for the entire 30 year exposure duration. As a result, a high level of uncertainty is associated with the HI for the inhalation exposure pathway. Because a more reasonable assumption is that VOCs vaporize over time, the inhalation HIs were adjusted by a factor of 365 days to produce an HI of 0.04.

The carcinogenic risk for TA-50-114 is 3E-05, which is within the acceptable 10^{-6} to 10^{-4} range of risks specified by 40 CFR §300.430. However, this cancer risk was calculated assuming immediate vaporization of VOCs and maintenance of that concentration for the entire 30 year exposure duration. As a result, a high level of conservatism is associated with the carcinogenic risk for the inhalation exposure pathway. However, with this assumption the carcinogenic risk is within the acceptable risk range.

C1.5 Uncertainty

The level of certainty associated with the conclusions of the HHRA depends upon the quality of data, the assumptions made in estimating exposure conditions, and the methods used to develop toxicity factors. Uncertainties in the HHRA process could result in an overestimation or underestimation of potential health risk.

EPCs used in the risk assessment were the MDCs. These concentrations likely overestimate the average exposure to COPCs in the TA-50-114 CSU. For VOCs, a worst-case vapor concentration estimated using working area volume (Pannell, 2001). Under this assumption, VOCs immediately volatilize and that concentration is maintained for the entire 30 year exposure duration. This assumption is highly conservative in that VOCs vaporize at different rates; no building ventilation is accounted for; and volatilization and exposure are continuous, whereas workers are only present at certain hours of the day. Therefore, the health risks due to the inhalation of VOCs exposure pathway are highly overestimated.

The characterization of noncancer hazards and cancer risks associated with the inhalation pathway (Section C1.4) includes calculations using no correction of the airborne concentration (i.e., a correction factor = 1) and a correction factor of 1/365. Use of no correction factor is consistent with the worst-case assumption regarding the exposure point concentration for inhalation (see Section C1.2.3, Pannell, 2001). This approach results in a highly overestimated upper bound on the exposure concentration and inhalation risk. If it is assumed that the entire removable inventory of a chemical in the CSU becomes volatile on the first day of a hypothetical 30-year exposure, it follows that (in the absence of any recontamination) the concentration available for exposure on succeeding days must be lower until the available inventory is entirely depleted. Therefore, a factor to correct for this depletion was assumed such that the entire removable inventory is depleted over the course of 1 year at a rate that would maintain a constant concentration of 1/365 of the available chemical in air and have zero concentration in the remaining 29 years.

Current EPA risk assessment guidance does not specify correction factors described above. Other factors might be assumed. If it is assumed that the entire available inventory is depleted by volatilization over the entire 30-year exposure, the entire concentration would be reduced by 1(30x365) = 1/10,950. This factor would include the unlikely assumption that no recontamination would occur during 30 years. A shorter depletion period, such as 30 days, might be assumed. However, the inhalation toxicity factors used in the assessment were developed to address chronic exposures over a lifetime. A more refined approach to correct for depletion of the volatile source term and its affect on airborne vapor concentration would require additional information to estimate the volatilization rate of each chemical from materials that make up the CSU surfaces, and data on the air turnover rate within the building.

Other exposure parameters were typically upper-bound estimates and likely result in an overestimate potential human health risk. For example, it was assumed that an industrial worker would be in contact with the MDC 250 days per year for 30 years. The exposure duration of 30 years for an industrial worker was equated to the 90th percentile value for time at a residence (see Section C1.2.4). This assumption likely results in an overestimation of human health risk. As another example, the skin surface area for hands is the 50th percentile for male workers (EPA, 2001b). This includes the entire surface area of the hands rather than the palms only, which is the area of the hands that is most likely to contact surfaces. As a result, the surface area is likely an overestimate.

Although the use of central-tendency techniques (e.g., using 50th percentile values) in addition to the RME provides a risk range for consideration in risk management decisions, it is not necessary to conduct assessments using central-tendency methods if the RME risks are acceptable using maximum or near maximum values for each of the input parameters. EPA states that "bounding estimates" (e.g., upper-bound estimates) may be calculated using maximum or near maximum values if the purpose of the approach is, for example, to eliminate unimportant exposure pathways" (EPA, 1997a). In this HHRA, the human health risks are shown to be acceptable using RME exposure estimates and adjusting the risk and HI to assume volatilization of VOCs over time. Therefore, central-tendency estimates were not presented.

The methodology for toxicity assessment was developed by EPA to produce toxicity factors protective of human health. Health-protective approaches are used in developing toxicity factors to ensure dose-response or hazard potential are not underestimated. For example, uncertainty factors of 10 to 10,000 are used to estimate RfDs; humans are assumed to be more sensitive than the most sensitive laboratory species; carcinogens are considered not to have a threshold; and it is assumed that chemicals that are carcinogenic to laboratory animals also cause cancer in humans. Toxicity values for chronic exposure were used for the assumed exposure duration of 30 years. In cases where toxicity values were not available for a given route of exposure, route-to-route extrapolation was used, consistent with EPA Region 6 guidance (EPA, 2004). This may result in an over- or underestimation of risk depending on chemical-specific toxicological characteristics.

In some cases, risk estimates were not developed for chemicals lacking toxicity data or dermal absorption factors, which could result in an underestimation of risk. EPA states that where there is too little data to extrapolate a reasonable default value for the dermal absorption fraction of a chemical, an interim method should be to treat the exposure pathway qualitatively (EPA, 2001b). Dermal absorption values were not available for any of the COPCs. In lieu of EPA-recommended, chemical-specific values, the remaining COPCs were not evaluated quantitatively for the dermal exposure pathway.

The adjustment factor of 365 days to account for volatilization of VOCs over time is not an EPA-recommended method and may result in underestimation of health risks. However, the assumption that VOCs immediately volatilize and remain in the area at a concentration which is

maintained for the entire 30 year exposure duration is highly conservative and does not reasonably reflect actual exposure conditions. The adjustment factor of 365 days was assumed to be reasonable in the absence of an EPA-approved method for evaluating inhalation of VOCs on indoor surfaces.

C1.6 Conclusions

The exposure pathways quantified for occupational workers were ingestion and inhalation. Dermal exposure to volatile chemicals on indoor surfaces was not evaluated in accordance with EPA guidance which states that VOCs will tend to be volatilized and should be accounted for via inhalation routes (EPA, 2001b). The COPCs in the TA-50-114 CSU were evaluated quantitatively for noncarcinogenic effects are 1,2,4-trimethylbenzene, bromomethane, chloromethane, and methylene chloride. The adjusted noncarcinogenic HI for Room 114 is 0.04.

The COPCs in TA-50-114 CSU evaluated quantitatively for carcinogenic risk are chloromethane and methylene chloride. The unadjusted carcinogenic risk for TA-50-114 is 3E-05, which is within the acceptable 10^{-6} to 10^{-4} risk range specified by 40 CFR §300.430. Therefore, it is concluded that health risks in Building 114 are acceptable for an industrial exposure scenario.

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APPENDIX D
Detection Limits and Uncertainties Associated with the Analytical Data

Table D-1
Range of Reporting Limits for Verification Samples (August 2002), TA-50-114

Analytical Method	Analyte	Minimum RL (µg/L) [a]	Maximum RL (µg/L) [a]
Total Metals (Method 6010A)	Arsenic	100	100
	Barium	100	100
	Cadmium	20	20
	Chromium	20	20
	Lead	50	50
	Selenium	50	50
	Silver	40	40
Mercury (Method 7470)	Mercury	0.2	0.2
Volatile Organic Compounds (Method 8260B)	1,1,1,2-Tetrachloroethane	1	1
	1,1,1-Trichloroethane	1	1
	1,1,2,2-Tetrachloroethane	1	1
	1,1,2-Trichloroethane	1	1
	1,1-Dichloroethane	1	1
	1,1-Dichloroethene	1	1
	1,2,3-Trichloropropane	1	1
	1,2,4-Trimethylbenzene	1	1
	1,2-Dibromoethane (EDB)	1	1
	1,2-Dichlorobenzene	1	1
	1,2-Dichloroethane (EDC)	1	1
	1,2-Dichloropropane	1	1
	1,3,5-Trimethylbenzene	1	1
	1,3-Dichlorobenzene	1	1
	1,4-Dichloro-2-butene	10	10
	1,4-Dichlorobenzene	1	1
	2-Butanone (MEK)	5	5
	2-Hexanone (MBK)	5	5
	4-Methyl-2-pentanone (MIBK)	5	5
	Acetone	10	10
	Acrolein	20	20
	Acrylonitrile	20	20
	Benzene	1	1
	Bromodichloromethane	1	1
	Bromoform	1	1
	Bromomethane	5	5
	Carbon disulfide	5	5
	Carbon tetrachloride	1	1
	Chlorobenzene	1	1
	Chlorodibromomethane	1	1
	Chloroethane	5	5
	Chloroform	1	1
	Chloromethane	5	5
	cis-1,2-Dichloroethene	1	1
	cis-1,3-Dichloropropene	1	1
	Dibromomethane	1	1
	Ethyl methacrylate	5	5
	Ethylbenzene	1	1
Volatile Organic Compounds (Method 8260B)	Freon 113	5	5
	Freon 12	10	10
	Methyl t-butyl ether (MTBE)	1	1
	Methylene chloride	10	10
	Naphthalene	5	5
	o-Xylene	1	1
	p/m-Xylenes	2	2
	Styrene	1	1
	t-1,2-Dichloroethene	1	1
	t-1,3-Dichloropropene	1	1
	Tetrachloroethene (PCE)	1	1
	Toluene	1	1
	Trichloroethene	1	1
	Trichlorofluoromethane	5	5
	Vinyl acetate	5	5
	Vinyl chloride	5	5
Semivolatile Organic Compounds (Method 8270B)	1,2,4-Trichlorobenzene	1	171
	1,2-Dichlorobenzene	1	171
	1,3-Dichlorobenzene	1	171
	1,4-Dichlorobenzene	1	171
	1-Methylnaphthalene	1	171
	2,3,4,6-Tetrachlorophenol	5	855
	2,4,5-Trichlorophenol	5	855
	2,4,6-Trichlorophenol	5	855
	2,4-Dichlorophenol	5	855
	2,4-Dimethylphenol	1	171
	2,4-Dinitrophenol	10	1,710
	2,4-Dinitrotoluene	5	855
	2,6-Dinitrotoluene	5	855
	2-Chloronaphthalene	1	171
	2-Chlorophenol	1	171
	2-Methylnaphthalene	1	171
	2-Methylphenol	1	188
	2-Nitroaniline	5	855
	2-Nitrophenol	5	855
	3,3-Dichlorobenzidine	10	1,710
	3+4-Methylphenol	1	171
	3-Nitroaniline	5	855
	4,6-Dinitro-2-methylphenol	10	1,710
	4-Bromophenyl-phenylether	1	171
	4-Chloro-3-methylphenol	5	855
	4-Chloroaniline	5	855
	4-Chlorophenyl-phenylether	1	171
	4-Nitroaniline	5	855
	4-Nitrophenol	10	1,710
	Acenaphthene	1	171
Semivolatile Organic Compounds (Method 8270B)	Acenaphthylene	1	171
	Aniline	10	1,710
	Anthracene	1	171
	Azobenzene&1,2-Diphenylhydrazine	1	171
	Benzo(a)anthracene	1	171
	Benzo(a)pyrene	1	197
	Benzo(b&k)fluoranthene	1	197
	Benzo(g,h,i)perylene	1	197
	Benzoic acid	25	4,275
	Benzyl alcohol	5	855
	bis(2-Chloroethyl)ether	1	171
	bis(2-Chloroethyoxy)methane	1	171
	bis(2-Chloroisopropyl)ether	1	171
	bis(2-Ethylhexyl)phthalate	5	855
	Butylbenzylphthalate	1	171
	Chrysene	1	171
	Dibenz(a,h)anthracene	1	197
	Dibenzofuran	1	171
	Diethylphthalate	1	171
	Dimethylphthalate	1	171
	di-n-Butylphthalate	1	171
	di-n-Octylphthalate	1	197
	Fluoranthene	1	171
	Fluorene	1	171
	Hexachlorobenzene	10	1,710
	Hexachlorobutadiene	10	1,710
	Hexachlorocyclopentadiene	10	1,710
	Hexachloroethane	5	855
	Indeno(1,2,3-cd)pyrene	1	197
	Isophorone	1	171
	Naphthalene	1	171
	Nitrobenzene	1	171
	n-Nitroso-dimethyl-amine	10	1,710
	n-Nitroso-di-n-propylamine	1	171
	n-Nitrosodiphenylamine	1	171
	Pentachlorophenol	10	1,710
	Phenanthrene	1	171
	Phenol	10	1,710
	Pyrene	1	171
	Pyridine	10	1,710

a. Reporting limits (RLs) are 3 to 5 times the method detection limit (the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the value is above zero) and are sample-specific (i.e., reporting limit multiplied by the dilution factor). Treating results as nondetect at the RL sets the acceptable rate of false negatives at <1 percent.

µg/L = Micrograms per liter
MSSL = Medium Specific Screening Level
EPA = U.S. Environmental Protection Agency
n/a = Not available

Table D-2
Range of Reporting Limits for Swipe Samples (July 2004), TA-50-114

Analytical Method	Analyte	Minimum RL (µg/100 cm^2)	Maximum RL (µg/100 cm^2)
Lead (7000 Series)	Lead	5	5
Volatile Organic Compounds (Method 8260B)	1,1,1,2-Tetrachloroethane	0.5	1
	1,1,1-Trichloroethane	0.5	1
	1,1,2,2-Tetrachloroethane	0.5	1
	1,1,2-Trichloroethane	0.5	1
	1,1-Dichloroethane	0.5	1
	1,1-Dichloroethene	0.5	1
	1,2,3-Trichloropropane	0.5	1
	1,2,4-Trimethylbenzene	0.5	1
	1,2-Dibromoethane (EDB)	0.5	1
	1,2-Dichlorobenzene	0.5	1
	1,2-Dichloroethane (EDC)	0.5	1
	1,2-Dichloropropane	0.5	1
	1,3,5-Trimethylbenzene	0.5	1
	1,3-Dichlorobenzene	0.5	1
	1,4-Dichloro-2-butene	5	10
	1,4-Dichlorobenzene	0.5	1
	1-Methylnaphthalene	1.5	1.5
	2-Butanone (MEK)	2.5	5
	2-Hexanone (MBK)	2.5	5
	2-Methylnaphthalene	1.5	1.5
	4-Methyl-2-pentanone (MIBK)	2.5	5
	Acetone	5	10
	Acrolein	10	20
	Acrylonitrile	10	20
	Benzene	0.5	1
	Bromochloromethane	6	6
	Bromodichloromethane	0.5	1
	Bromoform	0.5	1
	Bromomethane	2.5	10
	Carbon disulfide	2.5	5
	Carbon tetrachloride	0.5	1
	Chlorobenzene	0.5	1
	Chlorodibromomethane	0.5	1
	Chloroethane	2.5	5
	Chloroform	0.5	1
	Chloromethane	2.5	5
	cis-1,2-Dichloroethene	0.5	1
	cis-1,3-Dichloropropene	0.5	1
	Dibromomethane	0.5	1
	Ethyl methacrylate	2.5	5
	Ethylbenzene	0.5	1
	Freon 113	2.5	5
	Freon 12	5	10
	Methyl t-butyl ether (MTBE)	0.5	1
	Methylene chloride	5	10
Volatile Organic Compounds (Method 8260B)	Naphthalene	2.5	5
	o-Xylene	0.5	1
	p/m-Xylenes	1	2
	Styrene	0.5	1
	t-1,2-Dichloroethene	0.5	1
	t-1,3-Dichloropropene	0.5	1
	Tetrachloroethene (PCE)	0.5	1
	Toluene	0.5	1
	Trichloroethene	0.5	1
	Trichlorofluoromethane	2.5	5
	Vinyl acetate	2.5	5
	Vinyl chloride	2.5	5
Semivolatile Organic Compounds (Method 8270C)	1,2,4-Trichlorobenzene	10	10
	1,2-Dichlorobenzene	10	10
	1,3-Dichlorobenzene	10	10
	1,4-Dichlorobenzene	10	10
	1-Methylnaphthalene	10	10
	2,3,4,6-Tetrachlorophenol	500	500
	2,4,5-Trichlorophenol	100	100
	2,4,6-Trichlorophenol	100	100
	2,4-Dichlorophenol	100	100
	2,4-Dimethylphenol	10	10
	2,4-Dinitrophenol	125	125
	2,4-Dinitrotoluene	100	100
	2,6-Dinitrotoluene	100	100
	2-Chloronaphthalene	10	10
	2-Chlorophenol	10	10
	2-Methylnaphthalene	10	10
	2-Methylphenol	10	10
	2-Nitroaniline	100	100
	2-Nitrophenol	100	100
	3,3-Dichlorobenzidine	100	100
	3+4-Methylphenol	10	10
	3-Nitroaniline	100	100
	4,6-Dinitro-2-methylphenol	100	100
	4-Bromophenyl-phenylether	10	10
	4-Chloro-3-methylphenol	100	100
	4-Chloroaniline	100	100
	4-Chlorophenyl-phenylether	10	10
	4-Nitroaniline	100	100
	4-Nitrophenol	200	200
	Acenaphthene	10	10
	Acenaphthylene	10	10
	Aniline	100	100
	Anthracene	10	10
	Azobenzene&1,2-Diphenylhydrazine	10	10
Semivolatile Organic Compounds (Method 8270C)	Benzo(a)anthracene	10	10
	Benzo(a)pyrene	10	10
	Benzo(b&k)fluoranthene	10	10
	Benzo(g,h,i)perylene	100	100
	Benzoic acid	1000	1000
	Benzyl alcohol	500	500
	bis(2-Chloroethyl)ether	10	10
	bis(2-Chloroethyoxy)methane	10	10
	bis(2-Chloroisopropyl)ether	10	10
	bis(2-Ethylhexyl)phthalate	100	100
	Butylbenzylphthalate	10	10
	Chrysene	10	10
	Dibenz(a,h)anthracene	100	100
	Dibenzofuran	10	10
	Diethylphthalate	10	10
	Dimethylphthalate	10	10
	di-n-Butylphthalate	100	100
	di-n-Octylphthalate	100	100
	Fluoranthene	10	10
	Fluorene	10	10
	Hexachlorobenzene	10	10
	Hexachlorobutadiene	10	10
	Hexachlorocyclopentadiene	500	500
	Hexachloroethane	10	10
	Indeno(1,2,3-cd)pyrene	100	100
	Isophorone	10	10
	Naphthalene	10	10
	Nitrobenzene	10	10
	n-Nitroso-dimethyl-amine	100	100
	n-Nitroso-di-n-propylamine	10	10
	n-Nitrosodiphenylamine	10	10
	Pentachlorophenol	100	100
	Phenanthrene	10	10
	Phenol	100	100
	Pyrene	10	10
	Pyridine	100	100

a. Reporting limits (RLs) are 3 to 5 times the method detection limit (the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the value is above zero) and are sample-specific (i.e., reporting limit multiplied by the dilution factor). Treating results as nondetect at the RL sets the acceptable rate of false negatives at <1 percent.

µg/100 cm^2 = Micrograms per 100 square centimeters