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Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

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Date: JUN 1 1995
Refer to: EM/ER:95-262

Mr. William Honker
RCRA Permits Branch
Hazardous Waste Management Division
US Environmental Protection Agency
1445 Ross Avenue, Suite 1200
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SUBJECT: REQUEST FOR PERMIT MODIFICATION

Dear Mr. Honker:

Los Alamos National Laboratory (Laboratory) is requesting a Class III permit modification per 40 CFR 270.42 (c). This request, if approved, will allow the Laboratory to implement expedited cleanups (ECs) for six solid waste management units (SWMUs) that will constitute a final remedy for the SWMUs. This EC process was developed and discussed within the Accelerated Cleanup Process Policy Paper previously sent to your office. Enclosed please find six EC plans addressing these six SWMUs.

The cleanup remedy identified for these SWMUs is apparent and readily implementable. Therefore, the Laboratory wishes to proceed with a proactive approach for the cleanup of the sites in the near future rather than delaying the cleanup due to the lengthy corrective action process. Upon completion of the expedited cleanup, the Laboratory will submit a summarization of data and verification statements assuring that the plan has been implemented and the SWMUs have been cleaned up. The SWMUs can then be removed from Module VIII.

Public notice of this activity is anticipated to be published on June 2, 1995, and the public meeting is scheduled for June 21, 1995. Per recommendations received from Barbara Driscoll of your staff, detailed information requiring these cleanup levels and methodologies will be presented at this meeting. Notices will be sent to all persons on the facility mailing list, which will contain at a minimum, all information as prescribed in 40 CFR 270.42. Comments received from the public

Received by ER-RPF
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meetings and other comments received as a result of public review of these plans will be forwarded to your office. When our public notices are published, copies of the articles will also be provided to your office. Upon addressing any potential concerns or problems received from public input, it is understood that your office will grant Temporary Authorization to proceed with the field work.

Should you have any questions pertaining to this request, please contact David McInroy or Court Fesmire of our staffs. They can be reached at 505-667-0819 and 505-665-4718, respectively.

Sincerely,

Jorg Jansen, Project Manager
Environmental Restoration

Sincerely,

for Theodore J. Taylor, Program Manager
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JJ/TT/bp

Enclosures: Six EC Plans

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Environmental Restoration

CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly 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 violation.

Document Title:

Class III Permit Modification for Expedited Cleanup Plans for SWMUs 3-056(c), 9-015, 18-003(c), 22-015(c), and 36-003(a)

Name: _____ Date: 6/1/95

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Los Alamos National Laboratory

Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 22-015(c)

June 1995
Revision 0

Environmental
Restoration

ACRONYMS

AP	Administrative Procedure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code Of Federal Regulations
COPC	chemicals of potential concern
COC	contaminant of concern
DOE	U.S. Department of Energy
EC	expedited cleanup
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FIMAD	Facility for Information Management, Analysis, and Display
FPL	Field Project Leader
FTL	Field Team Leader
HSWA	Hazardous and Solid Waste Amendments
LANL, the Laboratory	Los Alamos National Laboratory
OU	Operable Unit
PPE	personal protective equipment
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
TSD	treatment, storage, and disposal
UCL	upper confidence limit
UTL	upper tolerance limit
WAC	waste acceptance criteria
VOC	volatile organic compound
XRF	x-ray fluorescence

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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan addresses Solid Waste Management Unit (SWMU) 22-015(c), a former plating and etching facility outfall and related runoff area. The site is located on Two Mile Mesa adjacent to Building TA-22-52 in the western portion of Los Alamos National Laboratory (the Laboratory), in Los Alamos, New Mexico (Figure 1-1). This EC Plan is being proposed as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in the Operable Unit (OU) 1111 RFI Work Plan (LANL 1993, 1091).

SWMU 22-015(c) is included in Table A of the Hazardous and Solid Waste Amendments (HSWA) of the Laboratory's RCRA permit.

SWMU 22-015(c) consists of a former outfall from a plating and etching facility, and a related runoff area. Preliminary results from the Phase I RFI sampling indicate that sediments and soils within the drainage channel contain concentrations of metals that are elevated with respect to Laboratory screening action levels (SALs) and background concentrations.

Activities comprising this EC Plan include excavation of metals-contaminated soils where above cleanup levels and collection of verification samples. The excavation will be backfilled with clean fill, recontoured, and revegetated to prevent future erosion. The excavated soil will be disposed of at a permitted industrial waste landfill.

This EC Plan identifies the level of effort required from the initial transmittal of the plan to the U.S. Environmental Protection Agency (EPA) Region 6 for review and implementation of the plan, through completion of the final project report. In the development of this EC Plan, the following assumptions were made:

- The levels of contaminants of concern (COCs) and volumes of anticipated waste are consistent with preliminary RFI data.
- Future land use at the location of this SWMU will continue to be for industrial purposes.
- Minimal delays in EC operations will be experienced as a result of inclement weather, site access problems, or other delays. Delays that may result from the acquisition and scheduling of heavy equipment, subcontractors, and from the acceptance of waste at a permitted disposal facility cannot be anticipated and therefore are not considered in this plan.
- A Site-Specific Health and Safety Plan (SSHASP) and Waste Management Checklist will be developed specifically to address COCs identified in this EC Plan. Deviations from the anticipated concentrations and locations of COCs may necessitate adjustments to both plans.
- Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC Plan.

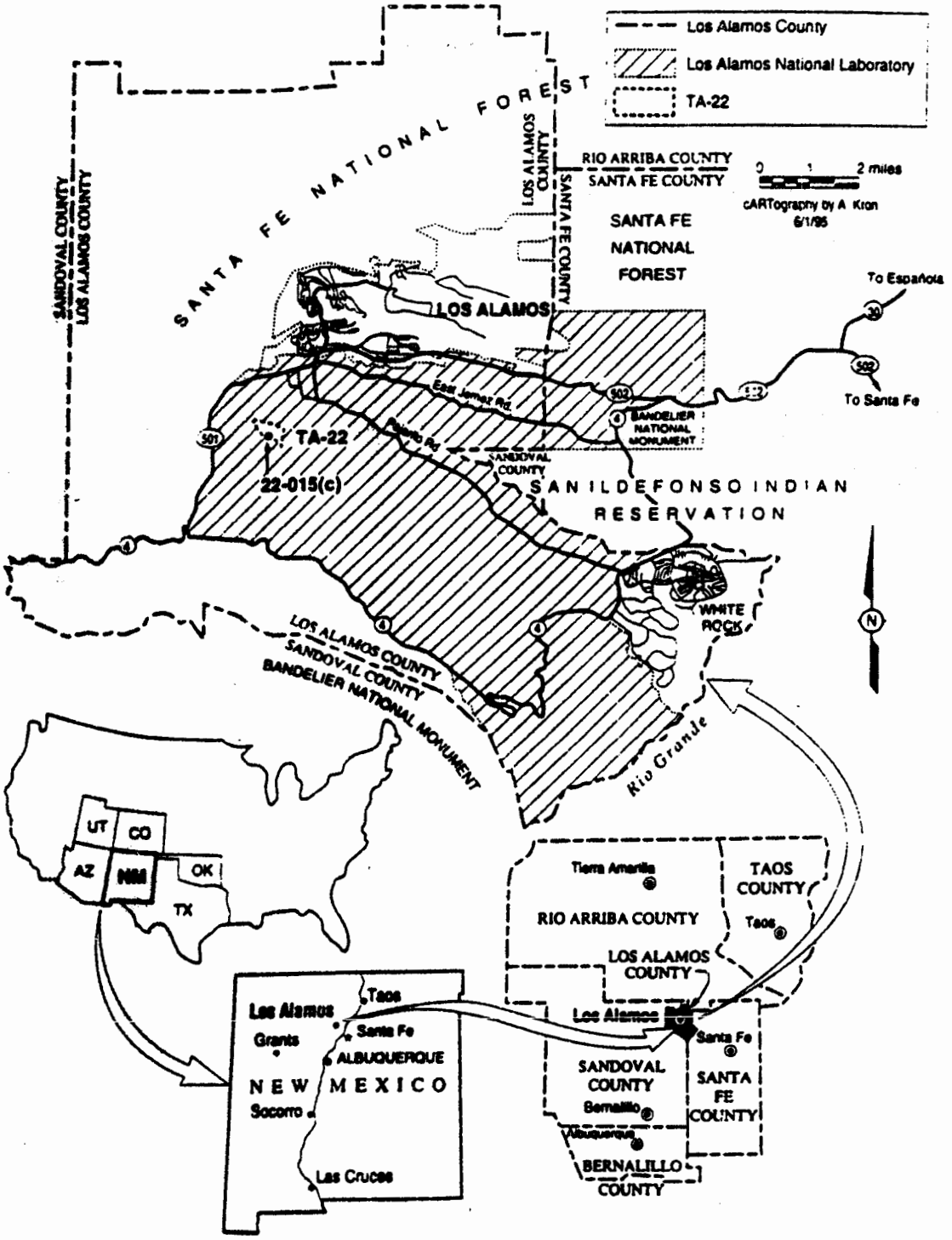


Figure 1-1. Regional location map.

..0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Detailed Description of SWMU 22-015(c)

SWMU 22-015(c) is a former outfall and related runoff area originating from a floor drainage system in Building TA-22-52, a plating and circuit etching shop that operated from approximately 1953 to 1977. The site is shown on Figure 2-1. Floor drains within the shop reportedly received spills from plating baths and rinse tank overflow. The SWMU is comprised of a drainage channel leading to a former pond area (a depression in the land surface where effluent and stormwater collect) located near the edge of the mesa; an overflow drainage channel from the pond area that flowed downhill to a wagon road; and two channels that flowed across the road and discharged over a rock cliff to Pajarito Canyon. The former pond area is filled with sediments and presently contains no water.

2.1.1 Operational History

SWMU 22-015(c) is believed to have received spilled plating liquids containing gold, copper, nickel, chromium, silver, cadmium, rhodium, zinc, and platinum. The basic plating process was as follows: metal parts were plated, suspended over the plating bath to drip dry, and then rinsed in a water bath. Hazardous chemicals used in the process included sulfuric, chromic, hydrochloric, nitric, hydrofluoric, and phosphoric acids, benzene; trichloroethylene; percloroethylene; sodium thiosulfate; hydrogen peroxide; and sodium hydroxide. The rinse water containing dilute concentrations of plating chemicals is believed to have been the primary contributor of contaminants to the outfall.

In 1956, an irradiated reactor part was stripped of a gold coating and then plated. Radiation monitoring of the part before striping and plating indicated that a low level of radioactivity was present, probably neutron activation products with short half-lives. In 1974, standard, printed circuit board etching operations began in TA-22-52. This was a photosensitive, resistant coating operation that used ferric chloride and caustic chemicals. The spent ferric chloride solution, containing traces of copper, was reportedly disposed through the outfall from 1974 to 1977. From 1977 to 1985, the ferric chloride waste solution was drummed and sent to the Laboratory's liquid waste treatment plant for disposal. The outfall has been inactive since 1977.

2.1.2 Physical Setting

The former TA-22 plating shop is located on Two Mile Mesa on the northern flank of Pajarito Canyon in Los Alamos County. Los Alamos County has a semi-arid, temperate mountain climate. Rainfall at this site averages approximately 22 inches per year. High extremes in precipitation include 2.51 inches per day of precipitation and 153 inches per year of snowfall. Average snowfall is about 55 inches per year.

SWMU 22-015(c) lies within US Department of Energy (DOE)-owned land, and the area is removed from public access roads. Access to the site is via State Road 501 and then Two Mile Mesa Road. Elevation contours, shown on a Facility for Information Management, Analysis, and Display (FIMAD) map of SWMU 22-015(c) (FIMAD Plot G103324), indicate that the lower portion of this SWMU potentially receives stormwater runoff from a 5-acre catchment area in TA-22.

A soil map presented in the RFI Work Plan for OU 1111 defines the soil types present within the SWMU drainage, as Carjo and Tocal loam soil types. The upper part of the drainage from the outfall to the former pond overflow area contains the deepest soil profile, with an approximate depth of 30 inches. Downstream of the former pond area, soils are 6 inches deep or less and have outcrops of the Tshirege Member of the Bandelier Tuff exposed at eroded areas in the channel. Several surface stormwater drainage channels converge downstream of the pond area. The drainage flows along the tuff surface and is poorly defined where all soil has been eroded. At the wagon road, the drainage appears to split into two paths: both branches of the drainage cascade over a steep rock embankment to flow to Pajarito Canyon. There is no continuous soil cover within the drainage downstream of the wagon road.

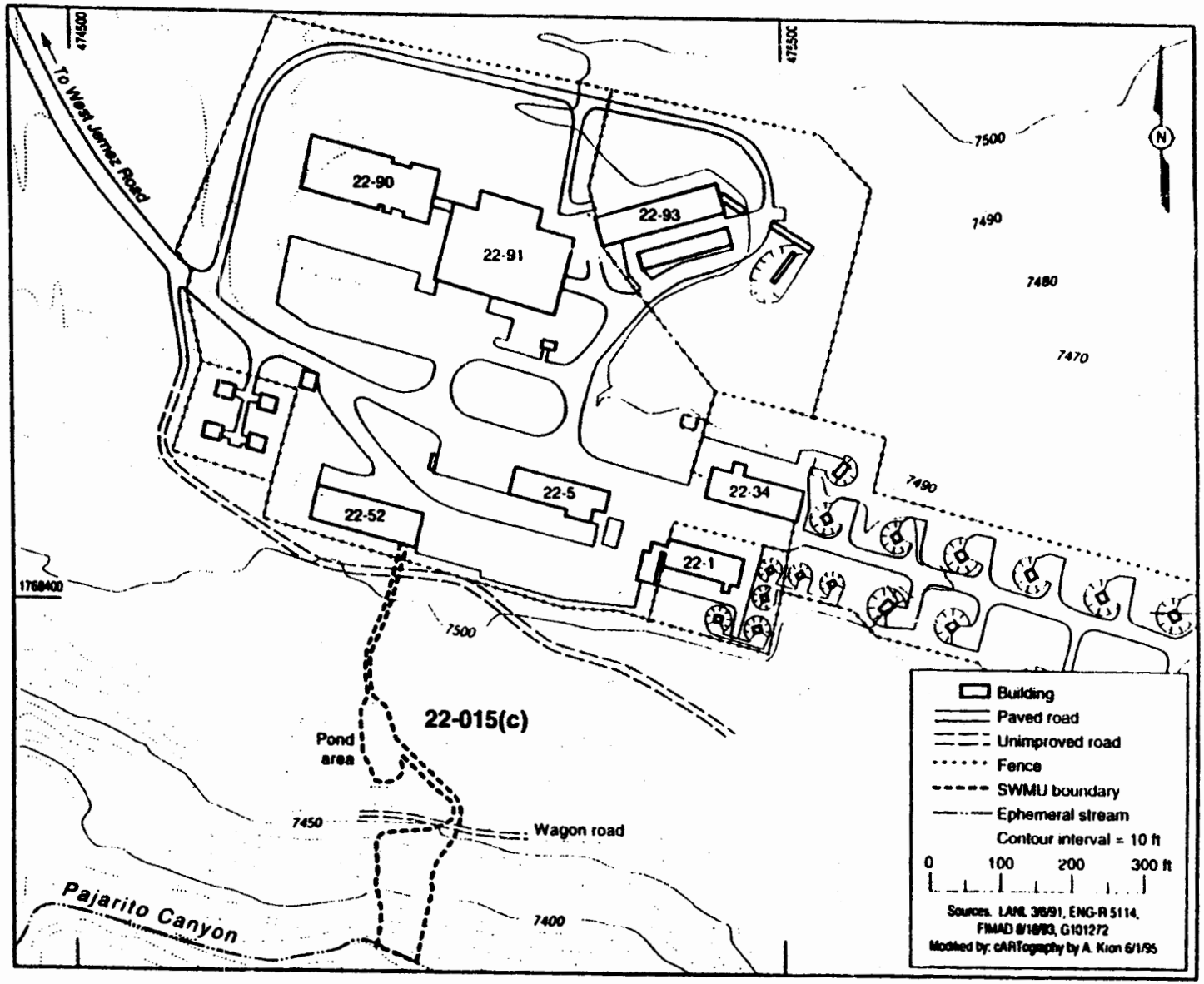


Figure 2-1. SWMU 22-015(c) site location map.

2.2 Summary of Investigations

2.2.1 Investigations Prior to the RFI

There were no investigations of SWMU 22-015(c) prior to the RFI Phase I investigation completed in June 1994.

2.2.2 RCRA Facility Investigation

2.2.2.1 Method of Investigation

During June 1994, sediment and soil samples were collected from stained and unstained areas within the drainage and from the pond area. RFI sample locations and site topography are shown on Figure 2-2. The area was divided into seven reaches to designate sampling locations based on SWMU characteristics and topography. These reaches are shown on Figure 2-3 and are described below:

- S1 extends from the TA-22-52 drain pipe and includes the pond area;
- S2 extends from the pond area to the wagon road and includes the wagon road;
- S3 consists of the drainage area below the wagon road;
- U1 consists of unstained soil within the east and west banks of the upper outfall drainage channel to the upper edge of the pond;
- U2 designates unstained soils surrounding the pond area;
- U3 consists of the unstained channel banks from the lower edge of the pond area to just below the wagon road; and
- U4 consists of the unstained channel banks along the drainage channel from below the wagon road to the canyon bottom.

Soil samples from S3 were located between rocks in the drainage where soils and sediments have accumulated. These soil samples were collected from two depths (0-6 inches and from tuff) in the drainage area below the wagon road.

A composite sampling method was implemented for areas S1, S2, U1, U2, U3, and U4 based on the assumption that the contaminants of concern were distributed homogeneously along the channel due to infiltration over long time periods. Six grab samples were collected from within the pond area (area S2) to compare to the composite samples collected from the same area to verify this assumption. Downstream of the pond area, grab samples were collected from the channel and banks of the drainage (the S3 reach). No composites were prepared from these grab samples since the sediment cover was discontinuous and the concentration of contaminants was likely to be widely variable. Composite and grab sample locations are summarized in Tables presented in Annex 6.10.

Two composite samples were gathered from each depth at each sample composite sample location: one composite from grab samples collected from a shallow depth and one composite from samples collected from the tuff to characterize the stained channel and the adjacent unstained embankment within the pond area and within the channels leading to and from the pond area. The embankment samples were collected approximately 5 feet out from the channel bank. Separate composite samples were collected to represent the east bank and the west bank of the drainage.

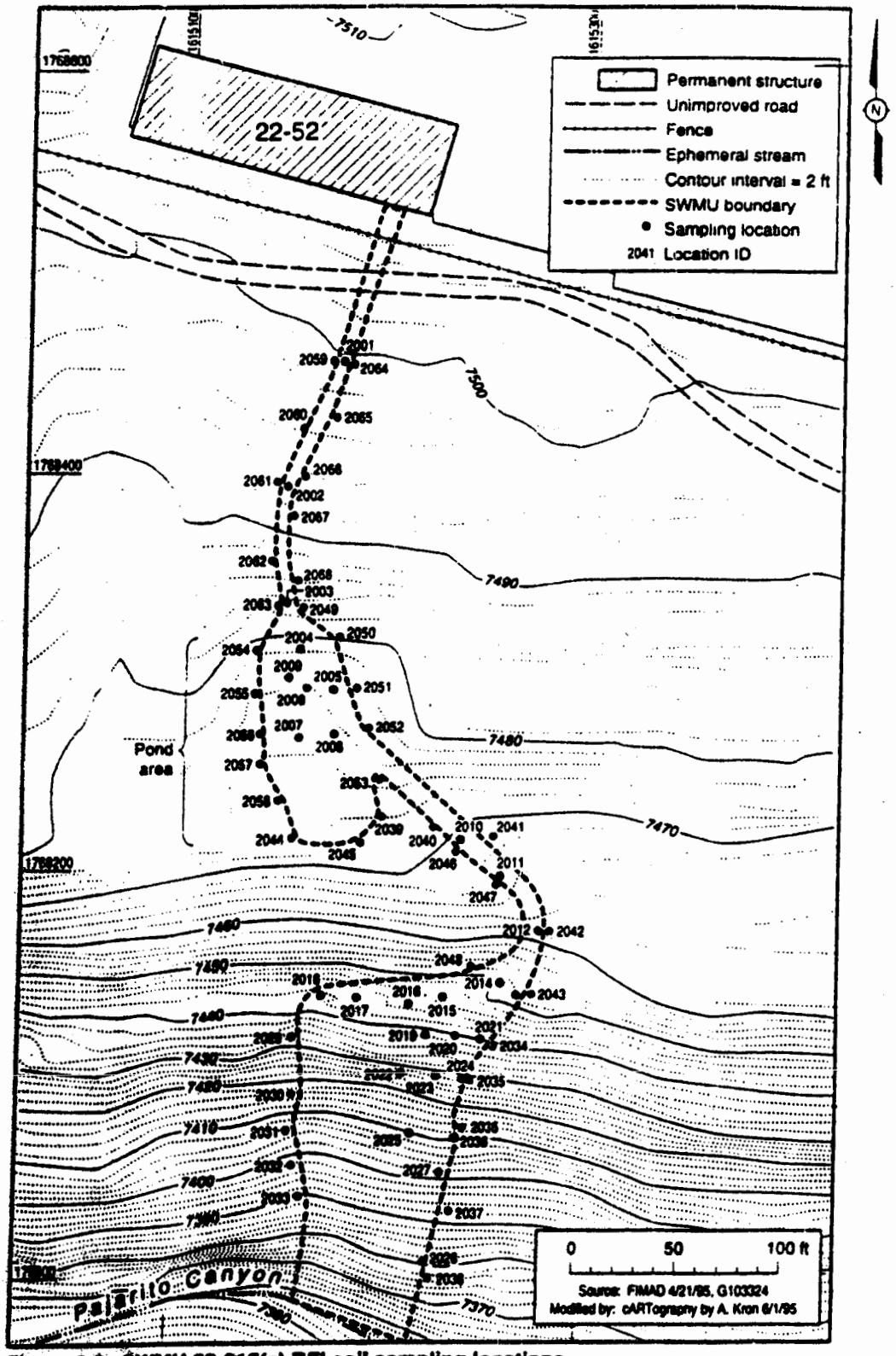


Figure 2-2. SWMU 22-015(c) RFI soil sampling locations.

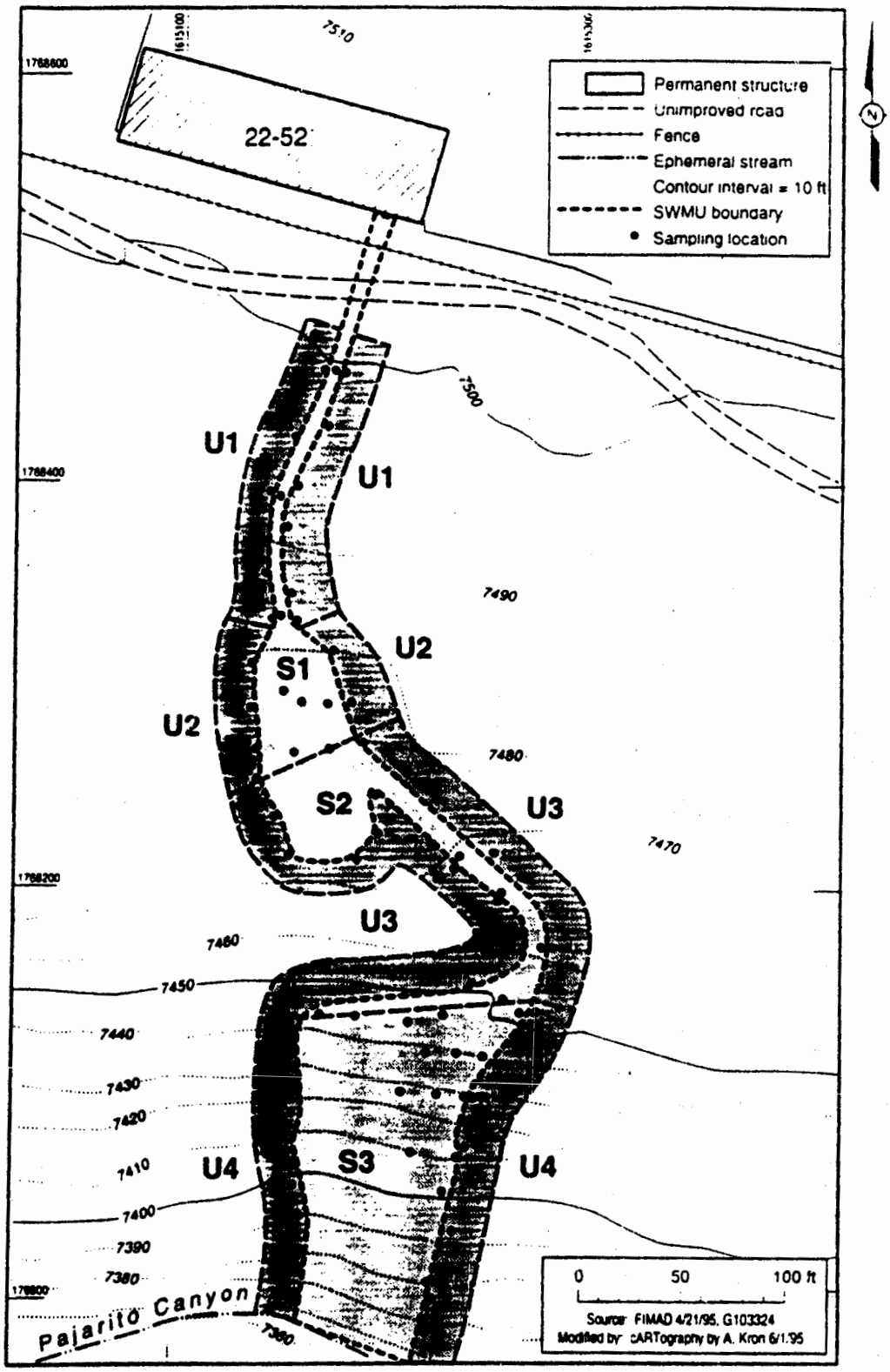


Figure 2-3. Areas designated for RFI sampling.

Shallow soil samples were collected from the surface to a depth 6 inches using stainless steel scoops. Stainless steel hand augers were used to collect deeper samples, which extended to variable depths between 4 and 37 inches. Sampling protocols are described in the standard operating procedures (SOPs) ER-SOP-06.09 (scoop sampling) and ER-SOP-06.10 (hand auger sampling) (LANL 1993, 0875). Forest detritus was removed from the samples, the samples were packaged in a locked cooler, and submitted under chain-of-custody to an approved off-site laboratory.

All samples were analyzed by gamma spectroscopy for cesium-137 and strontium-90, metals, semivolatile organic compounds (SVOCs), and cyanide. Three additional samples were collected from the pond area and analyzed for volatile organic compounds (VOCs), nitrites, and fluoride, as well as the above analytes.

2.2.2.2 Results of the Investigation

Annex 6.9 presents a summary of the RFI analytical sampling results reported above detection limits for all RFI samples collected at the site. The detected concentrations, screening action levels (SALs), and upper tolerance limits (UTLs) for background concentrations in soil are also presented for comparison. The sample locations where data exceeded the SALs are summarized in Annex 6.10. Based on preliminary review of the RFI sampling data, the results are summarized below:

S1 Sample Data - Concentrations of metals (arsenic, chromium, copper, lead, nickel, and silver) exceeded SALs (UTL for chromium) in soil samples from the channel (S1 samples), the former pond area, and the unstained soil within the east and west banks of the channel (U1 samples). Concentrations decreased rapidly below a depth of 6 inches and did not exceed the SALs in unstained soil surrounding the pond area (U2 samples). A comparison of composite sample data and grab sample data from the pond area indicates that the composite samples tend to be half the maximum concentrations in the grab samples for most metals, except lead and mercury. Therefore, a factor of two was applied to the composite data to assess whether or not values exceeded SALs.

S2 Sample Data - Concentrations of arsenic, chromium, copper, and lead exceeded SALs in samples from a 6-inch depth in the channel. The chromium UTL was exceeded for samples collected from the unstained west embankment (U3 samples).

S3 Sample Data - Concentrations for chromium exceeded the UTL in soil and tuff samples collected from the unstained embankment (U4 samples).

Radioisotope Data - Soil samples collected from the center of the pond area and the channel leading to the pond area detected trace concentrations of strontium-90 that were slightly elevated with respect to background and the SAL. This radionuclide detection is most probably the result of deposition and subsequent transport of TA-22 air emissions concentrated in the pond area from sediment erosion and deposition.

Background Data - Three site-specific background surface soil samples were collected from an area west of TA-22-52, and upgradient from the SWMU. Chromium, lead and zinc were detected in these samples; however, the elements silver, cadmium, copper, mercury, and nickel were not detected. Cesium-137 and strontium-90 were detected at an average level of 1.2 pCi/g. Analytical results from the TA-22 background samples are also provided in Annex 6.9.

2.2.3 Summary and Evaluation of Results

Annex 6.9 presents a summary of Phase I RFI analytical results reported above detection or method-specific quantitation limits for all samples collected at this site. The detected concentrations, SALs, and UTLs for Laboratory background concentrations in soil are also presented for comparison. An extensive review of preliminary Phase I RFI analytical data confirms that historical releases to the soil-lined channels on the south side of TA-22-52 have left elevated levels of heavy metals. The deepest penetration of the metals into the soil was detected in samples from the former pond area and in the channel leading to the pond area. Downstream of the pond area, the channel is narrow

and close to the tuff surface. In these areas, metals concentrations that exceeded SALs were limited to a depth of 6 inches or less. The results are summarized as follows:

- Arsenic and lead were detected above SALs, and chromium above the UTL in soil samples from the S1, U1, Pond, and S3 areas. Concentrations for all metals detected decrease in concentration with depth. For example, the maximum concentration of arsenic (227 ppm) was detected at a depth of 6 inches in the pond area (sample location 2007). However, a concentration of 3.2 ppm arsenic was detected at a depth of 37 inches at the same sample location. The maximum chromium concentration (952 ppm) was detected at a depth of 6 inches in the pond area (sample location 2008), but was detected at 9.4 ppm at a depth of 29 inches at the same sample location. The maximum lead concentration (557 ppm) was also detected at a depth of 6 inches at sample location 2024 near the cliff edge. This sample also had the second highest observed chromium concentration (931 ppm) and appears to represent soil and sediment eroded from the pond area. Additional heavy metals were detected; however, arsenic, chromium and lead are the primary COCs for this SWMU (see Annex 6.9).

- Analytical results from soil samples collected from the S3 reach showed relatively homogeneous metals concentrations throughout each soil depth (i.e., 0 to 6-inches, 6- to 18-inches, etc.). The grab or discrete sample data indicate that metals concentrations decrease with distance downstream within the S3 reach.

- A single SVOC (bis(2-ethylhexyl)phthalate) was detected only in samples collected from the pond area with a maximum concentration of 69 ppm (sample locations 2007 and 2008). Phthalates are common components of plasticizers and are often seen in samples contaminated by laboratory gloves (EPA Method SW 846, Volume IB, Section 4.1.2). Additionally, this compound was not used in any operations conducted in TA-22-52.

- Two VOCs (methylene chloride and tri-chloro-1,2,2-triflouroethane) were also detected at trace concentrations (0.032 and 0.054 ppm, respectively) only in samples collected from locations 2007 and 2008 in the pond area. These results are attributed to laboratory contamination since neither compound was used in TA-22-52 operations and these samples are from the same analytical run as those with the SVOC detects.

- Strontium-90 was detected above the Laboratory SAL (5.9 pCi/g) in sediments within the pond area at a depth of 6 inches at a maximum concentration 7.2 pCi/g (at sample location 2007).

Subsequent to the RFI sampling, four additional soil and sediment samples were collected from RFI sample locations that represent the "worst-case" metals concentrations, and were analyzed by the Toxicity Characteristic Leaching Procedure (TCLP) to determine if the leachate exceeded RCRA standards for hazardous waste. These samples were collected from the following locations:

- One grab sample from the drainage channel above the pond area (RFI sample location 2001);

- One grab sample from sediments in the pond area (RFI sample location 2008);

- One composite sample from sediments in the pond area (from the vicinity and RFI sample location 2008); and

- One grab sample below the pond area past the wagon trail and near the canyon edge (RFI sample 2024).

Analytical results from the samples indicate that the soil and sediments from these "worst-case" locations do not approach TCLP limits (see Annex 6.11). The composite sample was also analyzed using a hydrochloric acid (HCl) extraction according the procedure described in Annex 6.11. This procedure is intended to simulate the bio-availability of the heavy metals upon ingestion. The HCl extraction yielded trace concentrations of lead and barium and indicated that the metals present in soils at this site are not readily available if the soil were to be ingested (see Annex 6.11).

2.3 Types and Volumes of Waste

The nature of the wastes expected to be generated by the proposed cleanup is presented in Table 2-3. Surface and near-surface soil samples revealed elevated levels of a variety of heavy metals. Strontium-90 was also detected at slightly elevated levels in the pond area. The soils contaminated with heavy metals are considered special or industrial solid waste and the soils with elevated levels of strontium-90 may be considered low-level solid waste. As described in Section 3.3, soils contaminated above proposed cleanup levels will be excavated and placed directly into bulk storage containers or dump trucks on site for transportation to and disposal at an approved waste facility. The soils will be segregated to ensure that all soil with elevated levels of strontium-90 are disposed at the Laboratory's Area G, and the remaining soils are disposed at an approved industrial waste landfill.

Verification sampling will be performed as described in Section 3.5. A small volume of solid and/or liquid wastes may be generated by this activity. Waste associated with this effort may include disposable sampling equipment, personal protective equipment, and decontamination water. These materials will be handled in accordance with the site-specific Waste Management Checklist.

TABLE 2-1
ANTICIPATED WASTE VOLUMES

Item	Type	Anticipated Volume
Sampling Waste/Personal Protective Equipment (PPE)	Solid Waste - Non-hazardous	8 cu. ft.
Decontamination Wastewater	Water - Non-hazardous	1,000 gal.
Soils with Heavy Metals	Industrial Waste - Non-hazardous	350 cu. yds.
Soils with Heavy Metals and Radionuclides	Low-Level - Non-hazardous	60 cu. yds.

2.4 Potential Impacts on Public Health and the Environment

Receptors of possible contaminants include animals and humans. Potential exposure routes of receptors include the following:

- Inhalation of dust from dried sediments from the stained channel or the pond area;
- Ingestion of sediment or possibly contaminated drainage water; and
- Skin contact with contaminated sediments, water, or soil.

2.4.1 Potential Pathways

2.4.1.1 SWMU - In Place

The SWMU is partially located within a drainage channel that continues to receive stormwater runoff which discharges to Pajarito Canyon. Chemical data indicate that the pond area and shallow sediments contain elevated concentrations of heavy metals and radioisotopes. Therefore, a source area continues to be present for releases to the environment via erosion of contaminated soil and sediment.

The primary mode for transport of contaminated soil and sediment is believed to be via the established drainage system. In this scenario, flow in the drainage channel would remove material from the SWMU and transport it to Pajarito Canyon.

2.4.1.2 SWMU - Remediation

Expedited cleanup activities at SWMU 22-015(c) include excavation of soils and regrading of the site to minimize future erosion. Primary pathways associated with these activities are airborne dispersion during the excavation and surface water runoff of contaminated sediments prior site restoration activities. These possible scenarios will be minimized through dust control and by the use of erosion control during construction. Disturbed soil will be compacted, contoured, and revegetated as needed to minimize erosion. Little or no potential exists for aqueous transport during remediation because excavated soils will be placed directly into bulk containers or dump trucks. Furthermore, the excavated area will be covered with plastic sheeting to prohibit water from entering the excavation.

2.4.2 Future Land Use

SWMU 22-015(c) lies within DOE-owned land on a mesa top. The area is removed from public access roads. In the foreseeable future, the land is anticipated to be used exclusively for Laboratory (industrial) operations (LANL 1994, 1171).

2.4.3 Cleanup Levels

Identification of the chemicals of potential concern (COPCs) considered for this EC was based on simple comparisons of SWMU 22-015(c) Phase RFI analytical results to background and SAL concentrations. As presented in Annex 6.9, analytical results from the Phase I RFI sampling indicate that a background UTL or SALs were exceeded for arsenic, chromium, copper, nickel, lead, and silver. SAL comparisons for chromium (Cr) are not as straight forward due to the range of SALs for Cr VI at 400 ppm to Cr III at 80,000 ppm. Concentrations of total chromium in the RFI analytical results exceed the Cr VI SAL but not the Cr III SAL.

The derivation of human health risk-based cleanup levels for this EC is based on an occupational exposure scenario (continued Laboratory operations) using the standard EPA default exposure parameters for the generic worker as presented in *RAGS Part B, Development of Risk-Based Preliminary Remediation Goals (US EPA, 1991)*. These default exposure parameters assume an exposure frequency and duration of 250 days per year for 25 years. Exposure pathways considered include ingestion and inhalation of contaminated soil. This approach is considered very conservative in that few to no workers are expected to come into contact with remediated soils in this outfall area.

Cleanup levels calculated for this EC effort are presented in Table 2-2 below. Typically, the Laboratory derives cleanup levels assuming an acceptable level of risk of 1E-06 for carcinogens, and a hazard index of 0.1 for noncarcinogens. This conservative approach is adopted to account for the presence of multiple constituents. With this approach, the residual risk remaining at the site following remediation will be within the EPA acceptable risk range of 1E-04 to 1E-06 for carcinogens, and less than a hazard index of 1 for noncarcinogens. Table 2-2 indicates that the cleanup effort at this SWMU will be driven by the 25 mg/kg cleanup level for arsenic and cadmium (due to its toxicity). It should be noted that the arsenic cleanup level is based on an acceptable risk level of 1E-05 due to the fact that a risk level of 1E-06 results in a cleanup level for this contaminant lower than background (the background UTL for arsenic is 12 mg/kg). The equations and assumptions used for the calculation of cleanup levels in this plan are provided in Annex 6.12.

TABLE 2-2
CLEANUP LEVELS FOR SWMU 22-015(c)

Chemical	Cleanup Level (mg/kg)	Rationale
Arsenic	25	Carcinogen. Based on a risk level of 10^{-5}, a risk level of 10^{-6} creates a cleanup level lower than background.
Cadmium	25	Carcinogen - 10^{-6} risk level.
Chromium III	204,400	Noncarcinogenic. Based on a hazard index of 0.1.
Chromium VI	38	Carcinogenic Chromium VI. Based on a risk level of 10^{-5}, a risk level of 10^{-6} creates a cleanup level lower than background.
Lead	3,000	California Department of Toxic Substances Control (DTSC 19920 algorithm for adults.
Copper	7,500	Noncarcinogenic. Based on a hazard index of 0.1.
Nickel	4,100	Noncarcinogenic. Based on a hazard index of 0.1.
Silver	1,000	Noncarcinogenic. Based on a hazard index of 0.1.

2.4.3.1 Sampling and Risk Assessment Plan for Residual Downstream Soils

Results from the RFI and additional biased samples submitted for TCLP analysis indicate that leaching of metals from soils and sediments at this SWMU did not contribute concentrations of metals on the hillside below the outfall that would pose an unacceptable human health or ecological risk. In addition, the possibility that the total chromium present is in the form of Cr VI (the most toxic and mobile state of CR) is also highly unlikely for several reasons: (1) chromium was barely detectable following the TCLP procedure for soil containing the highest concentrations observed at this site; and (2) the presence of high levels of iron in the soils may have caused any Cr VI to be reduced to Cr III.

Therefore, to ensure that contaminated soils left in place on the hillside do not pose an unacceptable health and/or ecological risk, a minimum of five additional biased samples will be collected from sediment traps located in the two main drainages flowing down the hillside. These samples will be collected and analyzed for the metals of concern (including Cr VI) prior to initiation of the EC. Results from this additional sampling will be compared to SALs and ecological screening thresholds (currently under development) to determine if further action is required. If assessment results indicate that leaving these soils in place may pose an unacceptable human health or ecological risk, they will be excavated and disposed during the EC. Results of this assessment will be provided in the final report for this EC. It should be noted that human health and ecological risk assessment of the canyon bottom will be addressed in future Canyons Phase I RFIs.

3.0 EXPEDITED CLEANUP

3.1 Overview and Rationale

Phase I RFI analytical results indicate that soil and sediment in the drainage downstream of the TA-22-52 outfall contains metals concentrations that exceed LANL SALs, but are not hazardous according to TCLP. These sediments are potentially part of the larger drainage system of the Pajarito Canyon. The proposed EC (described in Section 3.3) will be implemented to remove the soil and physically stabilize the remediated site using erosion controls.

During the planning of this EC, three different treatment technologies were reviewed for potential applicability to this site. The three treatment technologies include: electro kinetic remediation, soil washing, and soil stabilization. All three technologies offer viable options for treating metals-contaminated soil in-situ; however, the electro kinetic remediation and soil washing options require a large site with between 2,000 and 3,000 cubic yards of contaminated soil. As such, these two technologies involve significant mobilization and treatment costs which are prohibitive for such a small site.

Subsequent sampling and analysis of soils from the most contaminated portions of this SWMU confirmed that the soils do not come close to failing RCRA TCLP limits, making the third treatment option of soil stabilization unnecessary. All three technologies are currently being evaluated by the ER Project for application at more suitable sites.

3.2 Permitting, Approval, and Notification Requirements

An excavation permit will be prepared and submitted for approval before execution of this plan.

Documentation will be prepared in accordance with Laboratory Environmental Restoration (ER) Administrative Procedure (AP) LANL-ER-AP-05.1, Rev. 0, "Readiness Review for Environmental Restoration Program Field Activities" (LANL 1993, 0951). Key documents to be prepared include a SSHASP and a site-specific Waste Management Checklist. Personnel training requirements will be specified and will require completion prior to implementation of the EC Plan. Site workers must have received all training for this project as specified in the SSHASP.

3.2.1 Regulatory Notification/Permit Modifications

SWMU 22-015(c) is included in Table A of the Hazardous and Solid Waste Amendments permit. Implementation of this EC will require a Class III modification to the Laboratory's RCRA Permit. EPA and the New Mexico Environment Department have been notified of this project, and a request for a permit modification has been submitted. Implementation of this EC Plan will proceed upon receipt of EPA approval.

3.2.2 DOE Approval

If the Laboratory intends to implement this EC prior to receiving EPA approval, DOE approval must be documented through receipt of the signed Field Work Approval Form (Annex 6.7).

3.3 Cleanup Activities

SWMU 22-015(c) is located outside of the secured and fenced area that comprises TA-22. Access to the site is already restricted along the Two Mile Mesa Road. The first activity will be to secure site access and establish staging areas and exclusion zones. Soil requiring removal to a low-level radioactivity disposal site will be taken to Area G. Other soil will be excavated as needed and staged for transport as a non-hazardous solid waste to Cerro Colorado landfill near Albuquerque, New Mexico (see Figure 3-1).

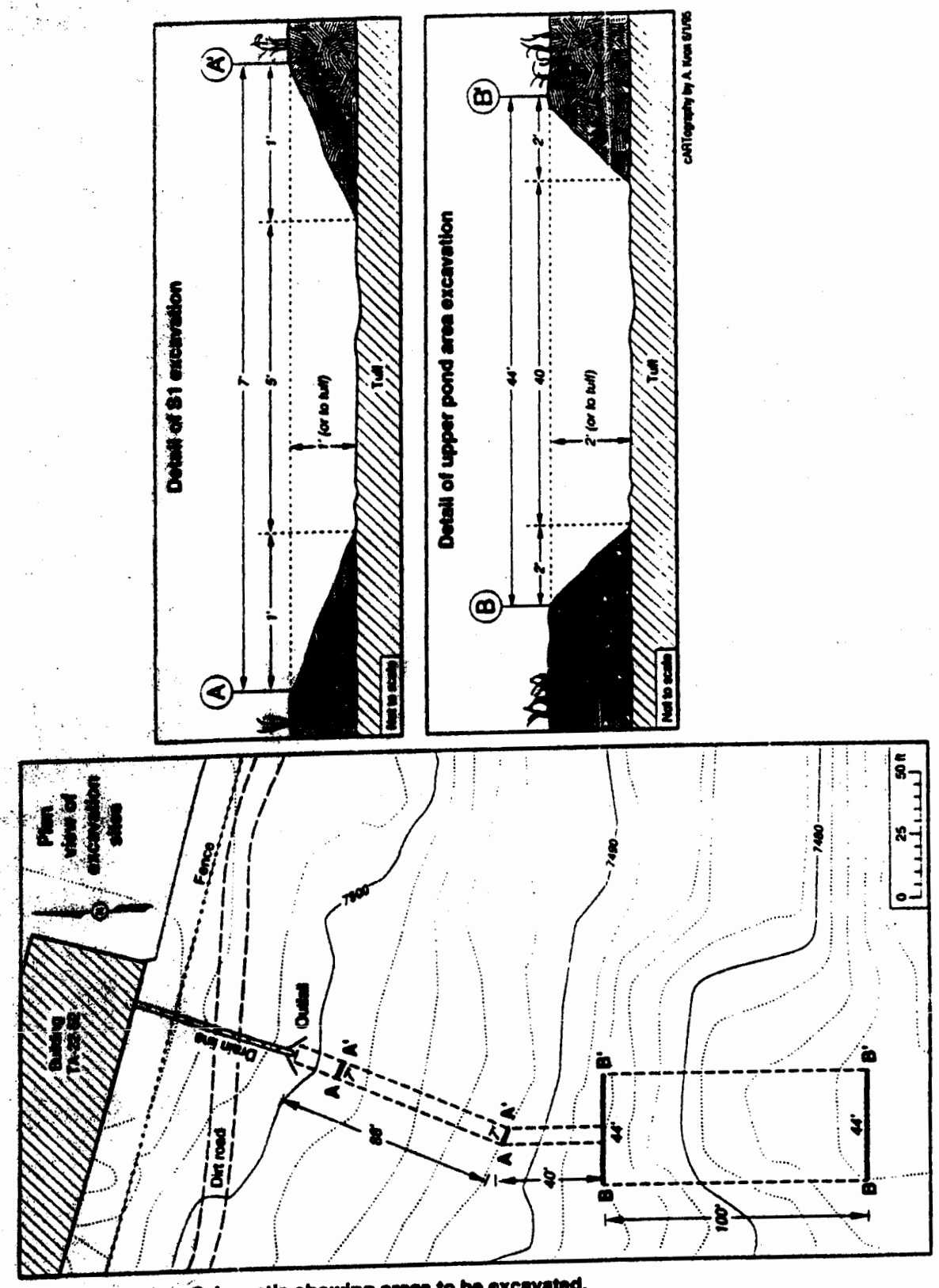


Figure 3-1. Schematic showing areas to be excavated.

As contaminated soil is excavated from each portion of the SWMU, confirmation samples will be collected from the excavation and analyzed for total metals and radionuclides in a mobile field laboratory to confirm that cleanup levels have been met. Four samples will be collected in the drainage between the outfall and the pond area. Six samples will be collected from the pond area. This number of samples is believed to be sufficient because the RFI data indicate that there is consistent metals concentrations with depth and location along the drainage channel. Areas with metals concentrations still above cleanup levels will be excavated and resampled.

As described in Section 3.5, verification samples will be collected from the excavations prior to backfilling with clean soil. Clean soil will be brought to the site and used as fill for the excavations. The fill will be placed in lifts as needed, compacted by rolling with the excavator, and contoured.

Soils located along the wagon road and down the canyon wall are not proposed for excavation. This is because of the small quantity of soils involved and because disturbance of the soil will contribute to significant future erosion in these areas. However, prior to the initiation of this EC, a maximum of five additional samples will be collected and analyzed from these areas, and a risk assessment conducted (with these new data and RFI data) to ensure levels of materials left in the soils and sediment do not pose an unacceptable health and/or ecological risk. If the assessment indicates the residual soils pose an unacceptable risk, then the soil will be excavated and disposed of as a solid waste.

Excavating equipment will be decontaminated with pressure-washing equipment on-site. Wash water will be contained, tested, and disposed of in accordance with the Waste Management Checklist.

3.4 Waste Management Issues

As indicated in Section 2.3, wastes to be generated during the EC include non-hazardous solid waste (soils), used PPE, and decontamination rinse water. Solid and liquid wastes will be disposed of in accordance with the Waste Management Checklist.

3.4.1 Characterization of Materials for Disposal

Field screening of samples for radioactivity will be conducted on all solid and liquid wastes generated during the EC. Excavated will be characterized in accordance with the approved disposal facility's waste acceptance criteria. One sample of the liquid waste (decon water) will be collected for characterization prior to disposal.

3.4.2 Treatment, Storage, and Disposal Plans for Waste

The excavated soil is not a hazardous waste and no treatment of soil has been proposed. Excavated soils will be placed directly into bulk containers or dump trucks for transport to the permitted disposal facility. Any liquid waste will be staged on-site until the final waste characterization data are available. Any other solid waste will be disposed of in accordance with the Waste Management Checklist.

3.5 Verification Plan

As mentioned in Section 2.4.3, the cleanup effort at this SWMU will be driven by the 25 ppm (or 25 mg/kg) cleanup level for arsenic. Therefore, this verification sampling plan design is based on the arsenic cleanup level. Because RFI data indicate that the other metal contaminants are collocated with the arsenic contamination, attainment of all cleanup levels will be achieved once the arsenic cleanup level is achieved. This will be confirmed during the collection and analyses of verification samples.

The number of samples to be taken to determine whether a confirmation unit has achieved the cleanup standard due to excavation is dictated by the sampling frequency needed to achieve statistically defensible data. In this case, the area to be excavated corresponds to the default industrial occupational scenario exposure unit of 500 cubic meters. Therefore, the entire excavated area will be sampled to determine if cleanup levels have been met. *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Solid Media (EPA 1988)*, provides the formulae for calculating the number of random samples needed to determine if the mean concentration remaining in the area after excavation is less than the cleanup goal at a specified level of confidence. The required number of samples is computed using the equation presented in Annex 6.13.

Application of this approach with assumptions as outlined, results in a verification sample size of 4 random soil samples to be collected for off-site certified laboratory analysis, (see Table 3-1). Results from the 4 laboratory verification samples will be used to calculate the 95% upper confidence limit (UCL) to compare to the cleanup level established for each contaminant of concern. The site cleanup objectives will be obtained when the calculated UCL is less than the established cleanup levels.

3.6 Site Restoration Plan

When verification sample results confirm that the site has been remediated in accordance with this plan, the excavated area will be filled with clean dirt, compacted, and contoured to minimize erosion. The pond area will have clean fill added to elevate the final grade approximately 1 to 2 feet above the pre-existing grade. Erosion protection such as flow diversions, berms, gravel and stone protection, and revegetation will be used to minimize future erosion of the impacted area. Areas downstream of the pond area that require excavation will have clean gravel backfill applied to minimize erosion. Two drainage culverts are proposed to divert stormwater away from the east and west sides of the remediated area. The surface will be graded as needed to direct surface flow to the culverts.

3.7 Acceptance Inspection

The Laboratory proposes an Acceptance Inspection as the mechanism for DOE and EPA to assess the implementation and effectiveness of the EC. A minimum of 10 days' notification will be provided to the agencies before the start of field activities. At that time, a tentative date for the inspection will be agreed upon.

An inspection checklist will be used to document the scope of the inspection and will become part of the EC Final Report. The checklist and the timing of the inspection will be developed by the Laboratory and agreed to by the other agencies. This inspection checklist will contain specific items, criteria, and requirements to be inspected that will constitute acceptance of remediation activities.

The Acceptance Inspection will be conducted by an independent professional skilled in the appropriate technical discipline. During the Acceptance Inspection, written resolution and an anticipated schedule for completion will be identified for any outstanding items and documented on the inspection checklist. The Laboratory Field Project Leader (FPL) or designee will be responsible for completing outstanding inspection items and documenting their resolution in the EC report.

Upon completion of the remediation activities, the Laboratory will submit a written report to EPA Region 6, certifying that the remedy has been completed in accordance with the EC Plan and Acceptance Inspection Checklist. The certification will be signed by the permittees (the Laboratory and DOE) and by the independent professional conducting the inspection. The certification will accompany the EC Final Report.

TABLE 3-1
SUMMARY OF VERIFICATION SAMPLES AND ANALYSES
FOR SWMU 22-015(c)

	Field Screening					Field Laboratory Analysis					Fixed Laboratory Analysis					
Sample Description	Beta-Gamma	Alpha	Organic Vapor	Radiological Smear & Swipe Techniques	XRF	PCBs	VOCs (SW 8260)*	SVOCs (SW 8270)*	Metals (ICPES)	Gross Gamma, Alpha, Beta	PCBs	VOCs (SW 8260)*	Metals (SW 6010/7000)*	SVOCs (SW8270)*	Total Uranium	Gamma Spectrometry
Surface Soil Samples	14	14							10	10			4			
Duplicate	3	3							1	1			1			
Decontamination Water	2	2							1	1						
Excavation Equipment	1	1							1	1						

ote: Additional samples may be taken based on field surveys and observations.
. Applicable EPA SW 846 methods.

3.8 Final Report

After field activities are completed and all analytical results from the verification samples are obtained, a final report on the EC will be prepared. This report will outline the EC process and the "as-left" condition of the site. A proposed outline for this report is presented as Annex 6.8.

4.0 PROJECT MANAGEMENT

Overall implementation of this expedited cleanup will be managed by Cheryl Rofer, the FPL. Danny Martinez will serve as Field Team Leader (FTL) for the EC activities.

4.1 Staff and Resource Requirements

Total anticipated cost for the EC is **$93,300** as detailed in the following breakdown.

Pre-Field Activities	
Preparation of Waste Management Checklist	$1,000
Preparation of Site Health and Safety Plan	2,500
Field Work Plan preparation	2,000
Contracting of subcontractors/plan prep.	3,500
Subtotal	*$9,000*
Field Activities	
Excavation of 350 cu. yds.	$7,000
Transportation of soil to Cerro Colorado	9,500
Site restoration	3,500
Disposal of low-level radioactive waste	5,000
Disposal of solid waste	14,000
Subtotal	*$39,000*
Personnel Costs	
Field Team verification sampling	$2,050
Coordination/supervision	24,250
Subtotal	*$26,300*
Analytical Costs	
Verification Samples	$ 4,800
Chem Van @ $2,000/day	4,000
Rad Van @ $2,000/day	4,000
Waste Disposal Characterization	200
Subtotal	*$13,000*
Post Field Activities	
Acceptance Inspection	$4,000
Final Report	2,000
Subtotal	*$6,000*
TOTAL ESTIMATED COST	**$93,300**

It is important to note that the total estimated cost of this EC may increase by $30,000 if the eco-risk assessment indicates that additional soils from the hillside must also be removed. The maximum estimated volume of this soil is approximately 75 cu. yds.; however, the labor involved in removing soil from the hillside will be significant.

4.2 Schedule

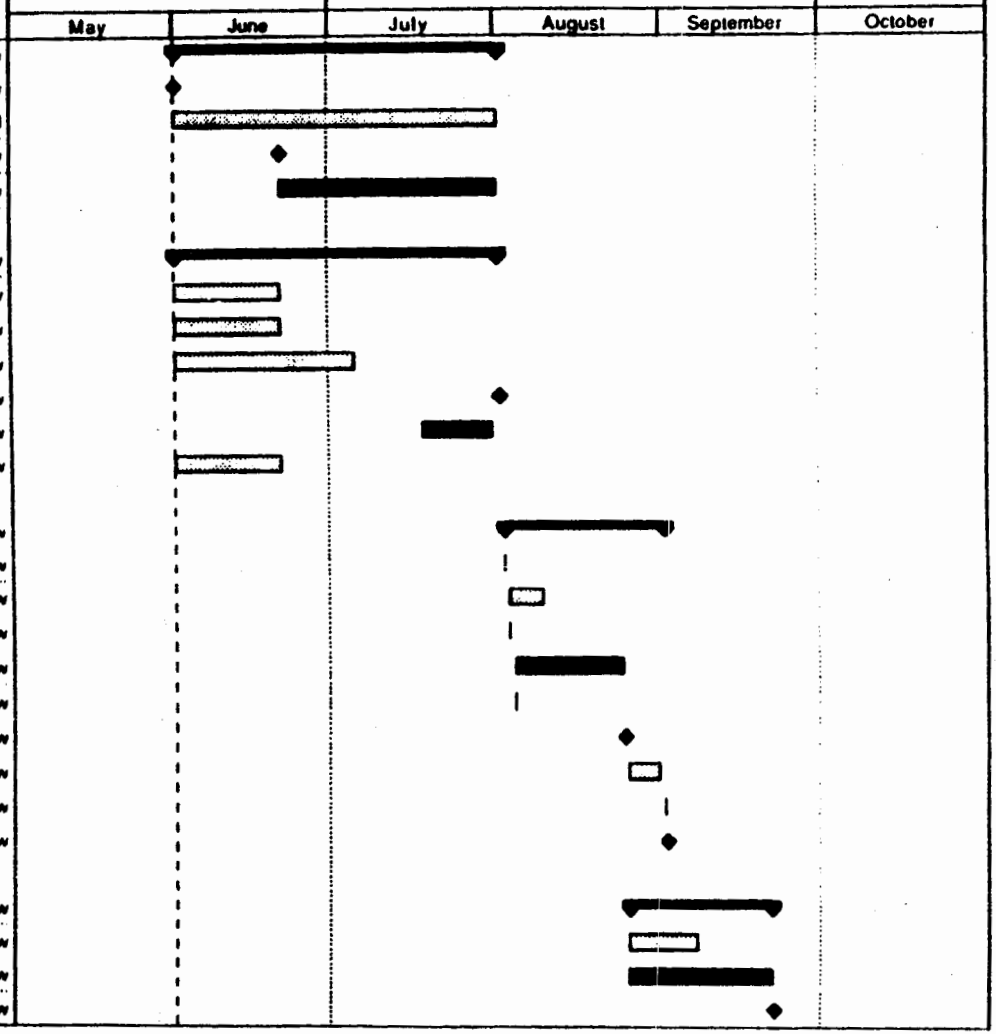
The proposed EC schedule is shown in Table 4-1. The submittal of this EC Plan to the EPA in June 1995 will initiate the 60-day public review/comment period. No sooner than 15 days after the start of this period, a public meeting will be held. Preparation for field work will be conducted concurrent to the public review period. Field work will be initiated within 10 days of agency and public approval or receipt of EPA temporary authorization to proceed. The final report will be submitted to EPA within 14 days of receipt of verification sample results.

4.3 Stakeholder Notifications

Stakeholder notifications are an integral part of the procedure for conducting ECs. ER Project personnel will notify state and local governments, external and internal stakeholders, and individuals on the ER Project mailing list of the availability of the EC Plan. The EC Plan will be available to the stakeholders at the Laboratory Community Reading Room in Los Alamos; the document repositories at the public libraries in Los Alamos, Espanola, and Santa Fe; and the San Ildefonso Pueblo Governor's office.

The submission to EPA of this EC plan will trigger publication of a public notice starting a 60-day public comment period.

ID	Name	Duration
1	1.0 PUBLIC ACCEPTANCE	8.77ew
2	1.1 SUBMIT EC PLAN TO EPA	0w
3	1.2 PUBLIC COMMENTS	44d
4	1.3 PUBLIC MEETING	0ew
5	1.4 RESPOND TO PUBLIC COMMENT	6w
6		
7	2.0 PLANNING	8.77ew
8	2.1 PREPARE/REVISE HEALTH AND SAFETY PLAN	3w
9	2.2 PREPARE/REVISE WASTE MANAGEMENT PLAN	3w
10	2.3 FIELD WORK PLANNING	5w
11	2.4 FIELD WORK APPROVAL FORM SIGNED	0w
12	2.5 10-DAY NOTIFICATION OF FIELD WORK	2w
13	2.6 SAMPLE COLLECTION/ECO-RISK	3w
14		
15	3.0 IMPLEMENT EXPEDITED CLEANUP	4.34ew
16	3.1 MOBILIZATION	0.2w
17	3.2 PERFORM EXCAVATION	1w
18	3.3 VERIFICATION SAMPLING	0.2w
19	3.4 VERIFICATION ANALYSIS	3w
20	3.5 ACCEPTANCE INSPECTION	0.2w
21	3.6 ANALYSIS COMPLETE	0w
22	3.7 SITE RESTORATION	1w
23	3.8 DEMOBILIZATION	0.2w
24	3.9 COMPLETE EC	0w
25		
26	4.0 REPORT PREPARATION	3.91ew
27	4.1 VALIDATE SAMPLE DATA	2w
28	4.2 PREPARE FINAL REPORT	4w
29	4.3 SUBMIT REPORT	0w



Project:
Date: 6/1/95

Critical Noncritical Progress Milestone Summary

Los Alamos National Laboratory

6.0 ANNEXES

6.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures. Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

6.2 Quality Assurance Plan

See Quality Program Plan And Quality Assurance Project Plan For Environmental Restoration, February 1995, Los Alamos National Laboratory, Los Alamos, New Mexico.

6.3 Health and Safety Plan

See Los Alamos National Laboratory (LANL) ER Project Health and Safety Plan (HASP), (LANL, February 11, 1995).

6.4 Records Management Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter IV, Records Management Program Plan.

6.5 Public Involvement Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter V, Public Involvement Program Plan.

6.6 Waste Management Checklist

6.7 Field Work Approval Form

6.8 Proposed Outline for Expedited Cleanup Report

6.9 RFI Analytical Results

6.10 Summary of Composite and Grab Sample Location

6.11 TCLP and HCl Extraction Results

6.12 Cleanup Level Calculations

6.13 Verification Sample Locations

ANNEX 6.7

FIELD WORK APPROVAL FORM

ANNEX 6.7

FIELD WORK APPROVAL FORM

This form must be completed prior to starting site remediation field work for Expedited Cleanups that do not have an EPA-approved plan.

I, _____, DOE-LAAO, APPROVE the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU 22-015(c), TA-22-52, for the excavation and restoration of the surface disposal site.

I, _____, DOE-LAAO, DO NOT APPROVE the field work as proposed for SWMU 22-015(c), TA-22-52, as described in the accompanying Expedited Cleanup Plan for the excavation and restoration of the surface disposal site.

The following reasons reflect the decision for disapproval:

Signed: _____ Date:_____

ANNEX 6.8

PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORT

ANNEX 6.8

PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORT

1.0 SUMMARY OF EXPEDITED CLEANUP

- 1.1 Overview
- 1.2 Expedited Cleanup

2.0 DISCUSSION OF SAMPLING AND ANALYSIS

- 2.1 Verification Sampling and Analysis
  - 2.1.1 Sampling Objectives
  - 2.1.2 QA/QC
  - 2.1.3 Sampling Activities
- 2.2 Site Restoration

3.0 MODIFICATIONS TO THE EC PLAN

4.0 QUANTITIES AND TYPES OF WASTE GENERATED

5.0 OUTSTANDING PROBLEMS FROM THE ACCEPTANCE INSPECTION

6.0 PROBLEMS ENCOUNTERED AND LESSONS LEARNED

APPENDICES

A ANALYTICAL DATA
B ACCEPTANCE INSPECTION CHECKLIST
C WASTE STREAM INVENTORY
D PHOTOGRAPHS
E CERTIFICATION OF COMPLETION

ANNEX 6.9

RFI ANALYTICAL RESULTS

22-015(c)
Locations and Depths
Single Grabs

Sample ID	Location ID	Depth (in)
AAA8588	2004	2 - 6
AAA8589	2004	37
AAA8590	2007	2 - 6
AAA8591	2007	28
AAA8592	2008	2 - 6
AAA8593	2008	29
AAA8600	2019	0 - 6
AAA8601	2019	6
AAA8602	2020	0 - 6
AAA8603	2020	12
AAA8604	2021	0 - 6
AAA8605	2021	12
AAA8606	2022	0 - 6
AAA8607	2022	8
AAA8608	2023	0 - 6
AAA8609	2023	6
AAA8610	2024	0 - 6
AAA8611	2024	10
AAA8612	2025	0 - 6
AAA8613	2025	6
AAA8614	2026	0 - 6
AAA8615	2026	30
AAA8616	2027	0 - 6
AAA8617	2027	24
AAA8619	2028	0 - 6
AAA8620	2028	16

22-01 5rc.
Locations and Depths
Multiple Grabs

Sample ID		Grab 1	Grab 2	Grab 3	Grab 4	Grab 5	Grab 6
AAA8581	Location ID	2001	2002	2003			
	Depth (in)	0 - 6	0 - 6	0 - 6			
AAA8582	Location ID	2001	2002	2003			
	Depth (in)	12	4	4			
AAA8583	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8584	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8585	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8586	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	32	32	32	32	32	19
AAA8587	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	32	32	32	32	32	19
AAA8594	Location ID	2010	2011	2012			
	Depth (in)	6	6	6			
AAA8595	Location ID	2010	2011	2012			
	Depth (in)	3	10	10			
AAA8596	Location ID	2013	2014	2015	2016	2017	2018
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8597	Location ID	2013	2014	2015	2016	2017	2018
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8598	Location ID	2013	2014	2015	2016	2017	2018
	Depth (in)	10	12	10	10	10	6
AAA8599	Location ID	2013	2014	2015	2016	2017	2018
	Depth (in)	10	10	10	10	10	8
AAA8621	Location ID	2029	2030	2031	2032	2033	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8622	Location ID	2029	2030	2031	2032	2033	
	Depth (in)	7	12	16	8	4	
AAA8623	Location ID	2034	2035	2036	2037	2038	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8624	Location ID	2034	2035	2036	2037	2038	
	Depth (in)	10	7	36	8	19	
AAA8625	Location ID	2039	2040	2041	2042	2043	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8626	Location ID	2039	2040	2041	2042	2043	
	Depth (in)	8	5	3	3	14	
AAA8627	Location ID	2044	2045	2046	2047	2048	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8628	Location ID	2044	2045	2046	2047	2048	
	Depth (in)	12	18	2	12	6	
AAA8629	Location ID	2049	2050	2051	2052	2053	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8630	Location ID	2049	2050	2051	2052	2053	
	Depth (in)	24	36	36	24	24	
AAA8631	Location ID	2054	2055	2056	2057	2058	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8632	Location ID	2054	2055	2056	2057	2058	
	Depth (in)	4	3	13	10	6	
AAA8633	Location ID	2059	2060	2061	2062	2063	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8634	Location ID	2059	2060	2061	2062	2063	
	Depth (in)	6	6	3	10	10	
AAA8635	Location ID	2064	2065	2066	2067	2068	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8636	Location ID	2064	2065	2066	2067	2068	
	Depth (in)	11	13	11	13	11	
AAA8637	Location ID	2064	2065	2066	2067	2068	
	Depth (in)	11	13	11	13	11	

Samples were not taken at additional locations

22-015(c)
Organic and Radionuclide Detects
Single Grab

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8588	1	Bis(2-ethylhexyl)phthalate	7	MG/KG	50	NA
AAA8588	1	Methylene chloride	0.01	MG/KG	5.6	NA
AAA8588	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.016	MG/KG	NA	NA
AAA8589	1	Methylene chloride	0.009	MG/KG	5.6	NA
AAA8589	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.01	MG/KG	NA	NA
AAA8590	1	Bis(2-ethylhexyl)phthalate	6.6	MG/KG	50	NA
AAA8590	1	Methylene chloride	0.032	MG/KG	5.6	NA
AAA8590	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.054	MG/KG	NA	NA
AAA8591	1	Methylene chloride	0.013	MG/KG	5.6	NA
AAA8591	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.009	MG/KG	NA	NA
AAA8592	1	Bis(2-ethylhexyl)phthalate	69	MG/KG	50	NA
AAA8592	1	Methylene chloride	0.009	MG/KG	5.6	NA
AAA8592	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.012	MG/KG	NA	NA
AAA8593	1	Methylene chloride	0.01	MG/KG	5.6	NA
AAA8593	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.007	MG/KG	NA	NA
AAA8603	1	Bis(2-ethylhexyl)phthalate	2.6	MG/KG	50	NA
AAA8588	1	Cesium-137	0.537	PCI/G	4	1.4
AAA8589	1	Cesium-137	0.001	PCI/G	4	1.4
AAA8590	1	Cesium-137	0.658	PCI/G	4	1.4
AAA8591	1	Cesium-137	0.001	PCI/G	4	1.4
AAA8592	1	Cesium-137	0.404	PCI/G	4	1.4
AAA8593	1	Cesium-137	0.025	PCI/G	4	1.4
AAA8600	1	Cesium-137	0.682	PCI/G	4	1.4
AAA8601	1	Cesium-137	0.393	PCI/G	4	1.4
AAA8602	1	Cesium-137	1.761	PCI/G	4	1.4
AAA8603	1	Cesium-137	0.152	PCI/G	4	1.4
AAA8604	1	Cesium-137	1.460	PCI/G	4	1.4
AAA8605	1	Cesium-137	0.150	PCI/G	4	1.4
AAA8606	1	Cesium-137	1.085	PCI/G	4	1.4
AAA8607	1	Cesium-137	0.199	PCI/G	4	1.4
AAA8608	1	Cesium-137	1.259	PCI/G	4	1.4
AAA8609	1	Cesium-137	0.114	PCI/G	4	1.4
AAA8610	1	Cesium-137	1.762	PCI/G	4	1.4
AAA8611	1	Cesium-137	0.183	PCI/G	4	1.4
AAA8611R	1	Cesium-137	0.271	PCI/G	4	1.4
AAA8612	1	Cesium-137	0.155	PCI/G	4	1.4
AAA8613	1	Cesium-137	0.001	PCI/G	4	1.4
AAA8614	1	Cesium-137	0.221	PCI/G	4	1.4
AAA8614R	1	Cesium-137	0.203	PCI/G	4	1.4
AAA8615	1	Cesium-137	0.001	PCI/G	4	1.4
AAA8616	1	Cesium-137	0.375	PCI/G	4	1.4
AAA8617	1	Cesium-137	0.101	PCI/G	4	1.4
AAA8617R	1	Cesium-137	0.062	PCI/G	4	1.4

22-015(c)
Organic and Radionuclide Detects
Single Grab

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8618	1	Cesium-137	0.396	PCI/G	4	1.4
AAA8619	1	Cesium-137	0.494	PCI/G	4	1.4
AAA8620	1	Cesium-137	0.345	PCI/G	4	1.4
AAA8588	1	Strontium-90	5.75	PCI/G	5.9	1
AAA8589	1	Strontium-90	0.59	PCI/G	5.9	1
AAA8590	1	Strontium-90	7.22	PCI/G	5.9	1
AAA8591	1	Strontium-90	0.00	PCI/G	5.9	1
AAA8592	1	Strontium-90	6.24	PCI/G	5.9	1
AAA8593	1	Strontium-90	0.90	PCI/G	5.9	1
AAA8600	1	Strontium-90	0.18	PCI/G	5.9	1
AAA8600R	1	Strontium-90	0.08	PCI/G	5.9	1
AAA8601	1	Strontium-90	0.64	PCI/G	5.9	1
AAA8602	1	Strontium-90	0.51	PCI/G	5.9	1
AAA8603	1	Strontium-90	0.36	PCI/G	5.9	1
AAA8603R	1	Strontium-90	0.03	PCI/G	5.9	1
AAA8604	1	Strontium-90	0.02	PCI/G	5.9	1
AAA8605	1	Strontium-90	0.15	PCI/G	5.9	1
AAA8606	1	Strontium-90	0.83	PCI/G	5.9	1
AAA8607	1	Strontium-90	0.29	PCI/G	5.9	1
AAA8608	1	Strontium-90	0.30	PCI/G	5.9	1
AAA8609	1	Strontium-90	0.08	PCI/G	5.9	1
AAA8609R	1	Strontium-90	0.05	PCI/G	5.9	1
AAA8610	1	Strontium-90	0.45	PCI/G	5.9	1
AAA8611	1	Strontium-90	0.57	PCI/G	5.9	1
AAA8612	1	Strontium-90	0.90	PCI/G	5.9	1
AAA8613	1	Strontium-90	1.47	PCI/G	5.9	1
AAA8614	1	Strontium-90	0.15	PCI/G	5.9	1
AAA8615	1	Strontium-90	0.37	PCI/G	5.9	1
AAA8616	1	Strontium-90	0.15	PCI/G	5.9	1
AAA8617	1	Strontium-90	1.15	PCI/G	5.9	1
AAA8618	1	Strontium-90	0.83	PCI/G	5.9	1
AAA8619	1	Strontium-90	0.79	PCI/G	5.9	1
AAA8620	1	Strontium-90	0.28	PCI/G	5.9	1

NA Not applicable.

22-015(c)
Organic and Radionuclide Detects above UTL and/or SAL
Single Grab

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8592	1	Bis(2-ethylhexyl)phthalate	69	MG/KG	50	NA
AAA8602	1	Cesium-137	1.761	PCI/G	4	1.4
AAA8604	1	Cesium-137	1.460	PCI/G	4	1.4
AAA8610	1	Cesium-137	1.762	PCI/G	4	1.4
AAA8588	1	Strontium-90	5.75	PCI/G	5.9	1
AAA8590	1	Strontium-90	7.22	PCI/G	5.9	1
AAA8592	1	Strontium-90	6.24	PCI/G	5.9	1
AAA8613	1	Strontium-90	1.47	PCI/G	5.9	1
AAA8617	1	Strontium-90	1.15	PCI/G	5.9	1

NA Not applicable.

22-015(c)
Metal Detects. Single Grab

	Number of Grabs	silver	aluminum	arsenic	barium	beryllium	calcium	cadmium	cyanide
UTL---->		1.61	123000	11.6	1143	3.31	54362	2.7	n/a
SAL---->		400	n/a	n/a	5600	n/a	n/a	80	1600
AAA8588	1		3690	55.7				1.8	1.3
AAA8588R	1	2.1	3679	45.3	26.5	0.35	565	1.7	
AAA8589	1	7.6	5440	5.5		1.6		6.1	
AAA8590	1	5.5	2710	227			3860	5.9	11.5
AAA8591	1	4.2	3710	3.2				5.8	
AAA8592	1	20.7	5680	198				4.1	1.1
AAA8593	1		11300	3			1400	1.5	
AAA8600	1		5690	6.9	46.3		1070	1.4	
AAA8601	1		4940	3.6				1.3	
AAA8602	1	4.8	5520		121		7200	3.9	
AAA8603	1	4.1	4230	2.5	47.1		2430	8.5	
AAA8604	1	15.9	7730	20.5	120		4560	42.6	0.84
AAA8605	1	13	5580	9.2	46.6		1590	22.6	2.7
AAA8606	1	31.3	9600	36.7	97.2		3770	22	1.7
AAA8607	1	34.7	6230	3.9	52		1390	7.3	
AAA8608	1	9.1	6960	15.7	75		1430	12.8	1.3
AAA8609	1	3.6	4350	5.5				9.1	1.2
AAA8610	1	30	12700	66.9	151		4580	79.6	3.7
AAA8611	1	27.4	6200	5.3	58.9		1870	55.2	2
AAA8612	1	18.3	4640	6.7			1190	9.1	
AAA8613	1	2.8	6050	2.6				2.1	
AAA8614	1	5.7	5670	6.8				9.3	1
AAA8615	1	4.5	4020	2.9				5.5	
AAA8616	1	18.2	4710	7.5				16.8	
AAA8617	1	23	4880	6.2				37	3.4
AAA8618	1	10.5	5210	7.3				16	1.1
AAA8619	1	8.8	5270	15.3	50.7		1700	28.2	1.1
AAA8620	1	11.7	5900	4				15.6	4.1

n/a Not applicable.

22-015(c)
Metal Detects, Single Grab

	Number of Grabs	cobalt	chromium	copper	fluorine	iron	mercury	potassium	magnesium	manganese
UTL---->		51.1	34.2	15.7	n/a	35586	0.1	6179	16147	1030
SAL---->		n/a	n/a	3000	n/a	n/a	24	n/a	n/a	11000
AAA8588	1		449	3990	5	85100	0.06			120
AAA8588R	1	2.4	430	3998		92237	0.06	676	616	94
AAA8589	1		43.1	176	7	9280				174
AAA8590	1		566	13600	4	276000	0.21			127
AAA8591	1		48	59.8	4	8310				178
AAA8592	1		952	2540	4	42300	0.16			59.3
AAA8593	1		9.4	28.1	6	13500			1390	306
AAA8600	1		29.6	2400		17700		1100		150
AAA8601	1		30.3	1860		8720				145
AAA8602	1		20	33.4		5810		1430	1490	499
AAA8603	1		23.6	15.9		4190		1320		202
AAA8604	1	21	581	12500		37900	0.39		1340	363
AAA8605	1		318	3320		17800	0.08			191
AAA8606	1	16.4	637	6610		35300	0.28		1470	319
AAA8607	1		176	1440		6790				231
AAA8608	1		352	4080		17300	0.09			266
AAA8609	1		99.1	645		8220				381
AAA8610	1	21.1	931	15100		77900	0.2		1840	309
AAA8611	1		523	1750		10100	0.35			138
AAA8612	1		146	2400		13500				144
AAA8613	1		15.8	118		7880				215
AAA8614	1		118	1800		12800	0.04			268
AAA8615	1		24.5	243		6350				285
AAA8616	1		330	2350		13000	0.19			82.4
AAA8617	1		146	722		8650				226
AAA8618	1		347	2520		10900	0.25			159
AAA8619	1		303	4670		18000	0.06			163
AAA8620	1		166	1780		9340				289

n/a Not applicable.

22-015(c)
Metal Detects. Single Grab

	Number of Grabs	sodium	nickel	nitrite	nitrate	lead	platinum	selenium	vanadium	zinc
UTL---->		1884	26.7	n/a	n/a	39	n/a	1.7	66	101
SAL---->		n/a	1600	8000	130000	400	n/a	400	560	24000
AAA8588	1		526	7	7	127	81.9		95.7	99.1
AAA8588R	1	141	467			121	84.9	0.85	106	93.8
AAA8589	1		120	0.7	0.7	6.1	13.8			48
AAA8590	1		219	9.7	9.7	179	254		298	108
AAA8591	1		58.7	1.2	1.2	3.9	16.2			44.6
AAA8592	1		1200	8.1	8.1	271	51.1		59.4	111
AAA8593	1		68.7	1.1	1.1	8.3	19.9			44.5
AAA8600	1		36.3			22.3	15.9		18.3	30
AAA8601	1		53			46.1	16.4			32.4
AAA8602	1		48.2			19	14.2			28.1
AAA8603	1		38.7			13.1				24
AAA8604	1		1400			364	41.4		49.3	238
AAA8605	1		454			89.6	21.7		20	93.2
AAA8606	1		1330			518	37.6		48.4	191
AAA8607	1		269			35.9				57.7
AAA8608	1		920			413	26.6		33	139
AAA8609	1		380			74			14	68.2
AAA8610	1		1630			557	85.1		90.7	296
AAA8611	1		658			69.4	16.1		14.6	122
AAA8612	1		316			63.5	21.9		18.1	72.3
AAA8613	1		61.2			6.1				37.7
AAA8614	1		388			165	21		13.2	76.8
AAA8615	1		71.8			13.7	14.2			30.5
AAA8616	1		877			215	19.1		15.2	117
AAA8617	1		375			54.6	14.1			66.9
AAA8618	1		1160			196	16.7		16.4	151
AAA8619	1		1240			191	19.1		24.3	170
AAA8620	1		748			188	15.8		12.4	120

n/a Not applicable.

22-015(c)
Metal Detects above UTL and/or SAL
Single Grab

	Number of Grabs	silver	arsenic	cadmium	chromium	copper	iron	mercury	nickel	lead	vanadium	zinc
UTL---->		1.61	11.6	2.7	34.2	15.7	35586	0.1	26.7	39	66	101
SAL---->		400	n/a	80	n/a	3000	n/a	24	1600	400	560	24000
AAA8588	1		55.7		449	3990	85100		526	127	95.7	
AAA8588R	1	2.1	45.3		430	3998	92237		467	121	106	
AAA8589	1	7.6		6.1	43.1	176			120			
AAA8590	1	5.5	227	5.9	566	13600	276000	0.21	219	179	298	108
AAA8591	1	4.2		5.8	48	59.8			58.7			
AAA8592	1	20.7	198	4.1	952	2540	42300	0.16	1200	271		111
AAA8593	1					28.1			68.7			
AAA8600	1					2400			36.3			
AAA8601	1					1860			53	46.1		
AAA8602	1	4.8		3.9		33.4			48.2			
AAA8603	1	4.1		8.5		15.9			38.7			
AAA8604	1	15.9	20.5	42.6	581	12500	37900	0.39	1400	364		238
AAA8605	1	13		22.6	318	3320			454	89.6		
AAA8606	1	31.3	36.7	22	637	6810		0.28	1330	518		191
AAA8607	1	34.7		7.3	176	1440			269			
AAA8608	1	9.1	15.7	12.8	352	4080			920	413		139
AAA8609	1	3.6		9.1	99.1	645			380	74		
AAA8610	1	30	66.9	79.6	931	15100	77900	0.2	1630	557	90.7	296
AAA8611	1	27.4		55.2	523	1750		0.35	658	69.4		122
AAA8612	1	18.3		9.1	146	2400			316	63.5		
AAA8613	1	2.8				118			61.2			
AAA8614	1	5.7		9.3	118	1800			388	165		
AAA8615	1	4.5		5.5		243			71.8			
A[illegible]616	1	18.2		16.8	330	2350		0.19	877	215		117
A[illegible]617	1	23		37	146	722			375	54.6		
AAA8618	1	10.5		16	347	2520		0.25	1160	196		151
AAA8619	1	8.8	15.3	28.2	303	4670			1240	191		170
AAA8620	1	11.7		15.6	166	1780			748	188		120

n/a Not applicable.

22-015(c)
Organic and Radionuclide Detects
Multiple Grabs

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8581	3	Bis(2-ethylhexyl)phthalate	51	MG/KG	50	n/a
AAA8581	3	Di-n-octyl phthalate	2	MG/KG	1600	n/a
AAA8582	3	Bis(2-ethylhexyl)phthalate	3.4	MG/KG	50	n/a
AAA8583	6	Bis(2-ethylhexyl)phthalate	2.3	MG/KG	50	n/a
AAA8587	6	Bis(2-ethylhexyl)phthalate	2.5	MG/KG	50	n/a
AAA8633	5	Bis(2-ethylhexyl)phthalate	14	MG/KG	50	n/a
AAA8581	3	Cesium-137	0.150	PCI/G	4	1.4
AAA8582	3	Cesium-137	0.001	PCI/G	4	1.4
AAA8583	6	Cesium-137	0.425	PCI/G	4	1.4
AAA8584	6	Cesium-137	0.802	PCI/G	4	1.4
AAA8585	6	Cesium-137	0.982	PCI/G	4	1.4
AAA8586	6	Cesium-137	0.001	PCI/G	4	1.4
AAA8587	6	Cesium-137	0.001	PCI/G	4	1.4
AAA8594	3	Cesium-137	0.436	PCI/G	4	1.4
AAA8595	3	Cesium-137	0.069	PCI/G	4	1.4
AAA8596	6	Cesium-137	0.695	PCI/G	4	1.4
AAA8596R	6	Cesium-137	0.635	PCI/G	4	1.4
AAA8597	6	Cesium-137	0.730	PCI/G	4	1.4
AAA8598	6	Cesium-137	0.255	PCI/G	4	1.4
AAA8599	6	Cesium-137	0.355	PCI/G	4	1.4
AAA8621	5	Cesium-137	1.231	PCI/G	4	1.4
AAA8622	5	Cesium-137	0.124	PCI/G	4	1.4
AAA8623	5	Cesium-137	1.058	PCI/G	4	1.4
AAA8624	5	Cesium-137	0.166	PCI/G	4	1.4
AAA8625	5	Cesium-137	1.604	PCI/G	4	1.4
AAA8626	5	Cesium-137	0.123	PCI/G	4	1.4
AAA8626R	5	Cesium-137	0.105	PCI/G	4	1.4
AAA8627	5	Cesium-137	1.537	PCI/G	4	1.4
AAA8628	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8629	5	Cesium-137	1.271	PCI/G	4	1.4
AAA8630	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8631	5	Cesium-137	0.792	PCI/G	4	1.4
AAA8632	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8633	5	Cesium-137	1.256	PCI/G	4	1.4
AAA8634	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8635	5	Cesium-137	1.464	PCI/G	4	1.4
AAA8636	5	Cesium-137	1.373	PCI/G	4	1.4
AAA8637	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8581	3	Strontium-90	4.12	PCI/G	5.9	1
AAA8582	3	Strontium-90	0.32	PCI/G	5.9	1
AAA8583	6	Strontium-90	0.29	PCI/G	5.9	1
AAA8584	6	Strontium-90	0.48	PCI/G	5.9	1

22-015(c)
Organic and Radionuclide Detects
Multiple Grabs

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8585	6	Strontium-90	0.09	PCI/G	5.9	1
AAA8586	6	Strontium-90	0.64	PCI/G	5.9	1
AAA8587	6	Strontium-90	0.44	PCI/G	5.9	1
AAA8594	3	Strontium-90	0.20	PCI/G	5.9	1
AAA8595	3	Strontium-90	0.40	PCI/G	5.9	1
AAA8596	6	Strontium-90	0.07	PCI/G	5.9	1
AAA8597	6	Strontium-90	0.29	PCI/G	5.9	1
AAA8598	6	Strontium-90	0.13	PCI/G	5.9	1
AAA8599	6	Strontium-90	0.11	PCI/G	5.9	1
AAA8599R	6	Strontium-90	0.81	PCI/G	5.9	1
AAA8621	5	Strontium-90	0.34	PCI/G	5.9	1
AAA8621R	5	Strontium-90	0.32	PCI/G	5.9	1
AAA8622	5	Strontium-90	0.28	PCI/G	5.9	1
AAA8623	5	Strontium-90	0.50	PCI/G	5.9	1
AAA8624	5	Strontium-90	1.12	PCI/G	5.9	1
AAA8625	5	Strontium-90	0.11	PCI/G	5.9	1
AAA8626	5	Strontium-90	0.37	PCI/G	5.9	1
AAA8626R	5	Strontium-90	0.28	PCI/G	5.9	1
AAA8627	5	Strontium-90	0.47	PCI/G	5.9	1
AAA8628	5	Strontium-90	0.12	PCI/G	5.9	1
AAA8629	5	Strontium-90	0.63	PCI/G	5.9	1
AAA8630	5	Strontium-90	0.29	PCI/G	5.9	1
AAA8631	5	Strontium-90	0.43	PCI/G	5.9	1
AAA8632	5	Strontium-90	0.19	PCI/G	5.9	1
AAA8633	5	Strontium-90	0.26	PCI/G	5.9	1
AAA8634	5	Strontium-90	0.23	PCI/G	5.9	1
AAA8635	5	Strontium-90	0.12	PCI/G	5.9	1
AAA8636	5	Strontium-90	0.19	PCI/G	5.9	1
AAA8637	5	Strontium-90	0.18	PCI/G	5.9	1

n/a Not applicable.

22-015(c)

Organic and Radionuclide Detects above UTL and or SAL

Multiple Grabs

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8581	3	Bis(2-ethylhexyl)phthalate	51	MG/KG	50	n/a
AAA8625	5	Cesium-137	1.604	PCI/G	4	1.4
AAA8627	5	Cesium-137	1.537	PCI/G	4	1.4
AAA8635	5	Cesium-137	1.464	PCI/G	4	1.4
AAA8581	3	Strontium-90	4.12	PCI/G	5.9	1
AAA8624	5	Strontium-90	1.12	PCI/G	5.9	1

n/a Not applicable.

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Additional Organics and Radionuclides which may be of concern

Multiple Grabs

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	Sample value times # of grabs*	SAL	UTL
AAA8633	5	Bis(2-ethylhexyl)phthalate	14	MG/KG	70	50	n/a
AAA8584	6	Cesium-137	0.802	PCI/G	4.812	4	1.4
AAA8585	6	Cesium-137	0.982	PCI/G	5.892	4	1.4
AAA8596	6	Cesium-137	0.695	PCI/G	4.17	4	1.4
AAA8597	6	Cesium-137	0.730	PCI/G	4.38	4	1.4
AAA8621	5	Cesium-137	1.231	PCI/G	6.155	4	1.4
AAA8623	5	Cesium-137	1.058	PCI/G	5.29	4	1.4
AAA8629	5	Cesium-137	1.271	PCI/G	6.355	4	1.4
AAA8633	5	Cesium-137	1.256	PCI/G	6.28	4	1.4
AAA8636	5	Cesium-137	1.373	PCI/G	6.865	4	1.4

* This column shows the worst case scenario for grab samples. Even though the reported value did not exceed the UTL or SAL, these samples may still be of concern.

22-015(c)

Metal Detects, Multiple Grabs

	Number of Grabs	silver	aluminum	arsenic	gold	barium	beryllium	calcium	cadmium
UTL---->		1.61	n/a	n/a	n/a	1143	3.31	54362	2.7
SAL---->		400	123000	11.6	n/a	5600	n/a	n/a	80
AAA8581	3	71.2	5800	168	214	60.9		1450	26.4
AAA8582	3	14.9	4930	8.3	155				4.3
AAA8594	3	36.7	8660	15.6		70.9		1630	7.3
AAA8595	3	10.7	5430	4.5					8.9
AAA8621	5		5000			52.1		1800	
AAA8622	5		4250			43.6			
AAA8623	5	4.1	4600	2.9		49.6		1160	18.9
AAA8623R	5								
AAA8624	5	11.2	5010	2.8				1390	25.3
AAA8625	5	4.9	5260	2.8		52.7		2280	6.5
AAA8626	5		4350	2.3				1280	2.8
AAA8627	5	3.1	7540	3		84.1		2880	9.3
AAA8628	5	4.1	4800	3.3				1340	4.4
AAA8629	5	2.5	5900	2.8		69.2		2630	1.4
AAA8630	5		9080	4.5		84.4		1280	3.4
AAA8630R	5	6.4	5757	2.8		42.6	0.97	1442	3.3
AAA8631	5	2.2	5880	2.6		59.3		2300	4
AAA8632	5	6.1	3910	3.2				1140	7.1
AAA8633	5	266	5080	7.2	3080	56.5		1910	45.4
AAA8634	5	5.7	3730	4					9.3
AAA8635	5	65.9	6100	17.9	27.2	65.4		2200	68.2
AAA8636	5	35.1	6120	13.3	7.1	54.2		1410	41.9
AAA8637	5	3.7	3530	3.7					7.1
AAA8583	6	11.9	5240	45.1					3.5
AAA8584	6	13.1	5660	44.4					2.8
AAA8584R	6								
AAA8585	6	12.7	5660	47.6					4.7
AAA8586	6	3	8370	3.1		66.1	1.3	1780	3.6
AAA8587	6	3.6	6300	2.6					4.3
AAA8596	6	6.6	6210	12.3					5.2
AAA8597	6	8	6320	11.5					5.8
AAA8598	6	7.4	5510	6.8					8.4
AAA8598R	6	5.4	4675	6.8		36.4	0.29	815	6.62
AAA8599	6	8.1	7130	11.4					8.7
AAA8599R	6								

n/a Not applicable.

22-015(c)
Metal Detects, Multiple Grabs

	Number of Grabs	cyanide	cobalt	chromium	copper	iron	mercury	potassium	magnesium
UTL---->		n/a	51.1	34.2	15.7	35586	0.1	6179	16147
SAL---->		1600	n/a	n/a	3000	n/a	24	n/a	n/a
AAA8581	3	3.8		996	1800	215000	1.5		
AAA8582	3			95.8	204	17800	4.3		
AAA8594	3	1.3		624	2080	25900	0.28		1430
AAA8595	3			121	401	6860		1290	
AAA8621	5			13.1	16.6	7270			
AAA8622	5			13.4	30.1	5540			
AAA8623	5			60.7	124	8560			
AAA8623R	5								
AAA8624	5			80.6	324	6750			
AAA8625	5			29.6	203	7220			
AAA8626	5			21.5	40.2	7050			
AAA8627	5			35.9	72.8	7660		1380	1450
AAA8628	5			31	32.6	6380			
AAA8629	5			15.4	11.8	6730		1110	1060
AAA8630	5			27.7	28.6	9600		1620	2320
AAA8630R	5		3.3	28.2	34.8	10306		771	1017
AAA8631	5			11.2	8.8	6970		1070	1100
AAA8632	5			23.2	11.6	6040			
AAA8633	5	4.2		1340	389	30600	2.6		
AAA8634	5			73.4	83.9	6180	0.28		
AAA8635	5	6.6		1700	1390	10100	0.81		
AAA8636	5	4.3		897	1350	10200	0.58		
AAA8637	5			78.9	149	7100			
AAA8583	6	1.8		583	3840	69800	0.17		
AAA8584	6	1.9		579	3730	67100	0.76		
AAA8584R	6	1.5							
AAA8585	6	2.2		569	4790	81500	0.68		
AAA8586	6			54.1	150	13600			1520
AAA8587	6			53.5	202	8850			
AAA8596	6			314	1800	20800	0.22		
AAA8597	6			355	2000	22300	0.28		
AAA8598	6	2.7		275	1520	12800	0.06		
AAA8598R	6		3	218	1135	10128	0.04	836	748
AAA8599	6	1.5		298	1350	16300	0.07		1450
AAA8599R	6	1.7							

n/a Not applicable.

22-015ic.
Metal Detects, Multiple Grabs

	Number of Grabs	manganese	sodium	nickel	lead	platinum	selenium	vanadium	zinc
UTL---->		1030	1884	26.7	39	n/a	1.7	66	101
SAL---->		11000	n/a	1600	400	n/a	400	560	24000
AAA8581	3	77.9		1080	453	193	5.7	231	222
AAA8582	3	59.6		69.2	155	22.9			46.5
AAA8594	3	124		584	242	36		37.3	103
AAA8595	3	149		144	38.4	13.5			41.2
AAA8621	5	321		26.3	10.1				33.3
AAA8622	5	368		38.7	12.8				26.5
AAA8623	5	405		222	88.6				57.4
AAA8623R	5								
AAA8624	5	348		381	20.3				78.6
AAA8625	5	308		73.8	16.7				38.3
AAA8626	5	174		40.2	8.7				38.7
AAA8627	5	246		62.6	43.9			11.5	32.7
AAA8628	5	199		51.1	11				25.3
AAA8629	5	237		21.1	27.2				40.5
AAA8630	5	206		48.5	8.1			12.2	38.2
AAA8630R	5	434	222	48.4	7.3		0.83	10.6	36.4
AAA8631	5	228		12.3	9.9				23.6
AAA8632	5	236		81.2	4.6				28.5
AAA8633	5	165		1480	672	32		43.6	126
AAA8634	5	109		91.8	53.2				26.3
AAA8635	5	132		1080	382	16.7		34.9	139
AAA8636	5	107		677	228			27.1	101
AAA8637	5	163		68.9	15.1				31.4
AAA8583	6	72.4		511	206	66.8		81.1	88.7
AAA8584	6	89		544	172	62.3		77.9	89.7
AAA8584R	6								
AAA8585	6	79.6		692	241	71.9		95.9	109
AAA8586	6	528		64.8	10.5	16.6			42.5
AAA8587	6	276		72.6	8.3				37.5
AAA8596	6	133		582	163	21.1		24.5	84.2
AAA8597	6	163		566	170	27.7		27	81.3
AAA8598	6	194		443	122	13.6		17.9	67.4
AAA8598R	6	203	185	320	123	19.4	0.94	14.4	56.6
AAA8599	6	211		616	117	18.7		20.9	90.3
AAA8599R	6								

n/a Not applicable.

-015(c)

Metal Detects above UTL and/or SAL

Multiple Grabs

	Number of Grabs	silver	arsenic	cadmium	chromium	copper	iron	mercury	nickel	lead	selenium	vanadium	zinc
UTL---->		1.61	n/a	2.7	34.2	15.7	35586	0.1	26.7	39	1.7	66	101
SAL---->		400	11.6	80	n/a	3000	n/a	24	1600	400	400	560	24000
AAA8581	3	71.2	168	26.4	996	1800	215000	1.5	1080	453	5.7	231	222
AAA8582	3	14.9		4.3	95.8	204		4.3	69.2	155			
AAA8594	3	36.7	15.6	7.3	624	2080		0.28	584	242			103
AAA8595	3	10.7		8.9	121	401			144				
AAA8621	5					16.6							
AAA8622	5					30.1			38.7				
AAA8623	5	4.1		18.9	60.7	124			222	88.6			
AAA8624	5	11.2		25.3	80.6	324			381				
AAA8625	5	4.9		6.5		203			73.8				
AAA8626	5			2.8		40.2			40.2				
AAA8627	5	3.1		9.3	35.9	72.8			62.6	43.9			
AAA8628	5	4.1		4.4		32.6			51.1				
AAA8629	5	2.5											
AAA8630	5			3.4		28.6			48.5				
AAA8630R	5	6.4		3.3		34.8			48.4				
AAA8631	5	2.2		4									
AAA8632	5	6.1		7.1					81.2				
AAA8633	5	266		45.4	1340	389		2.6	1480	672			126
AAA8634	5	5.7		9.3	73.4	83.9		0.28	91.8	53.2			
AAA8635	5	65.9	17.9	68.2	1700	1390		0.81	1080	382			139
AAA8636	5	35.1	13.3	41.9	897	1350		0.58	677	228			101
AAA8637	5	3.7		7.1	78.9	149			68.9				
AAA8583	6	11.9	45.1	3.5	583	3840	69800	0.17	511	206		81.1	
AAA8584	6	13.1	44.4	2.8	579	3730	67100	0.76	544	172		77.9	
AAA8585	6	12.7	47.6	4.7	569	4790	81500	0.68	692	241		95.9	109
AAA8586	6	3		3.6	54.1	150			64.8				
AAA8587	6	3.6		4.3	53.5	202			72.6				
AAA8596	6	6.6	12.3	5.2	314	1800		0.22	582	163			
AAA8597	6	8		5.8	355	2000		0.28	566	170			
AAA8598	6	7.4		8.4	275	1520			443	122			
AAA8598R	6	5.4		6.62	218	1135			320	123			
AAA8599	6	8.1		8.7	298	1350			616	117			

n/a Not applicable.

22-015-c.
Additional Metal Detects which may be of concern
Multiple Grabs

	Number of Grabs	silver	silver times # of grabs*	cadmium	cadmium times # of grabs*	copper	copper times # of grabs*	nickel	nickel times # of grabs*	lead	lead times # of grabs*	vanadium	vanadium times # of grabs*
UTL---->		1 61		2 7		15 7		26 7		39		66	
SAL---->		400		80		3000		1600		400		560	
AAA8581	3					1800	5400	1080	3240			231	693
AAA8582	3									155	465		
AAA8594	3					2080	6240	584	1752	242	1210		
AAA8623	5			18.9	94 5					88 6	443		
AAA8624	5			25.3	126 5			381	1905				
AAA8633	5	266	1330	45.4	227			1480	7400				
AAA8635	5			68 2	341	1390	6950	1080	5400	382	1910		
AAA8636	5			41 9	209 5	1350	6750	677	3385	228	1368		
AAA8583	6							511	3066	206	1236		
AAA8584	6							544	3264	172	1032		
AAA8585	6							692	4152	241	1446	95 9	575 4
AAA8596	6					1800	10800	582	3492	163	978		
AAA8597	6					2000	12000	566	3396	170	1020		
AAA8598	6					1520	9120	443	2658	122	732		
AAA8598R	6					1135	6810	320	1920	123	738		
AAA8599	6					1350	8100	616	3696	117	0		

* This column shows the worst case scenario for grab samples Even though the reported value did not exceed the UTL or SAL, these samples may still be of concern.

22-015(c) Background samples
Radionuclide results

		SAL	4	5.9	86	18	59
		UTL	1.4	1	2.03	0.088	1.9
Location ID	Depth (ft.)	Sample ID	Cesium-137	Strontium-90	Uranium-234	Uranium-235	Uranium-238
06-9901	0 - 0.5	AAB7971	0.325	1.92	0.754	0.032	0.836
	0 - 0.5	AAB7971D	n/a	0.7	0.743	0.029	0.827
	2 - 3	AAB7972	0.044	-0.45	0.68	0.027	0.691
	2 - 3	AAB7972D	n/a	n/a	0.678	0.034	0.775
06-9902	0 - 0.5	AAB7973	0.344	0.68	0.655	0.038	0.734
	0 - 1	AAB7974	-0.01	-0.07	0.493	0.023	0.502
06-9903	0 - 0.5	AAB7975	0.947	1.21	0.687	0.027	0.831
	0 - 0.5	AAB7976	0.415	0.34	0.658	0.02	0.754
	0 - 1	AAB7977	0.022	-0.08	0.372	0.025	0.363
22-9904	0 - 0.5	AAB7978	0.446	0.09	0.601	0.029	0.635
	0 - 0.5	AAB7978D	n/a	0.38	n/a	n/a	n/a
	2 - 3	AAB7979	-0.009	0.03	0.527	0.032	0.527
22-9905	0 - 0.5	AAB7980	1.151	1.4	0.732	0.034	0.923
	0 - 1	AAB7981	0.019	0.21	0.5	0.023	0.464
22-9906	0 - 0.5	AAB7982	1.303	1	0.775	0.036	0.82
	0 - 0.5	AAB7983	1.052	0.3	0.736	0.034	0.791
	0.17 - 1.17	AAB7984	0.021	-0.08	0.561	0.038	0.489
	0.17 - 1.17	AAB7984D	0.027	n/a	n/a	n/a	n/a
n/a Not applicable.							
D= Duplicate.							

22-015(c) Background samples
Inorganic results

Location ID	Depth (ft)	Sample ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
		SAL	8N/A	32	n/a	5000	n/a	80	n/a	400	n/a	3000	1600	n/a	400	n/a	11000	24	1600	n/a	400	400	n/a	64	560	24000
		UTL	8N/A	25	116	1143	331	27	54362	342	511	157	n/a	35586	39	16147	1030	01	267	6179	17	161	1884	09	66	101
[illegible]	0-0.5	AAB7971	4340	45	14	42.2	0.64	0.06	916	3.5	3	26	0.4	5210	9.9	735	182	0.02	15	1000	0.56	0.79	91.7	0.28	99	142
	0-0.5	AAB7971D	4467	45	27	42.0	0.66	0.36	923	3	3	23	0	5247	13.2	753	197	0.02	21	1039	0.56	0.79	81.8	0.28	98	134
	2-3	AAB7972	11400	47	13	37.3	1.2	0.38	4938	7.2	17	41	0.42	7900	11	2150	114	0.02	58	1850	0.56	0.81	338	0.29	95	217
[illegible]	0-0.5	AAB7973	5980	46	16	77.7	0.47	0.39	1440	19	41	2	0.41	7000	11.4	821	269	0.02	17	1260	0.55	0.82	201	0.29	113	151
	0-1	AAB7974	4240	46	25	76.2	0.58	0.37	890	31	0.76	12	0.41	1380	5	349	23.2	0.02	13	920	0.54	0.81	183	0.28	26	37
	0-1	AAB7974D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
[illegible]	0-0.5	AAB7975	7660	47	28	78.5	0.61	0.38	2760	48	5	29	42	6260	12.8	1180	272	0.02	23	1490	0.56	0.83	177	0.29	96	171
	0-0.5	AAB7976	7180	48	27	115	0.49	0.39	3040	44	23	31	85	5410	9.5	1280	186	0.02	22	1430	0.57	0.84	197	0.3	91	18
	0-1	AAB7977	4079	44	21	51.3	0.52	0.36	617	36	0.74	12	0.39	1680	23	475	17	0.02	12	874	0.53	0.78	277	0.27	36	49
[illegible]	0-0.5	AAB7978	6540	5	21	69.5	0.53	0.41	1720	39	53	33	0.45	6660	10.6	900	471	0.02	22	1430	0.6	0.89	210	0.31	97	194
	2-3	AAB7979	4180	49	11	47	0.84	0.4	1510	46	16	24	0.44	6870	35	1140	280	0.02	54	1090	0.59	0.87	352	0.31	66	203
[illegible]	0-0.5	AAB7980	5740	47	13	50.7	0.45	0.38	1050	29	17	27	0.42	5700	7	800	216	0.02	22	1210	0.55	0.82	183	0.29	78	146
	0-1	AAB7981	6420	44	13	30.8	0.45	0.36	843	41	15	22	79	7160	4.5	711	170	0.02	2	918	0.53	0.78	328	0.27	71	161
[illegible]	0-0.5	AAB7982	6890	46	0	91.8	0.68	0.86	2840	41	24	53	0.41	7830	20.8	1310	155	0.03	33	1350	0.55	0.81	149	0.28	93	302
	0-0.5	AAB7983	6230	45	22	89.5	0.6	1.1	1340	44	24	59	0.4	7130	19.5	1340	376	0.03	32	1330	0.54	0.8	140	0.28	85	301
	0.17-1.17	AAB7984	3440	44	0.46	24.4	0.92	0.35	800	18	0.71	18	0.10	4960	15	588	226	0.02	16	425	0.52	0.77	104	0.27	3	212

n/a Not applicable
D Duplicate

22-015(c) Background samples
Organic results

		SAL	4800	n/a	120	24000	1	0.1	1
		UTL	3.4	1.1	n/a	4.29	12.4	12.1	12.2
Location ID	Depth (ft.)	Sample ID	Acenaphthene	Acenaphthylene	Aniline	Anthracene	Benzo[a]anthracene	Benzo[a]pyrene	Benzo[b]fluoranthene
06 9901	0 - 0.5	AAB7971	<350	<350	<350	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380	<380	<380	<380
22 9905	0 - 0.5	AAB7980	<400	<400	<400	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

Location ID	Depth (ft.)	Sample ID	Benzo[g,h,i]perylene	Benzo[k]fluoranthene	Benzoic acid	Benzyl alcohol	Bis(2-chloroethoxy)methane
		SAL	n/a	1	320000	24000	n/a
		UTL	5.9	19.4	n/a	n/a	n/a
06-9901	0 - 0.5	AAB7971	<350	<350	<3500	<1700	<350
	2 - 3	AAB7972	<350	<350	<3500	<1700	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<3700	<1800	<370
	0 - 1	AAB7974	<360	<360	<3600	<1800	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<3400	<1700	<340
	0 - 0.5	AAB7976	<370	<370	<3700	<1800	<370
	0 - 1	AAB7977	<350	<350	<3500	<1700	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<3900	<1900	<390
	2 - 3	AAB7979	<380	<380	<3800	<1900	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<4000	<1900	<400
	0 - 1	AAB7981	<340	<340	<3400	<1700	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<3600	<1800	<360
	0 - 0.5	AAB7983	<350	<350	<3500	<1700	<350
	0.17 - 1.17	AAB7984	<340	<340	<3400	<1700	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	0.12	100	50	n/a
		UTL	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Bis(2-chloroethyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-ethylhexyl)phthalate	Bromophenylphenyl ether [4-]
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350
	0 17 - 1.17	AAB7984	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	16000	n/a	320	6400	400
		UTL	n/a	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Butyl benzyl phthalate	Chloro-3-methylphenol [4-]	Chloroaniline [4-]	Chloronaphthalene [2-]	Chlorophenol [o-]
06-9901	0 - 0.5	AAB7971	<350	<710	<1700	<350	<350
	2 - 3	AAB7972	<350	<710	<1700	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<730	<1800	<370	<370
	0 - 1	AAB7974	<360	<730	<1800	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<690	<1700	<340	<340
	0 - 0.5	AAB7976	<370	<740	<1800	<370	<370
	0 - 1	AAB7977	<350	<690	<1700	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<780	<1900	<390	<390
	2 - 3	AAB7979	<380	<770	<1900	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<800	<1900	<400	<400
	0 - 1	AAB7981	<340	<690	<1700	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<720	<1800	<360	<360
	0 - 0.5	AAB7983	<350	<710	<1700	<350	<350
	0.17 - 1.17	AAB7984	<340	<690	<1700	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	n/a	96	8000	1600	0.1
		UTL	n/a	19.5	n/a	n/a	2.9
Location ID	Depth (ft.)	Sample ID	Chlorophenylphenyl ether [4-]	Chrysene	Di-n-butyl phthalate	Di-n-octyl phthalate	Dibenzo[a,h]anthracene
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

Location ID	Depth (ft.)	Sample ID	Dibenzofuran	Dichlorobenzene (1,2) [o-]	Dichlorobenzene (1,3) [m-]	Dichlorobenzene (1,4) [p-]
		SAL	n/a	1600	7200	29
		UTL	n/a	n/a	n/a	n/a
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340
22-9906	0 - 0 5	AAB7982	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	1.6	240	64000	800000	1600
		UTL	n/a	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Dichlorobenzidine [3,3'-]	Dichlorophenol [2,4-]	Diethyl phthalate	Dimethyl phthalate	Dimethylphenol [2,4-]
06-9901	0 - 0.5	AAB7971	<710	<350	<350	<350	<350
	2 - 3	AAB7972	<710	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<730	<370	<370	<370	<370
	0 - 1	AAB7974	<730	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<690	<340	<340	<340	<340
	0 - 0.5	AAB7976	<740	<370	<370	<370	<370
	0 - 1	AAB7977	<690	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<780	<390	<390	<390	<390
	2 - 3	AAB7979	<770	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<800	<400	<400	<400	<400
	0 - 1	AAB7981	<690	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<720	<360	<360	<360	<360
	0 - 0.5	AAB7983	<710	<350	<350	<350	<350
	0 17 - 1.17	AAB7984	<690	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	160	1	1	3200	3200	0.44
		UTL	n/a	n/a	n/a	32.5	3.3	n/a
Location ID	Depth (ft.)	Sample ID	Dinitrophenol [2,4-]	Dinitrotoluene [2,4-]	Dinitrotoluene [2,6-]	Fluoranthene	Fluorene	Hexachlorobenzene
06-9901	0 - 0.5	AAB7971	<1700	<350	<350	<350	<350	<350
	2 - 3	AAB7972	<1700	<350	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<1800	<370	<370	<370	<370	<370
	0 - 1	AAB7974	<1800	<360	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<1700	<340	<340	<340	<340	<340
	0 - 0.5	AAB7976	<1800	<370	<370	<370	<370	<370
	0 - 1	AAB7977	<1700	<350	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<1900	<390	<390	<390	<390	<390
	2 - 3	AAB7979	<1900	<380	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<1900	<400	<400	<400	<400	<400
	0 - 1	AAB7981	<1700	<340	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<1800	<360	<360	<360	<360	<360
	0 - 0.5	AAB7983	<1700	<350	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<1700	<340	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	90	560	80	1	7400
		UTL	n/a	n/a	n/a	6	n/a
Location ID	Depth (ft.)	Sample ID	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno[1,2,3-cd]pyrene	Isophorone
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

Location ID	Depth (ft.)	Sample ID	Methyl-4,6-dinitrophenol [2-]	Methylnaphthalene [2-]	Methylphenol [2-]	Methylphenol [4-]	Naphthalene	Nitroaniline [2-]
		SAL	n/a	n/a	n/a	400	3200	n/a
		UTL	n/a	0 64	n/a	n/a	0.66	n/a
06-9901	0 - 0.5	AAB7971	<1700	<350	<350	<350	<350	<1700
	2 - 3	AAB7972	<1700	<350	<350	<350	<350	<1700
06-9902	0 - 0.5	AAB7973	<1800	<370	<370	<370	<370	<1800
	0 - 1	AAB7974	<1800	<360	<360	<360	<360	<1800
06-9903	0 - 0 5	AAB7975	<1700	<340	<340	<340	<340	<1700
	0 - 0.5	AAB7976	<1800	<370	<370	<370	<370	<1800
	0 - 1	AAB7977	<1700	<350	<350	<350	<350	<1700
22 9904	0 - 0.5	AAB7978	<1900	<390	<390	<390	<390	<1900
	2 - 3	AAB7979	<1900	<380	<380	<380	<380	<1900
22-9905	0 - 0.5	AAB7980	<1900	<400	<400	<400	<400	<1900
	0 - 1	AAB7981	<1700	<340	<340	<340	<340	<1700
22-9906	0 - 0 5	AAB7982	<1800	<360	<360	<360	<360	<1800
	0 - 0.5	AAB7983	<1700	<350	<350	<350	<350	<1700
	0 17 - 1.17	AAB7984	<1700	<340	<340	<340	<340	<1700

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	240	240	5.3	n/a	5000	0.1
		UTL	n/a	n/a	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Nitroaniline [3-]	Nitroaniline [4-]	Nitrobenzene	Nitrophenol [2-]	Nitrophenol [4-]	Nitrosodi-n-propylamine [N-]
06-9901	0 - 0.5	AAB7971	<1700	<710	<350	<350	<1700	<350
	2 - 3	AAB7972	<1700	<710	<350	<350	<1700	<350
06-9902	0 - 0.5	AAB7973	<1800	<730	<370	<370	<1800	<370
	0 - 1	AAB7974	<1800	<730	<360	<360	<1800	<360
06-9903	0 - 0.5	AAB7975	<1700	<690	<340	<340	<1700	<340
	0 - 0.5	AAB7976	<1800	<740	<370	<370	<1800	<370
	0 - 1	AAB7977	<1700	<690	<350	<350	<1700	<350
22-9904	0 - 0.5	AAB7978	<1900	<780	<390	<390	<1900	<390
	2 - 3	AAB7979	<1900	<770	<380	<380	<1900	<380
22-9905	0 - 0.5	AAB7980	<1900	<800	<400	<400	<1900	<400
	0 - 1	AAB7981	<1700	<690	<340	<340	<1700	<340
22-9906	0 - 0.5	AAB7982	<1800	<720	<360	<360	<1800	<360
	0 - 0.5	AAB7983	<1700	<710	<350	<350	<1700	<350
	0.17 - 1.17	AAB7984	<1700	<690	<340	<340	<1700	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	0.014	140	5.8	n/a	48000	2400
		UTL	n/a	n/a	n/a	24.2	n/a	12.8
Location ID	Depth (ft.)	Sample ID	Nitrosodimethylamine [N-]	Nitrosodiphenylamine [N-]	Pentachlorophenol	Phenanthrene	Phenol	Pyrene
06-9901	0 - 0.5	AAB7971	<350	<350	<1700	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<1700	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<1800	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<1800	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<1700	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<1800	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<1700	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<1900	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<1900	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<1900	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<1700	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<1800	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<1700	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<1700	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	160	8000	64	n/a
		UTL	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Trichlorobenzene [1,2,4-]	Trichlorophenol [2,4,5-]	Trichlorophenol [2,4,6-]	Stigmast-5-en-3-ol [3,beta,] (TI)
06-9901	0 - 0.5	AAB7971	<350	<1700	<350	n/a
	2 - 3	AAB7972	<350	<1700	<350	n/a
06-9902	0 - 0.5	AAB7973	<370	<1800	<370	2200
	0 - 1	AAB7974	<360	<1800	<360	n/a
06-9903	0 - 0.5	AAB7975	<340	<1700	<340	n/a
	0 - 0.5	AAB7976	<370	<1800	<370	n/a
	0 - 1	AAB7977	<350	<1700	<350	n/a
22-9904	0 - 0.5	AAB7978	<390	<1900	<390	n/a
	2 - 3	AAB7979	<380	<1900	<380	n/a
22-9905	0 - 0.5	AAB7980	<400	<1900	<400	n/a
	0 - 1	AAB7981	<340	<1700	<340	n/a
22-9906	0 - 0.5	AAB7982	<360	<1800	<360	6500
	0 - 0.5	AAB7983	<350	<1700	<350	n/a
	0.17 - 1.17	AAB7984	<340	<1700	<340	n/a

n/a Not applicable.

22-015(c) Background samples
Organic results

Location ID	Depth (ft.)	Sample ID	Unknown Alcohol (TI)	Unknown organic acid (TI)	Unknown Polynuclear Aromatic Hydrocarbon (TI)
		SAL	n/a	n/a	n/a
		UTL	n/a	n/a	n/a
06-9901	0 - 0.5	AAB7971	n/a	n/a	n/a
	2 - 3	AAB7972	n/a	n/a	n/a
06-9902	0 - 0.5	AAB7973	n/a	3900	420
	0 - 1	AAB7974	n/a	n/a	n/a
06-9903	0 - 0.5	AAB7975	n/a	n/a	910
	0 - 0.5	AAB7976	500	n/a	920
	0 - 1	AAB7977	n/a	n/a	n/a
22-9904	0 - 0.5	AAB7978	n/a	n/a	n/a
	2 - 3	AAB7979	n/a	n/a	n/a
22-9905	0 - 0.5	AAB7980	n/a	n/a	n/a
	0 - 1	AAB7981	n/a	n/a	1100
22-9906	0 - 0 5	AAB7982	n/a	690	2500
	0 - 0.5	AAB7983	n/a	n/a	980
	0.17 - 1.17	AAB7984	n/a	n/a	n/a

n/a Not applicable.

ANNEX 6.10

SUMMARY OF COMPOSITE AND GRAB SAMPLE LOCATIONS

SUMMARY OF COMPOSITE AND GRAB SAMPLE LOCATIONS FOR SWMU 22-015(c)

Outfall Reach	Location ID	Sample ID	Grab Sample	Composite Sample (# of Grabs)	Sample Depth
S1	2001 - 2003	AAA8581		3	0-6"
S1	2001 - 2003	AAA8582		3	Tuff
S1	2004 - 2009	AAA8583		6	0-6"
S1	2004 - 2009	AAA8584		6	0-6"
S1	2004 - 2009	AAA8585		6 (FD)*	0-6"
S1	2004 - 2009	AAA8586		6	Tuff
S1	2004 - 2009	AAA8587		6	Tuff
Pond	2004	AAA8588	1		2-6"
Pond	2004	AAA8589	1		8"/Tuff
Pond	2007	AAA8590	1		2-6"
Pond	2007	AAA8591	1		8"/Tuff
Pond	2008	AAA8592	1		2-6"
Pond	2008	AAA8593	1		8"/Tuff
S2	2010 - 2012	AAA8594		3	0-6"
S2	2010 - 2012	AAA8595		3	Tuff
S2	2013 - 2018	AAA8596		6	0-6"
S2	2013 - 2018	AAA8597		6	0-6"
S2	2013 - 2018	AAA8598		6	Tuff
S2	2013 - 2018	AAA8599		6	Tuff
S3	2019	AAA8600	1		0-6"
S3	2019	AAA8601	1		Tuff
S3	2020	AAA8602	1		0-6"
S3	2020	AAA8603	1		Tuff
S3	2021	AAA8604	1		0-6"
S3	2021	AAA8605	1		Tuff
S3	2022	AAA8606	1		0-6"
S3	2022	AAA8607	1		Tuff
S3	2023	AAA8608	1		0-6"
S3	2023	AAA8609	1		Tuff
S3	2024	AAA8610	1		0-6"
S3	2024	AAA8611	1		Tuff
S3	2025	AAA8612	1		0-6"
S3	2025	AAA8613	1		Tuff
S3	2026	AAA8614	1		0-6"
S3	2026	AAA8615	1		Tuff
S3	2027	AAA8616	1		0-6"
S3	2027	AAA8617	1		Tuff
S3	2028	AAA8618	1		0-6"
S3	2028	AAA8619	1 (FD)*		0-6"
S3	2028	AAA8620	1		Tuff

SUMMARY OF COMPOSITE AND GRAB SAMPLE LOCATIONS FOR SWMU 22-015(c)

U4	2029 - 2033	AAA8621		5	0-6"
U4	2029 - 2033	AAA8622		5	Tuff
U4	2034 - 2038	AAA8623		5	9-6"
U4	2034 - 2038	AAA8624		5	Tuff
U5	2039 - 2043	AAA8625		5	0-6"
U5	2039 - 2043	AAA8626		5	Tuff
U5	2044 - 2048	AAA8627		5	0-6"
U5	2044 - 2048	AAA8628		5	Tuff
U2	2049 - 2053	AAA8629		5	0-6"
U2	2049 - 2053	AAA8630		5	Tuff
U2	2054 - 2058	AAA8631		5	0-6"
U2	2054 - 2058	AAA8632		5	Tuff
U1	2059 - 2063	AAA8633		5	0-6"
U1	2059 - 2063	AAA8634		5	Tuff
U1	2064 - 2068	AAA8635		5	0-6"
U1	2064 - 2068	AAA8636		5 (FD)*	0-6"
U1	2064 - 2068	AAA8637		5	Tuff

*(FD) - Field Duplicate

SUMMARY OF COMPOSITE AND GRAB SAMPLES COLLECTED FROM SWMU 22-015(c)

Outfall Trench	Description	Composite Samples	Grab Samples
S1	Stained area within the channel	2	0
S1	Within the pond area	4	6
U1	Unstained areas on channel banks	4	0
	Unstained areas on channel banks	4	0
S2	Stained areas within the channel	6	0
U3	Unstained areas on channel bank	4	0
S3	Stained areas within the channel down the hillside	0	19
U4	Unstained areas on channel bank	4	0

Note - This table does not include duplicate QA/QC samples.

SUMMARY OF AREAS WHERE METALS IN SOIL EXCEEDED SALs (cont.)

Element	SAL	S1 Channel						S2 Channel				S3 Channel			
		Stained Channel		Pond Area		Unstained Bank		Stained Channel		Unstained Bank		Stained Channel		Unstained Bank	
		Soil	Tuff	Soil	Tuff	Soil	Tuff	Soil	Tuff	Soil	Tuff	Soil	Tuff	Soil	Tuff
Ag	400					X									
As	11.6	X		X		X		X							
Cd	80														
Cr (Note 1)	34	X	X	X	X	X	X	X	X	X				X	X
Cu	3000	X		X		X									
Fe	N/A														
Ni	1600	X				X									
Pb	400	X				X		X							
Se	400														
V	560														
Zn	24000														
Cs-137	4														
Sr-90	5.9	X													
Cn	1600														

Notes: 1) The chromium value shown is the LANL background value.

ANNEX 6.11

TCLP AND HCL EXTRACTION RESULTS

REPORT NUMBER: 34579

********** CST ANALYTICAL REPORT **********

Prepared by: M. KOZUBAL on 15-May-1995

REQUEST NUMBER: 21925 MATRIX: SE ANALYST: OES PROGRAM CODE: MA51

OWNER: Richard Romero GROUP: ESH-19 MAIL-STOP: K490 PHONE: 5-4116

NOTEBOOK: EN90126 PAGE: 20

CUSTOMER SAMPLES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
22-2001	95.08661	AG	ICPES	< 0.01		MG/L	5/15/95	
22-2001	95.08661	BA	ICPES	0.89	0.09	MG/L	5/15/95	
22-2001	95.08661	CD	ICPES	0.4	0.04	MG/L	5/15/95	
22-2001	95.08661	CR	ICPES	0.038	0.018	MG/L	5/15/95	
22-2001	95.08661	PB	ICPES	< 0.03		MG/L	5/15/95	
22-2008	95.08662	AG	ICPES	< 0.01		MG/L	5/15/95	
22-2008	95.08662	BA	ICPES	0.84	0.08	MG/L	5/15/95	
22-2008	95.08662	CD	ICPES	0.039	0.005	MG/L	5/15/95	
22-2008	95.08662	CR	ICPES	0.041	0.004	MG/L	5/15/95	
22-2008	95.08662	PB	ICPES	< 0.03		MG/L	5/15/95	
22-2024	95.08663	AG	ICPES	< 0.01		MG/L	5/15/95	
22-2024	95.08663	BA	ICPES	1.4	0.1	MG/L	5/15/95	
22-2024	95.08663	CD	ICPES	0.81	0.08	MG/L	5/15/95	
22-2024	95.08663	CR	ICPES	0.047	0.031	MG/L	5/15/95	
22-2024	95.08663	PB	ICPES	< 0.03		MG/L	5/15/95	

CUSTOMER SAMPLE DUPLICATES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
22-2024	95.08663	AG	ICPES	< 0.01		MG/L	5/15/95	
22-2024	95.08663	BA	ICPES	1.4	0.1	MG/L	5/15/95	
22-2024	95.08663	CD	ICPES	0.8	0.08	MG/L	5/15/95	
22-2024	95.08663	CR	ICPES	0.049	0.005	MG/L	5/15/95	
22-2024	95.08663	PB	ICPES	< 0.03		MG/L	5/15/95	

****

REPORT NUMBER: 34579 (continued)

********** CST QUALITY ASSURANCE REPORT **********

Prepared by: M. KOZUBAL on 15-May-1995

REQUEST NUMBER: 21925 MATRIX: SE ANALYST: OES PROGRAM CODE: MA51

OWNER: Richard Romero GROUP: ESH-19 MAIL-STOP: K490 PHONE: 5-4116

NOTEBOOK: BW90126 PAGE: 20

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QC SAMPLES RUN WITH THIS BATCH

SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT
00.29417	BA	440.	44.	UG/L	500.	22.	5/15/95	UNDER CONTROL
00.29417	CD	430.	43.	UG/L	498.	21.	5/15/95	UNDER CONTROL
00.29417	CR	450.	45.	UG/L	499.	21.	5/15/95	UNDER CONTROL

SUMMARY OF CONTROL STATUS OF BLIND QC SAMPLES RUN WITH THIS BATCH

There were no blind Quality Control materials run with the samples reported above for one of the following reasons:

___ Only qualitative data requested

X Only Open (non-blind) QC samples run with this sample batch.

___ No QC samples run with this sample batch.

___ No QC samples for this constituent and matrix type available within CST

REPORT NUMBER: 34579

Analyst	Reviewer	Team Leader	QA Officer
5-15-95	5-15-95	5/17/95	5/17/95
Date	Date	Date	Date

No Sample Discrepancies Noted by Sample Management Section

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1992,' LA-12790-MS, Vol. I, pp. 19-20.

REPORT NUMBER: 34680

********** CST ANALYTICAL REPORT **********

Prepared by: BRL on 17-May-1995

REQUEST NUMBER: 21925 MATRIX: SE ANALYST: AAS PROGRAM CODE: NA51

OWNER: Richard Romero GROUP: ESH-19 MAIL-STOP: K490 PHONE: 5-4116

NOTEBOOK: PAGE:

CUSTOMER SAMPLES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
22-2001	95.08661	AS	ETVAA	< 3.		UG/L	5/15/95	
22-2001	95.08661	HG	CVAA	2.	0.2	UG/L	5/17/95	
22-2001	95.08661	SE	ETVAA	< 2.		UG/L	5/15/95	
22-2008	95.08662	AS	ETVAA	< 3.		UG/L	5/15/95	
22-2008	95.08662	HG	CVAA	< 0.2		UG/L	5/17/95	
22-2008	95.08662	SE	ETVAA	< 2.		UG/L	5/15/95	
22-2024	95.08663	AS	ETVAA	< 3.		UG/L	5/15/95	
22-2024	95.08663	HG	CVAA	< 0.2		UG/L	5/17/95	
22-2024	95.08663	SE	ETVAA	< 2.		UG/L	5/15/95	

CUSTOMER SAMPLE DUPLICATES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
22-2024	95.08663	AS	ETVAA	< 3.		UG/L	5/15/95	
22-2024	95.08663	SE	ETVAA	< 2.		UG/L	5/15/95	

MATRIX SPIKES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT
22-2024	95.08663	AS	ETVAA	10.	13.	UG/L	5/15/95	
22-2024	95.08663	SE	ETVAA	10.	9.	UG/L	5/15/95	

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REPORT NUMBER: 34680 (continued)

********** CST QUALITY ASSURANCE REPORT *********

Prepared by: BRL on 17-May-1995

REQUEST NUMBER: 21925 MATRIX: SE ANALYST: AAS PROGRAM CODE: MA51

OWNER: Richard Romero GROUP: ESH-19 MAIL-STOP: K490 PHONE: 5-4116

NOTEBOOK: PAGE:

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QC SAMPLES RUN WITH THIS BATCH

SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT
00.29417	AS	24.	5.	UG/L	25.	1.	5/15/95	UNDER CONTROL
00.29417	SE	26.	5.	UG/L	25.	1.	5/15/95	UNDER CONTROL
00.30468	HG	4.	0.4	UG/L	5.04	1.05	5/17/95	UNDER CONTROL

SUMMARY OF CONTROL STATUS OF BLIND QC SAMPLES RUN WITH THIS BATCH

There were no blind Quality Control materials run with the samples reported above for one of the following reasons:

___ Only qualitative data requested

___ Only Open (non-blind) QC samples run with this sample batch.

___ No QC samples run with this sample batch.

___ No QC samples for this constituent and matrix type available within CST

REPORT NUMBER: 34680

Analyst	Reviewer	Team Leader	QA Officer
brl	brl	[illegible]	mag
5/17/95	5/17/95	5/17/95	5/17/95
Date	Date	Date	Date

No Sample Discrepancies Noted by Sample Management Section

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1992,' LA-12790-MS, Vol. I, pp. 19-20.

****

Sevenson Environmental Services, Inc.

May 25, 1995

Mr. Seth Gifford
ERM
3250 Trinity Dr.
Los Alamos, NM 87544

RE: Analytical/Treatability Work for ERM/Golder Project No.: TA-22-015(c)

Dear Mr. Gifford:

Sevenson Environmental Services, Inc. is in the process of completing various analytical test methods on the sample received by our treatability and analytical testing laboratory, Waste Stream Technology, Inc. Per your requests, the following work was implemented:

1) characterize soil sample for total and TCLP (Method 1311) RCRA metals;

2) conduct a shortened bioavailability extraction method on the soil sample for the RCRA metals;

3) evaluate data for purposes of performing MAECTITE® treatability study to reduce leachability and bioavailability of RCRA metals; and

4) analyze the sample and its TCLP extract fluid for total hexavalent chromium.

The analytical data for RCRA metals as both totals in soil and for RCRA toxicity in TCLP extract suggest that the sample of material received at WST was not hazardous under the characteristic rule of the RCRA regulations. Therefore, Sevenson did not perform any MAECTITE® chemical treatment studies on the material.

Sevenson discussed the results with ERM on May 16, 1995 over the telephone. It was determined that examination of the bioavailability of the metals may have significant impact to potential risk assessment activities applicable to a possible course of remedial action. Sevenson indicated that a shortened version of an in vitro screening test to evaluate heavy metal

bioavailability (Ruby, et. al., 1993 - attached) could be performed. The test basically replicated the TCLP extraction analysis (Method 1311), however, the extraction fluid utilized was a hydrochloric acid (HCl) solution at a pH of 2.0 S.U. similar to gastric fluids in the stomach. Agitation time was set for 2 hours, with the pH of the extraction fluid maintained at a pH of 2.0 with periodic additions of concentrated HCl. The neutralization step replicative of the human digestive system (i.e., carbonate buffering pre-small intestine bolus entrance) was not attempted.

If it were, reduced bioavailability of the metals would have resulted due to the relative insolubility of metal:carbonate complexes at a neutral pH. The first step as executed, therefore, should have resulted in a "worst-case" representation.

Based upon the RCRA-list heavy metal concentrations in the HCl extract, the data suggests that less than one-half of one percent (<0.5%) of the total lead and even less for total chromium (<0.03 %) present in the soil is susceptible to disassociation in simulated conditions of the stomach.

On May 24, 1995 Sevenson was notified by ERM/Golder that the state of New Mexico had stipulated that the site's remedial action level for chromium was based upon a total hexavalent chromium in soil, and not total chromium (trivalent + hexavalent valence forms). Sevenson informed ERM/Golder that we did have a recently developed draft analytical method (attached) for Cr (VI) in soil that eliminated the potential of chromium oxidation/reduction [Cr (III) to and from Cr (VI)] during sample handling and preparation. Sevenson also informed ERM/Golder that the TCLP extraction fluid (from Method 1311) was not an appropriate matrix to examine the concentration of Cr (VI). During the method's sample preparation, air could be introduced, or reducing conditions created that would affect the oxidation state of chromium. On May 25, 1995 the attached Cr (VI) method was initiated. Those results will be forwarded upon their receipt.

Finally, all analytical data attached to this letter are in preliminary form and have not been QA/QC validated. However, based upon the available data, the soil, if it were to become a waste at the time of excavation, would not be RCRA hazardous (assuming the sample was representative of worst-case contamination levels). Although heavy metals are present, primarily chromium and lead, no RCRA list metal species appear to be overly bioaccessible as screened when compared to the total metal concentrations in the sample.

I have enclosed copies of two (2) papers relative to bioavailability of lead in soil. They seem to have sparked an interest in the arena of Risk Assessment of heavy metals. The science and precepts presented in the literature closely support MAECTITE® chemical treatment process end-

products as developed in the mid-1980's and patented more recently.

Should you have any questions, please do not hesitate to call. I trust this information will be useful for your site.

Sincerely,
Sevenson Environmental Services, Inc.

Karl W. Yost
Director of Treatment Services

enclosures

cc: B. Russell
J. Williams
File

SAMPLE PROGRESS REPORT

Wastestream Technology
Date: 05-15-1995 Time: 16:51:28

Sample I.D. WS18031
Status: Analyses incomplete
Expiration Date: 05/26/95
Group Number: 9505-087
Client code: LOSALAMO
Updated:
SamplDesc: INITIAL

Date collected: 05/12/95
Date submitted: 05/12/95
Due date: 05/26/95
Specification checking: off
Site Des:

Size: 14300G

Analysis	Result	Unit	Finished	Anl
Lead in Solids by ICP	237.045	mg/Kg	05/15/95	AM
Cadmium in solids by ICP	14.651	mg/Kg	05/15/95	AM
Barium in Solids by ICP	30.382	mg/Kg	05/15/95	AM
Chromium in Solids by ICP	1076.342	mg/Kg	05/15/95	AM
Silver in Solids by ICP	16.965	mg/Kg	05/15/95	AM
Arsenic in Solids by GFAA	33.780	mg/Kg	05/15/95	AM
Selenium in Solids by GFAA	0.226	mg/Kg	05/15/95	AM
Mercury in Solids by Cold Vapor	---			
Lead in TCLP by ICP	Not detected	mg/L	05/15/95	AM
Cadmium in TCLP by ICP	0.043	mg/L	05/15/95	AM
Barium in TCLP by ICP	0.802	mg/L	05/15/95	AM
Chromium in TCLP by ICP	Not detected	mg/L	05/15/95	AM
Silver in TCLP by ICP	Not detected	mg/L	05/15/95	AM
Arsenic in TCLP by GFAA	Not detected	mg/L	05/15/95	AM
Selenium in TCLP by GFAA	Not detected	mg/L	05/15/95	AM
Mercury TCLP by Cold vapor	Below det lim	mg/L	05/15/95	KP
Percent Moisture	35.16	%		

End of progress report on sample: WS18031

TA-22-015(c)

SAMPLE PROGRESS REPORT

Wastestream Technology
Date: 05-19-1995 Time: 09:40:57

Sample I.D. WB18106
Status: Analyses incomplete
Application Date: 05/24/95
Group Number: 9505-089
Client code: LOSALAMO
Updated:
Sample Desc: HCL EXTRACT

Date collected: 05/17/95
Date submitted: 05/18/95
Due date: 05/31/95
Specification checking: off
Site Desc:

Size: 1*500ML

Analysis	Result	Unit	Finished	Anl
Lead in Water by ICP	1.001	mg/L	05/18/95	AM
Cadmium in Water by ICP	0.097	mg/L	05/18/95	AM
Barium in Water by ICP	0.859	mg/L	05/18/95	AM
Chromium in Water by ICP	0.256	mg/L	05/18/95	AM
Silver in Water by ICP	Not detected	mg/L	05/18/95	AM
Arsenic in Water by GFAA	Not detected	mg/L	05/18/95	AM
Selenium in Water by GFAA	---			
Mercury in Water by Cold Vapor	---			
Hg Water Method Blank Result	---			
Hg Water Ref Sample % Recovery	---			
Hg Water MS % Recovery	---			
Hg Duplicate Sample Result	---			
Hg Duplicate sample RPD	---			

End of progress report on sample: WB18106

To: Karl
From: Donna

5/19/95

1 page

HCl Extract: 100g soil + 2L H_2O @ pH=2

ANNEX 6.12

CLEANUP LEVEL CALCULATIONS

The following equation was used to derive cleanup levels for carcinogenic compounds in commercial/industrial soil:

$$C\ (mg/kg) = \frac{TR \times BW \times AT \times 365\ d/yr}{EF \times ED \times \left[\left(SF_o \times 10^{-6}\ kg/mg \times IR_{soil}\right) + \left(SF_i \times IR_{air} \times (1/Y)\right)\right]}$$

Where:

Parameter	Definition	Units	Default
C	cleanup level - chemical concentration in soil	mg/kg	—
TR	target excess individual lifetime cancer risk	unitless	10^{-6} or 10^{-5}
BW	adult body weight	kg	70
AT	carcinogenic averaging time	yr	70
EF	exposure frequency	days/yr	250
ED	exposure duration	yr	25
SF_o	oral cancer slope factor	$(mg/kg\text{-}day)^{-1}$	chemical-specific
IR_{soil}	soil ingestion rate	mg/day	50
SF_i	inhalation cancer slope factor	$(mg/kg\text{-}day)^{-1}$	chemical-specific
IR_{air}	workday inhalation rate	m^3/day	20
Y	volatilization factor (VF) for volatiles	m^3/kg	chemical-specific
	particulate emission factor (PEF) for non-volatiles	m^3/kg	1.11×10^7

The following equation was used to derive cleanup levels for noncarcinogenic contaminants in commercial/industrial soil:

$$Action\ Level(mg/kg) = \frac{THI \times BW \times AT \times 365\,d/yr}{EF \times ED \times \left[\left((1/RfD_o) \times 10^{-6}\,kg/mg \times IR_{soil}\right) + \left((1/RfD_i) \times IR_{air} \times 1/Y\right)\right]}$$

Where:

Parameter	Definition	Units	Default
THI	target hazard index	unitless	0.1
BW	adult body weight	kg	70
AT	noncarcinogenic averaging time	yr	25 (always equal to ED)
EF	exposure frequency	days/yr	250
ED	exposure duration	yr	25
RfD_o	oral chronic reference dose	mg/kg-day	chemical-specific
IR_{soil}	soil ingestion rate	mg/day	50
SF_i	inhalation chronic reference dose	mg/kg-day	chemical-specific
IR_{air}	workday inhalation rate	m^3/day	20
Y	volatilization factor (VF) for volatiles	m^3/kg	chemical-specific
	particulate emission factor (PEF) for non-volatiles	m^3/kg	1.11×10^7 (LANL)

Methodology for Establishing Cleanup Levels for Lead in Soil

LEAD EXPOSURES

EPA has not derived CSFs or RfDs for evaluating the toxicity of lead or lead compounds. Previously, EPA had considered the concentration range of 500 to 1,000 mg/kg lead in soil to be acceptable as an interim cleanup level for residential Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites (EPA 1992). This interim cleanup level was proposed in a Centers for Disease Control document (CDC 1985) on lead poisoning in children, as children and fetuses are considered the most sensitive receptors for lead's toxic end points. Even more current EPA (1994) guidance has suggested a lead concentration in soil of 400 mg/kg as the threshold level. However, more recently for residential CERCLA and RCRA sites, EPA has recommended replacing the 500 to 1,000 mg/kg cleanup range and the 400 mg/kg threshold level with levels derived by its Integrated Exposure Uptake Biokinetic (IEUBK) Model (Version 0.99d).

Because of the anticipated future use of the Laboratory site for industrial/commercial purposes, the residential exposures are not considered relevant for the site. The California Environmental Protection Agency (Cal/EPA) has developed its own model (1993) to predict blood lead (PbB) levels in adults as well as children. The Cal/EPA model was employed in this assessment to evaluate potential adverse health effects to adults from lead in soil at the Laboratory site (see attached table).

Cal/EPA Lead Model

Similar to the EPA IEUBK model, the Cal/EPA model is used to estimate blood lead concentrations resulting from exposures via several pathways (inhalation of particulates, ingestion of food, dust, soil, water, and plant uptake). The contribution from the pathways are added to derive an estimate median PbB concentration resulting from multipathway exposure. In addition, the model calculates the 90th, 95th, 98th and 99th percentile concentrations by assuming a lognormal distribution with a standard deviation of 12 mg/dl.

A PbB concentration of 10 mg/dl is the target PbB level for exposure to lead in the environment, regardless of the source. Sources include drinking water, grocery story food products, soil (incidental soil ingestion and dermal contact), and the air. Therefore, the calculation of a soil lead cleanup level for an industrial exposure scenario includes the contribution to blood lead levels from non-site sources.

The soil lead cleanup level includes the contribution to PbB levels from non-site sources as well as on-site soil contact, soil ingestion, and inhalation pathways and was calculated not to exceed the target level of 10 mg/dl at the 95 percentile concentration. The contact rate for soil ingestion was changed from 0.03 g soil/day to 0.05 g soil/day to reflect the on-site industrial exposure pathway. The lead concentrations used in the water and food ingestion pathways are default values and represent background lead levels that may be encountered in tap water and grocery store food products. All other exposure input parameters are default values based on a residential exposure scenario.

REFERENCES

Cal/EPA (California Environmental Protection Agency. Department of Toxic Substance Control), 1993. Cal-Tox, a Multimedia Total Exposure Model for Hazardous Waste Sites. Office of Science Affairs, Department of Toxic Substances Control. June.

EPA (U.S. Environmental Protection Agency). 1992. Revised Guidance on Establishing Soil Lead Cleanup Levels at CERCLA/RCRA Sites. OSWER Directive 9355. 4-08.

EPA (U.S. Environmental Protection Agency). 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive No. 9355.4-12. July 14, 1994.

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

INPUT		OUTPUT					
MEDIUM	LEVEL		percentiles				
			50th	90th	95th	98th	99th
LEAD IN AIR (ug/m^3)	0.01						
LEAD IN SOIL (ug/g)	3385	BLOOD Pb, ADULT (ug/dl)	5.7	8.9	10.0	11.6	12.8
LEAD IN WATER (ug/l)	15						
PLANT UPTAKE? 1=YES 0=NO	0						
AIRBORNE DUST (ug/m^3)	50						

EQUATIONS, ADULTS

Pathway	Blood Pb ug/dl		Route-specific constant		concentration in medium	contact rate	percent of total
SOIL CONTACT:	0.66	=	1E-04 (ug/dl)/(ug/day)	*	3385 ug/g	* 1.85 g soil/day (5 g/m^2 * 0.37 m^2)	12%
SOIL INGESTION:	2.98	=	0.018 (ug/dl)/(ug/day)	*	3385 ug/g	* 0.05 g soil/day	53%
INHALATION:	0.29	=	1.64 (ug/dl)/(ug/m^3)	*	0.18 ug/m^3		5%
WATER INGESTION:	0.84	=	0.04 (ug/dl)/(ug/day)	*	15 ug/l	* 1.4 l water/day	15%
FOOD INGESTION:	0.88	=	0.04 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	* 2.2 kg diet/day	16%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (ug/kg) = 10.0 ug/kg

LEAD IN PRODUCE = 10 ug/kg or 0.00045 * soil lead = 10.0 ug/kg

ANNEX 6.13

VERIFICATION SAMPLE CALCULATIONS

SWMU 2-015(c)
Verification Sample Calculations

The required number of samples is computed using the following equation:

$$n_d = \frac{\left(z_{1-\beta} + z_{1-\alpha}\right)^2}{\tau^2} \quad where \quad \tau = \frac{(C_s - \mu_1)}{\sigma}$$

The required number of samples is computed using the following parameters and assumptions:

Parameter	Assumption	Value
α	alpha - the desired false positive rate	0.05
β	beta - the desired false negative rate	0.2
$z_{1-\alpha}$	critical value for the normal distribution with a probability of 1 - α	1.645
$z_{1-\beta}$	critical value for the normal distribution with a probability of 1 - β	0.842
τ	tau - an expression of relative difference	calculated
C_s	cleanup standard for the sample area	25 mg/kg for arsenic
μ_1	the mean concentration where the site should be declared clean with a high probability	assume 50% of C_s
σ	the estimate of the standard deviation of the individual contaminant concentrations within the CU	assume a coefficient of variation of 0.568 from arsenic background data (Longmire, et. al.), therefore, σ = 56.8% of μ_1.

Los Alamos National Laboratory
Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 9-013

June 1995
Revision 0

Environmental
Restoration

ACRONYMS

ACM	asbestos-containing material
AP	Administrative Procedure
COC	contaminant of concern
CPOC	chemical(s) of potential concern
DOE	U. S. Department of Energy
DTSC	Department of Toxic Substances Control
EC	expedited cleanup
EPA	U. S. Environmental Protection Agency
ER	Environmental Restoration
ESH	Environment, Safety, and Health
FPL	Field Project Leader
FTL	Field Team Leader
HE	high explosive
HSWA	Hazardous and Solid Waste Amendments
IEUBK	Integrated Exposure Uptake Biokinetic Model
LANL	Los Alamos National Laboratory
MDA	material disposal area
NMED	New Mexico Environment Department
OU	operable unit
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
TSD	treatment, storage, and disposal
UCL	upper confidence limit
UTL	upper tolerance limit
VOC	volatile organic compound
XRF	x-ray fluorescence

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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan addresses Solid Waste Management Unit (SWMU) 9-013, Material Disposal Area (MDA) M. MDA M is located southwest of Pajarito Canyon, within the western portion of the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico (Figure 1-1). This EC Plan is being proposed as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in the Operable Unit (OU) 1157 RFI Work Plan (LANL 1993, 1230).

SWMU 9-013 is included in Table A of the Hazardous and Solid Waste Amendments (HSWA) permit.

SWMU 9-013 consists of a former ground-surface disposal area and satellite area approximately 3.2 acres in size. A wide variety of materials including potentially hazardous waste, laboratory chemical waste, high explosive (HE) laboratory waste, organic waste, construction debris, and demolition debris was disposed at this site. The disposal area was used from 1948 until about 1965. Preliminary results from the RFI Phase I sampling effort indicate the presence of heavy metals, organics, and radionuclides (limited to one sample) above screening action levels (SALs). Additionally, asbestos was confirmed to be visually present at several locations in the disposal area.

This EC will be performed in two phases. Activities comprising Phase I of the EC include regrading the perimeter trench and diverting runoff, removal of all surface debris, segregation of waste streams, transportation and disposal of surface debris, "hot spot" excavation of contaminated soils, geophysical survey of cleared areas, and confirmatory sampling and analysis using Level III field analytical laboratories to confirm the nature and extent of soil contamination identified during the RFI sampling effort. After surface debris has been cleared and the area sampled, Phase II of the EC will commence. Phase II will consist of evaluating the confirmatory sampling results to determine if the cleanup levels developed from the RFI analytical results, and contained in this plan, are still appropriate. If this is the case, the contaminated soil exceeding cleanup levels will be excavated and transported to a landfill for disposal and final verification samples will be collected and analyzed on-site with 10% submitted off-site for analysis. However, if the confirmatory analytical results indicate the presence of different contaminants of concern (COC) or different concentrations of COCs then new cleanup levels may be calculated and the need for, and method of remediation will be evaluated at that time.

This EC Plan identifies the level of effort required from initial transmittal of the plan to the U. S. Environmental Protection Agency (EPA) for review, through implementation, to the completion of the final report as identified in the schedule. This plan may need to be modified to incorporate Phase II planning after analytical results from confirmatory sampling have been evaluated. A two phase approach is needed due to the uncertainty of contaminants in the surface and near-surface soils. In the development of this EC Plan, the following assumptions were made:

- The levels of COC and volumes of anticipated waste are consistent with preliminary RFI data;
- Based on current Laboratory land use planning, future land use at the location of this SWMU will continue to be for industrial purposes;
- Minimal delays in EC operations will be experienced as a result of inclement weather and site access problems. Delays that may result from the acquisition and scheduling of heavy equipment and from acceptance of waste at permitted disposal facilities cannot be anticipated and therefore are not considered in this plan;
- A Site-Specific Health and Safety Plan (SSHASP) and Waste Management Checklist will be developed specifically to address COCs identified in this EC Plan. Deviations from the anticipated concentrations and locations of contaminants of concern may necessitate adjustments to both plans, and;

- Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC Plan.

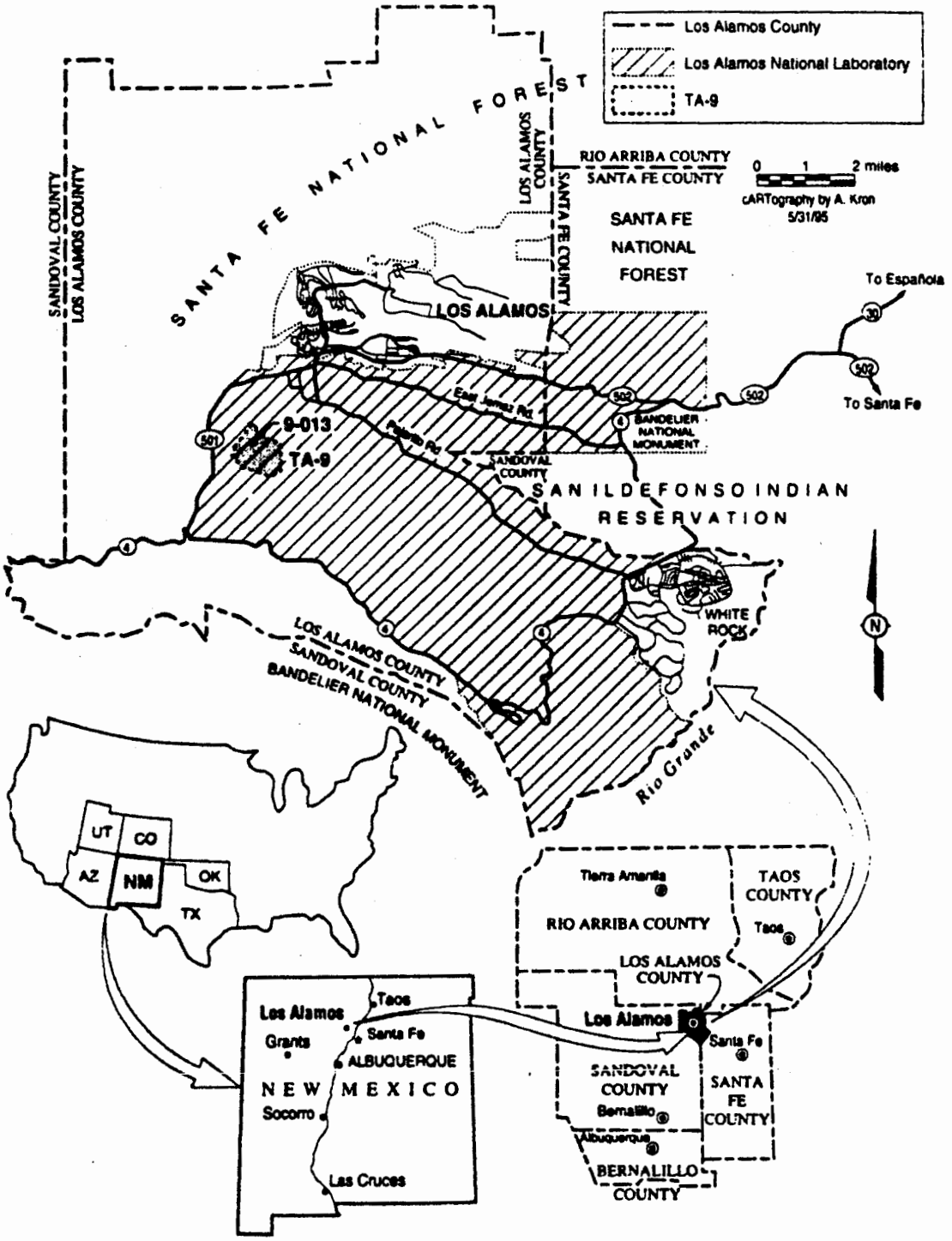


Figure 1-1. Regional location map.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Detailed Description of SWMU 9-013

SWMU 9-013 is a surface material disposal area located within a secured area of Technical Area (TA)-9, southeast of Guard Station 502 and northeast of Old Anchor East (Figure 2-1). MDA M occupies approximately 3.2 acres and is roughly circular in shape. This MDA also includes a satellite area located approximately 750 feet northwest of the main site which occupies an area approximately 40-ft by 60-ft (Figure 2-1). An earthen berm is present around the main disposal area. In some places, the berm has been eroded through by surface water run-off. There are runoff channels on the east and west sides of the site which lead to the mesa edge on the south side of the site.

2.1.1 Operational History

SWMU 9-013 was used as a surface dump for construction debris and other solid wastes. Metal and debris, generated during the removal of Old Anchor Sites East and West and the construction of the present TA-8 and -9 facilities (1948-65), have been flashed, to remove any high explosives, and deposited over the surface of this site. Nonhazardous waste from the construction of other sites within the Laboratory was also disposed at the site from 1960 to 1965. The disposal area has been inactive since 1965.

Aerial photographs of MDA M taken in 1958 were compared to those taken in 1974. These photographs showed that the area appears to have undergone some erosion and tree cutting, but the difference in the condition of the unimproved road in the two photos would indicate that traffic to the site is minimal. Also there was no evidence of any open pits or trenches used for disposal at the site in either of the photos.

2.1.2 Physical Setting

SWMU 9-013 is located in TA-9 at the western edge of the Pajarito Plateau in Los Alamos County. Los Alamos County has a semi-arid, temperate mountain climate. Rainfall at the site (approximate elevation is 7550 feet above mean sea level) averages about 22 inches per year. High extremes include 2.51 inches per day of precipitation and 153 inches per year of snowfall. Average snowfall is about 55 inches per year.

MDA M lies on a mesa between Canon de Valle on the south and Pajarito Canyon on the north located entirely on U. S. Department of Energy (DOE)-owned land. The surface of the mesa is partially dissected by tributary drainages to Pajarito Canyon. The canyons drain east-southeast to the Rio Grande approximately 10 miles east of the site. The area surrounding the site is heavily wooded.

The mesa top of this area overlies up to 1100 ft of unsaturated volcanic tuff and sediments of the Bandelier and Puye formations and Cerros del Rio basalts. This thick unsaturated zone is considered to inhibit groundwater recharge by surface water infiltration within the boundaries of the Laboratory. The regional aquifer, which lies beneath the Laboratory and serves as the municipal water supply for the Los Alamos area, is located in the lower Puye formation and Santa Fe group sediments. The depth to the regional aquifer is between 800 and 1100 ft at the site. Perched water may exist in the vicinity of, and perhaps beneath MDA M.

A soil map presented in the OU 1157 RFI Work Plan (LANL 1993,1230) defines the soil types present within the SWMU site. These comprise the Seaby, Carjo, and Tocal very fine sandy loam soil types.

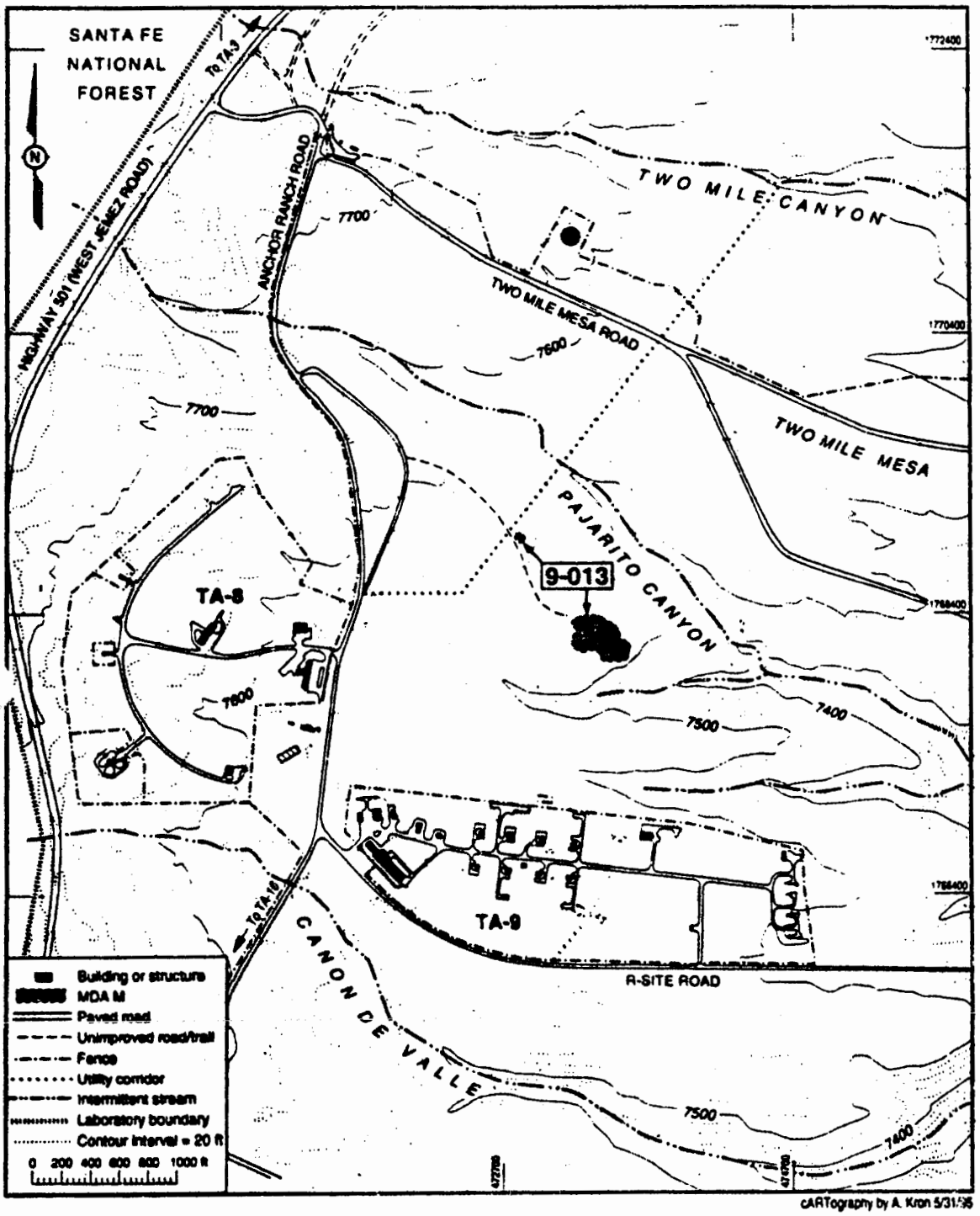


Figure 2-1. Location map for SWMU 9-013.

Access to MDA M is via State Road 501 to Anchor Ranch Road to an unimproved road which leads directly to both the main and satellite areas. Access is restricted by a security fence with entry limited to Laboratory employees with a security clearance. Visitors without a clearance must be escorted at all times.

2.2 Summary of Investigations

2.2.1 Investigations Prior to RFI

MDA M contains many noncombustibles and has been suspected of being contaminated with radioactive materials (LANL 1990, 0145). However, in an October 1992 general radiation survey, no areas registered above background.

During a site visit to MDA M in the spring of 1992, rusted metal cans ranging in size from 12 ounces to 55 gallons were observed. A white fibrous substance believed to be asbestos is visible on the ground in this area. A variety of glass containers and broken glass, some from camera lenses, has been identified at the site. Electrical wires and cables are scattered throughout the area. Other materials, including metal and wood objects, chemical and HE laboratory appliances and fixtures, bathroom appliances and fixtures, tree stumps, automobile parts, smudge pots, and construction and demolition debris, were disposed of at MDA M and the satellite area.

2.2.2 RCRA Facility Investigation

SWMU 9-013 and its satellite area were mapped and sampled as called for in the OU 1157 RFI Work Plan. In March 1994 the area was mapped into a grid of 167 cells (25-ft by 25-ft per cell) and a detailed inventory of each of the cells visible contents was documented. Additionally each cell was field screened for radionuclide contamination, volatile organic compounds (VOCs), and test kits were used to detect the presence of HE.

During May 1994, multimedia samples were collected from MDA M and the satellite area, as well as surrounding springs to ascertain the potential effect of the disposal area on public health and the environment (Figure 2-2). The sampling effort is described below and the analytical results are presented in Annex 6.9.

<u>Judgmental Soil Samples</u>

Eighteen judgmental soil samples (sample numbers 09-7300 through 09-7317) were collected at the main disposal site and one (sample number 09-7330) was collected at the satellite area. The judgmental sample locations were chosen based on the aforementioned cell inventory, as well as the results of field screening for HE, VOCs, and radionuclide contamination. The samples were analyzed for semivolatile organic compounds (SVOCs), VOCs, inorganic compounds, HE, organochlorine pesticides, and polychlorinated biphenyls (PCBs). A gross alpha/beta screening was also performed.

<u>Random Soil Samples</u>

Fourteen random soil samples (sample numbers 09-7006, -7014, -7018, -7037, -7054, -7058, -7061, -7085, -7093, -7104, -7126, -7130, -7142, and -7143) were collected from soils underlying the surface debris within the main disposal site and one random soil sample (sample number 09-7162) was collected from the satellite area. The random samples were collected to supplement the judgmental soil samples and analyzed for the same contaminants.

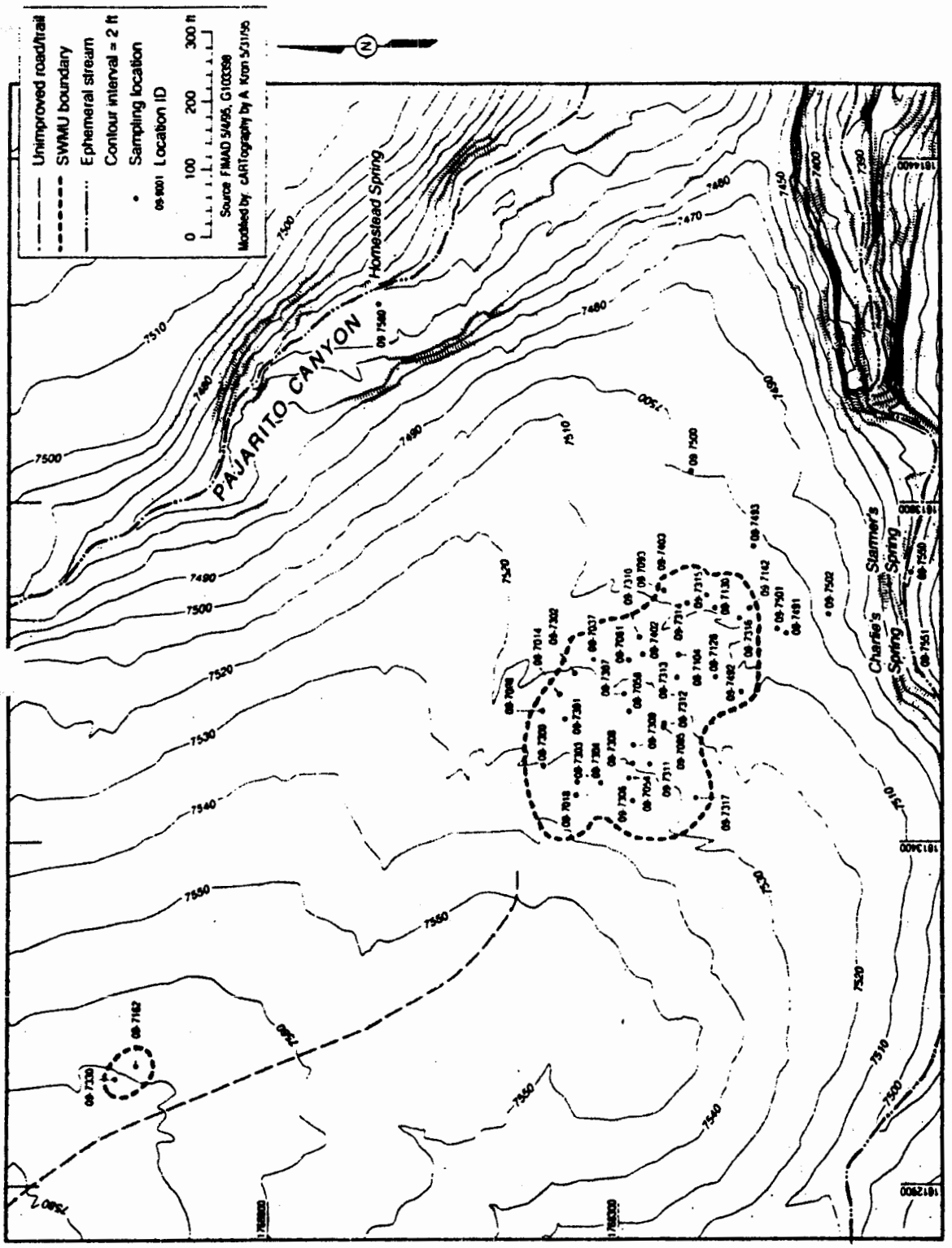


Figure 2-2. Site map for SWMU 9-013.

Judgmental Liquid Samples

Four samples (sample numbers 09-7400 through -7403) were collected from the residual liquid contained in reagent bottles disposed of at the main disposal site. These samples were analyzed for SVOCs, VOCs, inorganic compounds, organochlorine pesticides, and PCBs. A gross alpha/beta screening was also performed.

Judgmental Sampling of Downgradient Sediments

Three sediment samples (sample numbers 09-7500 through -7502) were collected of potentially contaminated surface sediments that appeared to have been eroded from the MDA M main disposal site and washed downgradient by surface runoff. The sample locations were in the runoff channels, two in the westernmost channel and one in the easternmost channel. With the exception of VOCs, these samples were analyzed for the same contaminants as the random and judgmental soil samples.

Judgmental Sampling of Surface Water Runoff

Three single stage surface water runoff samples (sample numbers 09-7491 through -7493) were collected and analyzed for the same contaminants as the downgradient sediments.

Spring and Creek Samples

Three samples (sample numbers 09-7550, -7551, and -7560) were collected from springs located in the canyons south and east of MDA M. The samples were analyzed for VOCs, SVOCs, inorganic compounds (filtered and unfiltered), organochlorine pesticides, PCBs, major ions, total dissolved solids, pH, alkalinity, conductivity, dissolved oxygen, hardness, fecal coliform, temperature, and HE. A gross alpha, beta, and gamma screen, as well as tritium analysis were also performed. Sampling was conducted for the dual purposes of chemically characterizing the water to help determine its source and to determine whether the water is contaminated.

For comparative purposes, one sample (sample number 09-7561) was obtained from Pajarito Creek west of State Road 501 and analyzed for the same parameters as samples collected from the springs.

2.2.2.1 Summary of RFI Analytical Results

Annex 6.9 presents a summary of the RFI analytical sampling results reported above detection limits for all RFI samples collected at the site. The detected concentrations, screening action levels (SALs), and upper tolerance limits (UTLs) for background concentrations in soil and water are also presented for comparison. Based on a preliminary review of the sampling data, the results are summarized as follows:

Soil Samples (random and judgmental)

- SVOC concentrations were detected above LANL SALs (or UTLs where SALs were not available) in three samples (09-7037, -7303, and -7316) with maximum values of the following constituents: benzo[a]anthracene (160 ppm), benzo[a]pyrene (130 ppm), benzo[b]fluoranthene (200 ppm), benzo[g,h,i]perylene (64 ppm), benzo[k]fluoranthene (77 ppm), chrysene (190 ppm), dibenzo[a,h]anthracene (23 ppm), indeno[1,2,3-cd]pyrene (80 ppm), and phenanthrene (150 ppm).

- Metal concentrations were detected above LANL SALs (or UTLs where SALs were not available) in thirty-one samples with maximum values of the following constituents: arsenic (113 ppm), calcium (122000 ppm), chromium (51.6 ppm), copper (42762 ppm), iron (88600 ppm), lead (11600 ppm), and mercury (29 ppm).

- Organochlorine pesticides were detected above LANL SALs in one sample (09-7037) with a maximum value of dieldrin (0.048 ppm).
- PCB concentrations were detected above LANL SALs in two samples (09-7303 and -7312) with a maximum value of Aroclor 1254 (2.6 ppm).
- Uranium-234 and -238 were detected above LANL SALs in one sample (09-7310) with maximum values of 150.622 pCi/g and 149.741 pCi/g respectively.
- No VOCs were detected above SALs or UTLs.
- No identifiable compounds were detected in the HE analyses.

Residual Liquids in Containers

- Metal concentrations were detected above LANL SALs in all four samples with maximum values of the following constituents: arsenic (200 µg/L), barium (2580 µg/L), beryllium (23.8 µg/L), cadmium (16.3 µg/L), chromium (225 µg/L), lead (168 µg/L), manganese (884 µg/L), mercury (10.5 µg/L), nickel (276 µg/L), and selenium (620 µg/L).
- No identifiable compounds were detected in the SVOC analyses.
- No identifiable compounds were detected in the VOC analyses.
- No identifiable compounds were detected in the organochlorine pesticide and PCB analyses.

Downgradient Sediments

- No metals were detected above SALs.
- No identifiable compounds were detected in the SVOC analyses.
- No identifiable compounds were detected in the VOC analyses.
- No identifiable compounds were detected in the organochlorine pesticide and PCB analyses.
- No identifiable compounds were detected in the HE analyses.

Surface Water Runoff

- Metal concentrations were detected above LANL SALs in all three samples with maximum values of the following constituents: antimony (94.8 µg/L), barium (2740 µg/L), beryllium (19.3 µg/L), cadmium (40.2 µg/L), chromium (144 µg/L), lead (147 µg/L), manganese (2770 µg/L), nickel (112 µg/L), and vanadium (370 µg/L).
- VOC concentrations were detected above LANL SALs in one sample (09-7493) with a maximum value of methylene chloride (6 µg/L).
- No identifiable compounds were detected in the SVOC analyses.
- No identifiable compounds were detected in the organochlorine pesticide and PCB analyses.
- No identifiable compounds were detected in the HE analyses.

Spring and Creek Samples

- HE concentrations were detected above LANL SALs for one spring sample (09-7550) with 2,4-DNT at 1.52 µg/L and the creek sample (09-7561) with 2,4-DNT at 0.9 µg/L.

- Low levels of radioactivity were detected but the concentrations did not exceed the LANL SAL values.
- No identifiable compounds were detected in the SVOC analyses.
- No identifiable compounds were detected in the organochlorine pesticide and PCB analyses.
- No identifiable compounds were detected in the VOC analyses.

2.2.3 Evaluation of the RFI Results

Based upon review of the preliminary data, the following conclusions were made:

- Soil samples indicate that surface soils throughout the site have elevated concentrations of metals. However, the elevated concentrations of VOCs, PCBs, and uranium seem to be limited to a small number of samples and would be amenable to "hot spot" excavation of the contaminated areas.
- Residual liquids sampled in various reagent bottles indicated only metal contaminants. These contaminants varied from bottle to bottle, but the analysis indicate that the residual liquids sampled were compatible with one another for disposal purposes.
- Downgradient sediments indicate there is no contamination above SALs in the soils downgradient of the main disposal site.
- Surface water runoff samples indicate that metals are being transported from the site through this mechanism.
- Spring and creek samples indicate that MDA M may not be the cause of the HE contamination found in the water because HE was detected upgradient as well as downgradient of the disposal site.

2.3 Types and Volumes of Waste Present

The nature of the wastes expected to be generated by the proposed cleanup is presented in Table 2-1.

The majority of the waste from Phase I of this EC is expected to be construction debris and scrap metal. Other wastes generated from Phase I of this EC include asbestos, radionuclide-contaminated soil, asbestos-contaminated soil, hazardous waste, decontamination liquid, personal protective equipment (PPE), and sampling waste. Phase II waste is expected to be metal-contaminated soils (assumed to be nonhazardous). These materials will be handled in accordance with the site-specific Waste Management Checklist and segregated for appropriate treatment, storage, and disposal.

TABLE 2-1
ANTICIPATED WASTE VOLUMES

Item	Type	Anticipated Volume
Sampling waste/PPE	solid - potential hazardous	250 cu. ft.
Sampling waste/PPE	solid - potential low-level rad	15 cu. ft.
Decontamination waste	liquid - potential hazardous	500 gal.
Decontamination waste	liquid - potential low-level rad	500 gal.
Debris	solid - clean	5000 cu. yds.
Debris	solid & liquid - potential hazardous	150 cu. yds.
Bulk Soil	solid - potential low-level rad	20 cu. yds.
Bulk Soil	solid - potential hazardous	1000 cu. yds.
Bulk Soil Containing Asbestos	solid - asbestos contaminated	500 cu. yds.
Asbestos	solid	500 cu. yds.

2.4 Potential Impacts on Public Health and the Environment

Receptors of possible contaminants include animals and humans. Potential exposure routes of receptors include the following:

- Inhalation (especially if the SWMU is disturbed);
- Ingestion; and
- Skin contact with contaminated soil, sediment, or debris.

2.4.1 Potential Pathways

2.4.1.1 SWMU - In Place

If the contaminated soil remains in place, several mechanisms are available to transport contaminants from their current location. These mechanisms include:

- surface water runoff (across the contaminated area);
- erosion of soil and sediments; and
- wind dispersion.

The only probable shallow water-bearing zone beneath MDA M is associated with small springs located near the site. The springs or consequent stream flow, if derived from this water-bearing zone, could be impacted through downward migration of contaminants with infiltrating precipitation. Once in the water-bearing zone, lateral movement with the perched groundwater to the point of discharge into the springs is possible.

2.4.1.2 SWMU - Remediation

Possible exposure pathways to workers of contaminants and hazardous materials, including radionuclides, asbestos, and SVOCs, are generally the same as those described in Section 2.4.1.1. While excavation activities will increase the potential for sediment transport and wind dispersion, precautions will be taken to minimize these pathways during remediation or excavation activities. Appropriate dust suppression techniques will be utilized to prevent contaminants from becoming

airborne. Covered storage containers for excavated materials and plastic sheeting covering the excavated area will prohibit rainwater and/or runoff from contacting potentially contaminated material.

2.4.2 Future Land Use

SWMU 9-013 lies entirely on DOE-owned land. The area is removed from public access roads. In the foreseeable future, the land is anticipated to be used exclusively for LANL (industrial) operations, as stated in the Site Development Plan Annual Update 1994 (LANL 1994, 1171).

2.4.3 Cleanup Levels

Identification of the chemicals of potential concern (COPCs) considered for this EC was based on simple comparisons of SWMU 9-013 RFI analytical results to background and SAL concentrations. As presented in Annex 6.9, analytical results from the Phase I RFI sampling indicate that lead is the primary contaminant of concern for soil contamination at the site.

A soil lead cleanup level of 3,000 ppm is proposed for LANL industrial sites undergoing Expedited Cleanups. This cleanup level was derived for an adult under an industrial exposure scenario and is considered conservative. The soil lead cleanup level was calculated using a computer spreadsheet algorithm for estimating blood lead concentrations in adults based on the multi-pathway analysis developed by the California Department of Toxic Substances Control (DTSC 19920). The DTSC algorithm is similar to the EPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) for children. However, unlike the IEUBK model which addresses children only, the DTSC computer spreadsheet can calculate blood levels for an adult.

A blood lead concentration of 10µg/dl is the target blood lead level for exposure to lead in the environment, regardless of the source. Sources include drinking water, grocery store food products, soil (incidental soil ingestion and dermal contact), and the air. Therefore, the calculation of a soil lead cleanup level for an industrial exposure scenario includes the contribution to blood levels from non-site sources.

The soil lead cleanup level includes the contribution to blood lead levels from non-site sources as well as on-site soil contact, soil ingestion, and inhalation pathways and was calculated not to exceed the target level of 10 µg/dl at 95th percentile concentration. The contact rate for soil ingestion was changed form 0.03 g soil/day to 0.05 g soil/day to reflect on-site industrial exposure pathway. The lead concentrations used in the water and food ingestion pathways are default values and represent background lead levels that may be encountered in tap water and grocery store food products. All other exposure input parameters are default values based on a residential exposure scenario. A model input description and assumptions are presented in Annex 6.10.

Cleanup levels for other potential contaminants of concern for this EC effort are presented in Table 2-2 below. Typically, the Laboratory derives cleanup levels assuming an acceptable level of risk of 1E-06 for carcinogens, and a hazard index of 0.1 for noncarcinogens. This conservative approach is adopted to account for the presence of multiple constituents. With this approach, the residual risk remaining at the site following remediation will be within the EPA acceptable risk range of 1E-04 to 1E-06 for carcinogens, and less than a hazard index of 1 for noncarcinogens. The equations and assumptions used for the calculation of cleanup levels in this Plan are provided in Annex 6.10.

TABLE 2-2
CLEANUP LEVELS FOR SWMU 9-013

Chemical	Cleanup Level (mg/kg)	Rationale
Arsenic	25	Carcinogen. Based on a risk level of 10^{-5}, a risk level of 10^{-6} creates a cleanup level lower than background.
Chromium III	204,400	Noncarcinogenic. Based on a hazard index of 0.1.
Chromium VI	38	Carcinogenic Chromium VI. Based on a risk level of 10^{-5}, a risk level of 10^{-6} creates a cleanup level lower than background.
Copper	7,500	Noncarcinogenic. Based on a hazard index of 0.1.
Mercury	54	Noncarcinogenic. Based on a hazard index of 0.1.
PAH	10	Carcinogenic. Based on a risk level of 10^{-5} for benzo[a]pyrene.
PCB	10	Carcinogenic. Based on a risk level of 10^{-5}.

Results from the RFI sampling indicate that leaching of metals from soils and sediments at this SWMU did not contribute concentrations of metals downgradient of the site which would pose an unacceptable risk to human health or the environment. When ecological screening thresholds (currently under development) are completed the downgradient sample results will be evaluated to determine if further action is required. If assessment results indicate that leaving these soils in place may pose an unacceptable risk, they will be excavated and disposed of during the EC. Results of the ecological assessment will be provided in the final report for this EC.

3.0 EXPEDITED CLEANUP

3.1 Overview and Rationale

Phase I RFI sampling results indicate heavy metals, organics, and uranium are present above SALs in surface and near-surface soils at the site. Additionally, asbestos was visually confirmed to be present at several locations in the disposal area. Residual liquids sampled in various bottles indicate the presence of heavy metals in the liquid. The potential for erosion and off-site transport of contaminants exists at the site and was partially confirmed by the metal contaminants found in the surface water runoff samples. The proposed EC Plan (described in Section 3.3) will be implemented to remove the surface debris, asbestos, and "hot spots" of radionuclide and organic contamination as part of Phase I. Phase II will address the contaminated soil beneath the surface debris.

3.2 Permitting, Approval, and Notification Requirements

An excavation permit will be prepared and submitted for approval before execution of this plan.

An asbestos permit issued by the New Mexico Environment Department (NMED) through Environment, Safety, and Health (ESH)-17 will be prepared and submitted for approval before execution of this plan.

Documentation will be prepared in accordance with LANL Environmental Restoration (ER) Administrative Procedure (AP) LANL-ER-AP-05.1, Rev. 0, Readiness Review for Environmental Restoration Program Field Activities. Key documents to be prepared include a SSHASP, and site-specific waste management checklist. Personnel training requirements will be specified and will require completion prior to implementation of this EC Plan. Site workers must have received all training for this project as specified in the SSHASP.

3.2.1 Regulatory Notification/Permit Modifications

SWMU 9-013 is included in Table A of the HSWA Module. Implementation of this EC will require a Class III modification to the HSWA Module. EPA and NMED have been notified of this project, and a request for a permit modification have been submitted. Implementation of this EC will proceed upon receipt of EPA approval.

3.2.2 DOE Approval

If the Laboratory intends to implement this EC prior to receiving EPA approval, DOE approval is documented through receipt of the signed Field Work Approval Form (Annex 6.7).

3.3 Cleanup Activities

The cleanup of this SWMU will be performed in two phases. The first phase is designed to remove all surface debris. The site has been divided into 167 cells measuring 25-ft by 25-ft. In each cell, all surface debris will be removed and segregated. This will facilitate the verification sampling of soil beneath the debris. The second phase will address surface and near-surface soil contamination currently beneath the surface debris.

3.3.1 Phase I

The following activities will be performed as part of Phase I:

- The road to the site will be graded to allow for heavy equipment traffic.
- The trench and berm surrounding the main site will be regraded to close existing breaches and route surface water runoff around the site.
- Staging areas for waste segregation and exclusion zones will be established.
- An asbestos subcontractor will mobilize to the site and remove, segregate, transport, and dispose of all asbestos and asbestos-containing material (ACM).
- A cell-by-cell cleanup will be performed. In each cell the debris will be segregated by waste stream, e.g., metal, glass, wood, concrete. The waste streams will be field screened for radionuclide-contamination before transport and disposal.
- When a cell has been cleared of surface debris it will be field screened for radionuclide and organic contamination. If the cell is found to be contaminated, that area will be roped off and marked.
- Any contaminated cells will undergo "hot spot" excavation to remove the contaminated soils. The excavated soil will be containerized and analyzed by the field laboratory to determine appropriate disposal requirements.
- A geophysical survey will be performed on the cleared site to identify any buried objects. If anything is found buried in the subsurface, further excavation will be required and will be performed as part of Phase II.
- Confirmatory sampling will be performed (see Section 3.5).

It is important to note that these activities may not occur in the order written and that, whenever possible, will occur simultaneously to expedite the cleanup process.

3.3.2 Phase II

At the completion of Phase I confirmatory sampling Phase II will be initiated. The first activity will be to evaluate the sampling results and compare them to the data contained in Annex 6.9 from the RFI. If the new data are consistent will the RFI data then cleanup will proceed with the following activities identified as part of Phase II:

- Establish staging areas and exclusion zones.
- Collect Toxicity Characteristic Leaching Procedure (TCLP) samples for metals to ascertain if the contaminated soil will be considered a hazardous waste upon excavation.
- Identify and flag sites for excavation based on the analytical results and cleanup levels.
- Excavate areas exceeding cleanup levels and bulk soils into containers for transport and disposal.
- Collect verification samples (see Section 3.5).
- Backfill excavation with clean fill and perform site restoration (see Section 3.6).

If the EC Phase I data differ from the data contained in Annex 6.9, new cleanup levels will be established and the remediation plans reevaluated.

3.4 Waste Management Issues

As indicated in Section 2.3 wastes to be generated during this EC include asbestos, scrap metal and other debris, potentially contaminated soils, and decontamination waste. All waste will be disposed of in accordance with the site-specific Waste Management Checklist.

3.4.1 Characterization of Materials for Disposal

Field screening for radioactivity and organic vapors will be conducted on the segregated waste streams generated during the EC. Additionally, liquids and soils will be analyzed by a field laboratory, as well as a representative sample sent to an off-site laboratory for TCLP, to determine appropriate disposal requirements.

3.4.2 Treatment, Storage, and Disposal Plans for Waste

The majority of the waste generated from this EC will be nonhazardous debris/scrap metal which will either be salvaged or sent to a local landfill. The asbestos and ACM will be transported to a permitted asbestos landfill for final disposal. Hazardous waste will be transported to a permitted treatment, storage, and disposal (TSD) facility for final disposal. Low-level radionuclide-contaminated waste will be sent to TA-54 for final disposal. All waste streams will be segregated and disposed of in accordance with the Waste Management Checklist.

3.5 Verification Plan

Confirmatory/verification samples will be collected during each phase of the EC as identified in Table 3-1.

<u>Phase I</u>

Confirmatory sampling will be performed to confirm and supplement the results from the RFI sampling effort which were used to calculate the cleanup levels.

Based on available analytical data, lead is the primary contaminant of concern in the soils at MDA M. Therefore, this Phase I sampling plan design is based on the observed distribution of lead contamination in the available data.

The number of samples to be collected to determine whether an exposure unit requires remediation is dictated by the sampling frequency needed to achieve statistically defensible data. In this case, the areas that may require excavation in Phase II, correspond to the default industrial scenario exposure unit of 500 m^2 (24 units are located on the 3.2 acre site). Therefore, the 500 m^2 areas will be sampled, as required, to determine if remediation is warranted because an area exceeds cleanup levels. *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Solid Media* (EPA 1989) provides the formulae for calculating the number of random samples needed to determine if the mean concentration in the area exceeds the cleanup goals at a specified level of confidence.

The equations and calculations used to determine the sampling frequency are contained in Annex 6.11. Application of this approach with the assumptions outlined (see Annex 6.11) results in a confirmatory sample size of 7 random samples within each 500 m^2 exposure unit, for a total of 168 samples. All 7 soil samples within each unit (or 168 total) will be field screened with an x-ray fluorescence (XRF) instrument to measure metal concentrations, two of the seven samples within each unit (or 48 total) will be submitted to the field laboratory for metals, SVOC, and PCB analyses, and 10% of those analyzed in the field laboratory (or 5 total) will be sent off-site for fixed laboratory analysis to verify field laboratory results. This sampling design is driven by the data requirements to determine if lead concentrations in the soil are greater than the cleanup goals. The other analytes,

SVOCs and PCBs, were observed at lower concentrations in the RFI data, and therefore fewer samples are required to determine if remediation is warranted based on their cleanup goals.

Results from the XRF samples will be used to calculate the 95% upper confidence limit (UCL) to compare to the cleanup levels established for the metal constituents. Results from the laboratory analyses will be used to calculate the 95% UCL to compare to the cleanup levels established for the non-metal constituents. Site remediation will be required if the calculated UCLs are greater than the established cleanup goals.

Phase II

Verification samples will be collected from the excavation, if any, and from the soil surrounding the excavation. Samples collected from the soil beneath the excavated soil will be analyzed to verify that total metals do not exceed the cleanup levels that were defined by the risk assessment. If Phase I confirmatory sampling should indicate that SVOCs and PCBs need to be remediated, then the samples will be analyzed for those constituents as well. A composite sample will be collected from each grid that was excavated, as well as random samples obtained from soil surrounding the excavations. A combination of field screening, field laboratory analytical techniques, and off-site, fixed laboratory analysis will be used to verify results.

Results from the laboratory verification samples will be used to calculate the 95% UCL to compare to the cleanup level established for each contaminant. The site cleanup objectives will be obtained when the calculated UCL is less than the established cleanup levels (USEPA, 1989).

3.6 Site Restoration Plan

Any excavation that was necessary during cleanup will be backfilled with clean fill. The site will then be graded and compacted to prevent any undue or unnatural erosion and contoured to harmonize with the surroundings. Erosion protection such as flow diversions, berms, and revegetation will be used to minimize erosion. The area will be seeded with native grasses to return the site to its pre-Laboratory condition.

3.7 Acceptance Inspection

The Laboratory proposes an Acceptance Inspection as the mechanism for DOE and EPA to assess the implementation and effectiveness of the EC. A minimum of 10 days' notification will be provided to the agencies before the start of field activities. At this time, a tentative date for the inspection will be agreed upon.

An inspection checklist will be used to document the scope of the inspection and will become part of the EC Final Report. The checklist and timing of the inspection will be developed by the Laboratory and agreed to by the other agencies. The inspection checklist will contain specific items, criteria, and requirements to be inspected that will constitute acceptance of remediation activities.

The Acceptance Inspection will be conducted by an independent professional skilled in the appropriate technical discipline. During the Acceptance Inspection, written resolution and an anticipated schedule for completion will be identified for any outstanding items, and documented on the inspection checklist. The

TABLE 3-1
SUMMARY OF VERIFICATION SAMPLES AND ANALYSES
FOR SWMU 9-013

Sample Description	Field Screening					Field Laboratory Analysis					Fixed Laboratory Analysis					
	Beta-Gamma	Alpha	Organic Vapor (head space)	Radiological Smear & Swipe Techniques	XRF	PCBs	VOCs (SW 8260)*	SVOCs (SW 8270)*	Metals (ICPES)	Gross Gamma, Alpha, Beta	PCBs	VOCs (SW 8260)*	Metals (SW 6010/7000)*	SVOCs (SW8270)*	Total Uranium	Gamma Spectrometry
Phase I Surface Soil Samples	168	168	168		168	48		48	48	48	5		5	5	5	
Phase II Surface Soil Samples	15	15	15		15	2		2	2	2	1		1	1	1	
Duplicate						3		3	3	3	1		1	1	1	
Decontamination Water						2		2	2	2						
Excavation Equipment				6												

Note: Additional samples may be taken based on field surveys and observations.
*: Applicable EPA SW 846 methods.

Laboratory FPL, or designee, will be responsible for completing outstanding inspection items and documenting their resolution in the EC Final Report.

Upon completion of remediation activities, the Laboratory will submit a written certification to EPA Region 6, stating that the remedy has been completed in accordance with the EC Plan and Acceptance Inspection Checklist. The certification will be signed by the permitee and by the independent professional conducting the inspection. The certification will accompany the EC Final Report.

3.8 Final Report

Following the return of analytical data from the verification sampling and completion of all field activities, a final report will be prepared. A proposed outline for this report is presented as Annex 6.8.

4.0 PROJECT MANAGEMENT

Overall implementation of this expedited cleanup will be managed by Cheryl Rofer, the Field Project Leader (FPL). Luan Walker will serve as the Field Team Leader (FTL) for the EC activities.

4.1 Staff and Resource Requirements

Total anticipated costs for the EC are $487,050, as detailed below.

Pre-Field Activities	
Preparation of Waste Management Plan	$2,000
Preparation of Site-Specific Health and Safety Plan	2,500
Field Work Preparation (including subcontracting)	7,000
Subtotal	$11,500
Field Activities	
Prepare Road & Trench:	
2 Laborers @ $50/hr x 5 days	$4,000
Heavy Equipment (JCI)	
Grader @ $85/day	425
Truck @ $75/day	375
Surface Debris Cleanup:	
167 cells total, assume 5 cells/day = 34 days of field work for surface debris	
FTL @ $70/hr x 34 days	19,040
SSHO/FCT @ $70/hr x 34 days	19,040
3 Laborers @ $50/hour x 34 days	40,800
Heavy Equipment (JCI)	
Backhoe @ $75/day	2,550
Forklift @ $75/day	2,550
Crane @ $75/day	2,550
3 Equipment Operators @ $50/hr	40,800
Geophysical Subcontractor	6,000
Asbestos Subcontractor	91,400
Subtotal	$229,530
Waste Disposal	
Solid Waste Debris:	
Debris assumed JCI hauls materials to salvage or county landfill	
2 trucks @ 2 loads/day/truck (assume 2 trucks) = 32 days	
1 Operator @ $50/hr x 32 days	$51,200
1 Truck @ $75/day	4,800
Disposal of 250 cu. yds. (assume $100/load)	25,000
Water Contaminated Soil (assumes nonhazardous):	
Disposal of 1000 cu. yds. @ $25/cu. yd.	25,000
Hazardous Waste:	
Disposal of 150 cu. yds. @ $500/cu yd	75,000
Low-Level Waste:	
Disposal of 20 cu. yds. @ $1150/cu yd	23,000
Subtotal	$181,500

Phase I Sampling/Analytical

Assume 168 XRF samples to be field screened, 48 of those sent to on-site lab for metals, SVOC, and PCBs, and 10% (and 2 duplicates) sent off-site for metals, SVOCs, and PCBs.

Assume 2 sampling teams for 5 days	
4 Sampling Technicians @ $60/hr	$9.600
7 Samples sent off-site @ $1250/sample	8,750
Rad Van @ $2000/day	10,000
Chem Van @ $2000/day	10,000
Subtotal	38,350

Phase II Sampling/Analytical

Assume 15 grids @ 1 sample/grid with 10% (and 1 duplicate) sent off-site

Assume 1 sampling team for 2 days	
2 Sampling Technicians @ $60/hr	1,920
3 samples sent off-site @ $1250/sample	3,750
Rad Van @ $2000/day	4,000
Chem Van @ $2000/day	4,000
Subtotal	$13,670

Post-Field Activities

Acceptance Inspection (including checklist)	$2,500
Final Report	10,000
Subtotal	$12,500

TOTAL ESTIMATED COST	**$487,050**

4.2 Schedule

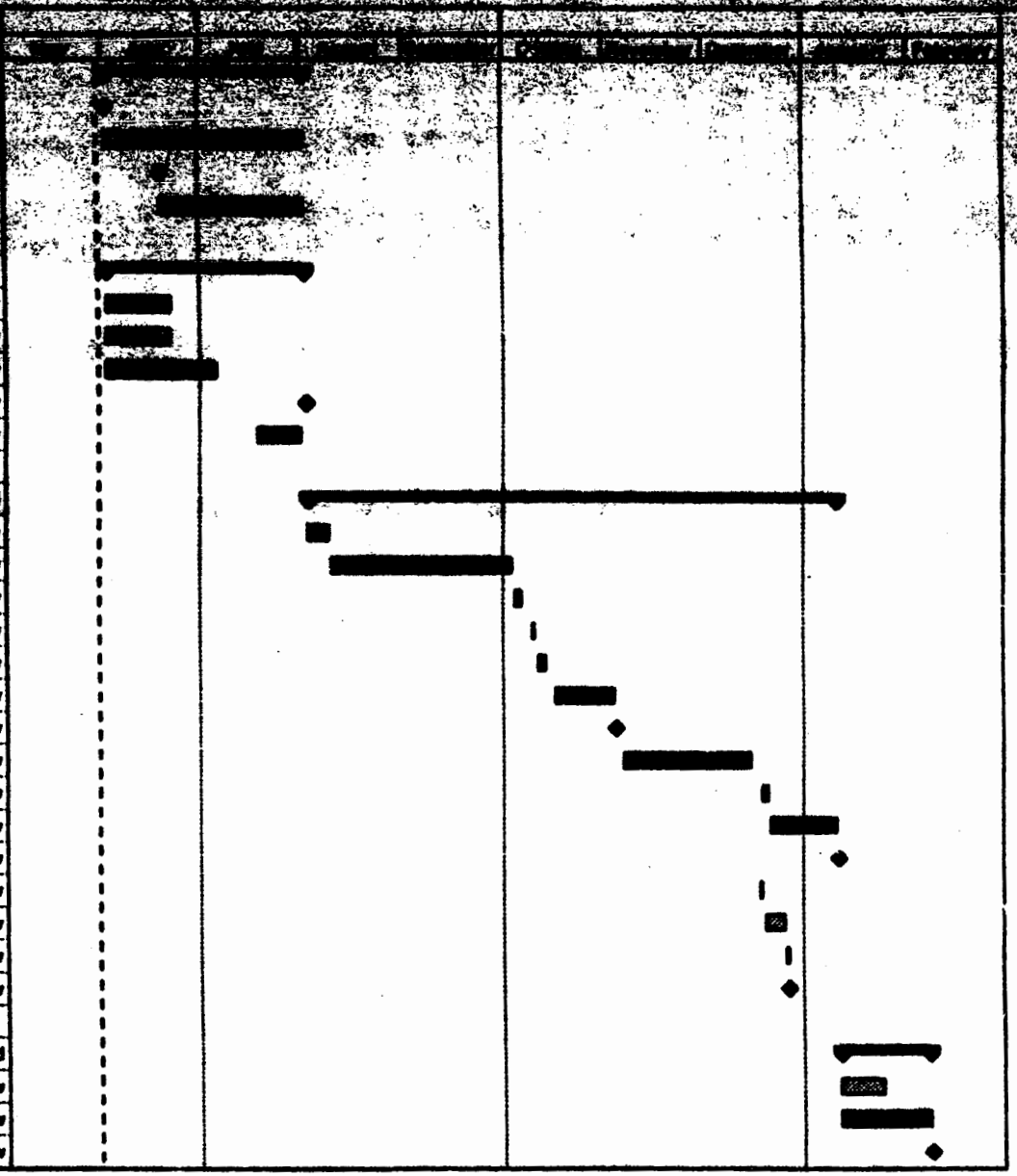
The proposed EC schedule is shown in Table 4-1. The submittal of this plan to EPA in May 1995 will initiate the 60-day public review/comment period. No sooner than 15 days after the start of this period, a public meeting will be held. Preparation for field work will be conducted concurrent to the public review period. Field work will be initiated within 10 days of agency and public approval or receipt of EPA temporary authorization to proceed. The final report will be submitted to EPA within 14 days of receipt of final verification sample results.

4.3 Stakeholder Notifications

Stakeholder notifications are an integral part of the procedure for conducting ECs. The ER Project will notify state and local governments, external and internal stakeholders and individuals on the ER Project mailing list of the availability of the EC Plan. The EC Plan will be available to the stakeholders at the LANL Community reading Room in Los Alamos, at the document repositories in the Los Alamos, Espanola, and Santa Fe public libraries and at the Governor's office at San Ildefonso Pueblo.

The submission of this EC Plan to EPA will trigger publication of a public notice indicating the start of the 60-day comment period.

ID	Task	Duration
1	1.0 [illegible]	[illegible]
2	1.1 [illegible]	[illegible]
3	[illegible]	[illegible]
4	1.3 [illegible]	[illegible]
5	1.4 [illegible] TO FUNDED CONSENT	[illegible]
6		
7	2.0 PLANNING	61.30ed
8	2.1 PREPARE/REVISE HEALTH AND SAFETY PLAN	3w
9	2.2 PREPARE/REVISE WASTE MANAGEMENT PLAN	3w
10	2.3 FIELD WORK PLANNING	5w
11	2.4 FIELD WORK APPROVAL FORM SIGNED	0w
12	2.5 10-DAY NOTIFICATION OF FIELD WORK	2w
13		
14	3.0 IMPLEMENT DEFERRED CLEANUP	181.20ed
15	3.1 MOBILIZATION	1w
16	3.2 PERFORM SURFACE DEBRIS REMOVAL	8w
17	3.3 HOT SPOT EXCAVATION	0.6w
18	3.4 GEOPHYSICAL SURVEY	0.4w
19	3.5 VERIFICATION SAMPLING	0.6w
20	3.6 VERIFICATION ANALYSIS	3w
21	3.7 ANALYSIS COMPLETE	0w
22	3.8 PHASE II EC	6w
23	3.5 VERIFICATION SAMPLING	0.6w
24	3.6 VERIFICATION ANALYSIS	3w
25	3.7 ANALYSIS COMPLETE	0w
26	3.9 ACCEPTANCE INSPECTION	0.2w
27	3.10 SITE RESTORATION	1w
28	3.11 DEMOBILIZATION	0.2w
29	3.12 COMPLETE EC	0w
30		
31	4.0 REPORT PREPARATION	27.36ed
32	4.1 VALIDATE SAMPLE DATA	2w
33	4.2 PREPARE FINAL REPORT	4w
34	4.3 SUBMIT REPORT	0w



Project:
Date: 5/30/95

Critical Noncritical Progress Milestone Summary

Los Alamos National Laboratory

5.0 REFERENCES

DOE (US Department of Energy), October 1987 "Phase I: Installation Assessment, Los Alamos National Laboratory," Volumes 1 and 2 (draft), Comprehensive Environmental Assessment and Response Program, Albuquerque Operations Office, Albuquerque, New Mexico. (DOE 1987, 0264)

EPA (US Environmental Protection Agency), July 27, 1990. "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," proposed rule, Title 40 Parts 264, 265, 270, and 271, Federal Register, Vol. 55, pp. 30798-30884. (EPA 1990, 0432)

EPA (US Environmental Protection Agency), February 1989. "Methods for Evaluating the Attainment of Cleanup Standards," Volume 1: Soils and Solid Media, EPA 230/02-89-042, National Technical Information Service, Springfield, Virginia. (EPA 1989, 0794)

ICF Kaiser, July 1992. "Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities." Prepared by The Office of the Science Advisor, State of California Environmental Protection Agency, Department of Toxic Substances Control

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report LA-UR-90-3400, prepared by International Technology Corporation, Los Alamos, New Mexico. (LANL 1990, 0145)

LANL (Los Alamos National Laboratory), January 1993. "Los Alamos National Laboratory Environmental Restoration Program Standard Operating Procedures," prepared by Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1993, 0875)

LANL (Los Alamos National Laboratory) April 1993. "Administrative and Quality Procedures for Environmental Restoration," prepared by Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1993, 0951)

LANL (Los Alamos National Laboratory), June 1993. "RFI Work Plan for Operable Unit 1157," Los Alamos National Laboratory Report LA-UR-93-1230, Los Alamos, New Mexico. (LANL 1993, 1088)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

LANL (Los Alamos National Laboratory), 1994. "Site Development Plan Annual Update 1994," prepared by Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1994, 1171)

6.0 ANNEXES

6.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

6.2 Quality Assurance Plan

See Quality Program Plan and Quality Assurance Project Plan for Environmental restoration, February 1995 revision, Los Alamos National Laboratory.

6.3 Site-Specific Health and Safety Plan

See Los Alamos National Laboratory Environmental Restoration Project Health and Safety Plan (HASP) (LANL, February 11, 1995).

6.4 Records Management Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter IV, Records Management Program Plan.

6.5 Public Involvement Plan

See Installation Work Plan for Environmental restoration, Revision 4, Chapter V, Public Involvement Program Plan.

6.6 Waste Management Plan

6.7 Field Work Approval Form

6.8 Proposed Outline for Expedited Cleanup Final Report

6.9 RFI Analytical Results

6.10 Risk-Based Cleanup Level Calculations

6.11 Phase I Sampling Calculations

ANNEX 6.7

FIELD WORK APPROVAL FORM

This form must be completed prior to starting remediation field work for Expedited Cleanups that do not have an EPA-approved work plan.

I, _____, DOE-LAAO, APPROVE the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU 9-013, TA-9.

I, _____, DOE-LAAO, DO NOT APPROVE the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU 9-013, TA-9.

The following reasons reflect the decision for disapproval:

Signed: _____ Date: _____

ANNEX 6.8

PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORT

1.0 SUMMARY OF EXPEDITED CLEANUP

- 1.1 Overview
- 1.2 Expedited Cleanup

2.0 DISCUSSION OF SAMPLING AND ANALYSIS

- 2.1 Verification Sampling and Analysis
  - 2.1.1 Sampling Objectives
  - 2.1.2 QA/QC
  - 2.1.3 Sampling Activities
- 2.2 Site Restoration

3.0 MODIFICATIONS TO THE EC PLAN

4.0 QUANTITIES AND TYPES OF WASTE GENERATED

5.0 OUTSTANDING PROBLEMS FROM THE ACCEPTANCE INSPECTION

6.0 PROBLEMS ENCOUNTERED AND LESSONS LEARNED

APPENDICES

- ANALYTICAL DATA
- B ACCEPTANCE INSPECTION CHECKLIST
- C WASTE STREAM INVENTORY
- D PHOTOGRAPHS
- E CERTIFICATION OF COMPLETION

ANNEX 6.9

RFI ANALYTICAL RESULTS

121.4725708

MDA-M Soil Detects above UTL and/or SAL

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
09-7018	0 - 1 ft.	AAB0922	Cadmium	10.1	MG/KG	80	2.7
			Copper	1620	MG/KG	3000	15.7
			Iron	37300	MG/KG	n/a	35586
			Lead	347	MG/KG	400	39
			Mercury	0.25	MG/KG	24	0.1
			Nickel	43.8	MG/KG	1600	26.7
			Silver	26.4 (J)	MG/KG	400	1.61
			Zinc	1650	MG/KG	24000	101
09-7037	0 - 1 ft.	AAB0924	Anthracene	32	MG/KG	24000	4.29
			Arsenic	113	MG/KG	n/a	11.6
			Benzo[a]anthracene	160	MG/KG	1	12.4
			Benzo[a]pyrene	130	MG/KG	0.1	12.1
			Benzo[b]fluoranthene	200	MG/KG	1	12.2
			Benzo[g,h,i]perylene	64	MG/KG	n/a	5.9
			Benzo[k]fluoranthene	77	MG/KG	1	19.4
			Calcium	57700	MG/KG	n/a	54362
			Chrysene	190	MG/KG	96	19.5
			Copper	25.1	MG/KG	3000	15.7
			Dibenzo[a,h]anthracene	23	MG/KG	0.1	2.9
			Dieldrin	0.048 (J)	MG/KG	0.044	n/a
			Fluoranthene	310	MG/KG	3200	32.5
			Indeno[1,2,3-cd]pyrene	80	MG/KG	1	6
			Lead	41.6	MG/KG	400	39
			Phenanthrene	150	MG/KG	n/a	24.2
			Pyrene	280	MG/KG	2400	12.8
			Zinc	105	MG/KG	24000	101
09-7054	0 - 1 ft.	AAB0926	Cadmium	4.6	MG/KG	80	2.7
			Copper	188	MG/KG	3000	15.7
			Lead	201	MG/KG	400	39
			Mercury	0.26	MG/KG	24	0.1
			Nickel	32	MG/KG	1600	26.7
			Silver	9.6 (J)	MG/KG	400	1.61
			Zinc	516	MG/KG	24000	101
09-7058	0 - 1 ft.	AAB0928	Copper	48.3	MG/KG	3000	15.7
			Lead	40.6	MG/KG	400	39
			Mercury	0.34	MG/KG	24	0.1
			Zinc	1660	MG/KG	24000	101
09-7061	0 - 1 ft.	AAB0930	Calcium	103000	MG/KG	n/a	54362
			Copper	24.2	MG/KG	3000	15.7
			Lead	119	MG/KG	400	39
			Zinc	185	MG/KG	24000	101
09-7085	0 - 1 ft.	AAB0932	Barium	1470	MG/KG	5600	1143
			Cadmium	25.6	MG/KG	80	2.7
			Chromium	43.1	MG/KG	n/a	34.2
			Copper	1190	MG/KG	3000	15.7
			Lead	882	MG/KG	400	39
			Mercury	0.58	MG/KG	24	0.1
			Nickel	62.9	MG/KG	1600	26.7
			Silver	107 (J)	MG/KG	400	1.61
			Zinc	2790	MG/KG	24000	101
09-7093	0 - 1 ft.	AAB0934	Antimony	22.2	MG/KG	32	2.5
			Arsenic	13	MG/KG	n/a	11.6

MDA-M Soil Detects above UTL and/or SAL

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Barium	2090	MG/KG	5600	1143
			Cadmium	13.7	MG/KG	80	2.7
			Chromium	38.6	MG/KG	n/a	34.2
			Copper	2820	MG/KG	3000	15.7
			Iron	42800	MG/KG	n/a	35586
			Lead	4930	MG/KG	400	39
			Nickel	85.9	MG/KG	1600	26.7
			Silver	102 (J)	MG/KG	400	1.61
			Zinc	4550	MG/KG	24000	101
09-7104	0 - 1 ft.	AAB0936	Cadmium	3.4	MG/KG	80	2.7
			Copper	73.5	MG/KG	3000	15.7
			Lead	9850	MG/KG	400	39
			Zinc	109	MG/KG	24000	101
09-7104	0 - 1 ft.	AAB0938	Copper	34	MG/KG	3000	15.7
			Lead	60.6	MG/KG	400	39
09-7130	0 - 1 ft.	AAB0942	Copper	21.4	MG/KG	3000	15.7
			Lead	40.8	MG/KG	400	39
			Mercury	0.33	MG/KG	24	0.1
09-7142	0 - 1 ft.	AAB0944	Cadmium	3.1	MG/KG	80	2.7
09-7143	0 - 1 ft.	AAB0946	Manganese	1250	MG/KG	11000	1030
09-7162	0 - 1 ft.	AAB2786	Cadmium	3.5	MG/KG	80	2.7
09-7301	0 - 1 ft.	AAB2738	Cadmium	6.7	MG/KG	80	2.7
			Copper	829	MG/KG	3000	15.7
			Lead	10200 (J)	MG/KG	400	39
			Manganese	1240	MG/KG	11000	1030
			Mercury	0.67	MG/KG	24	0.1
			Nickel	30.4	MG/KG	1600	26.7
			Silver	41.6	MG/KG	400	1.61
			Zinc	604	MG/KG	24000	101
09-7303	0 - 1 ft.	AAB2742	Antimony	18.4	MG/KG	32	2.5
			Aroclor 1254	2.6	MG/KG	1	n/a
			Barium	1300	MG/KG	5600	1143
			Benzo[a]pyrene	1	MG/KG	0.1	12.1
			Benzo[b]fluoranthene	1.3	MG/KG	1	12.2
			Cadmium	13.4	MG/KG	80	2.7
			Copper	592	MG/KG	3000	15.7
			Dibenzo[a,h]anthracene	0.7	MG/KG	0.1	2.9
			Lead	695 (J)	MG/KG	400	39
			Mercury	0.78	MG/KG	24	0.1
			Nickel	52.4	MG/KG	1600	26.7
			Silver	61.4	MG/KG	400	1.61
			Zinc	1620	MG/KG	24000	101
09-7304	0 - 1 ft.	AAB2744	Antimony	271	MG/KG	32	2.5
			Cadmium	5.4	MG/KG	80	2.7
			Copper	95.5	MG/KG	3000	15.7
			Lead	11600 (J)	MG/KG	400	39
			Mercury	29	MG/KG	24	0.1
			Zinc	1820	MG/KG	24000	101
09-7306	0 - 1 ft.	AAB2748	Copper	27.3	MG/KG	3000	15.7
09-7307	0 - 1 ft.	AAB2750	Cadmium	3.8	MG/KG	80	2.7
			Copper	101	MG/KG	3000	15.7

MDA-M Soil Detects above UTL and/or SAL

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Lead	2310 (J)	MG/KG	400	39
			Silver	3.1	MG/KG	400	1.61
			Zinc	499	MG/KG	24000	101
09-7308	0 - 1 ft.	AAB2752	Barium	2130	MG/KG	5600	1143
			Cadmium	10	MG/KG	80	2.7
			Cadmium	10.7	MG/KG	80	2.7
			Copper	725	MG/KG	3000	15.7
			Copper	4770	MG/KG	3000	15.7
			Lead	497 (J)	MG/KG	400	39
			Lead	1075	MG/KG	400	39
			Mercury	0.12	MG/KG	24	0.1
			Nickel	53.6	MG/KG	1600	26.7
			Nickel	66.6	MG/KG	1600	26.7
			Silver	71.4	MG/KG	400	1.61
			Silver	85.3	MG/KG	400	1.61
			Zinc	1120	MG/KG	24000	101
			Zinc	1039	MG/KG	24000	101
09-7308	0 - 1 ft.	AAB2754	Barium	1160	MG/KG	5600	1143
			Cadmium	24.4	MG/KG	80	2.7
			Copper	2110	MG/KG	3000	15.7
			Iron	64600	MG/KG	n/a	35586
			Lead	422 (J)	MG/KG	400	39
			Mercury	0.13	MG/KG	24	0.1
			Nickel	57.7	MG/KG	1600	26.7
			Silver	83.7	MG/KG	400	1.61
			Zinc	900	MG/KG	24000	101
09-7309	0 - 1 ft.	AAB2756	Cadmium	4.4	MG/KG	80	2.7
			Cadmium	2.8	MG/KG	80	2.7
			Copper	81	MG/KG	3000	15.7
			Copper	131	MG/KG	3000	15.7
			Lead	49.6	MG/KG	400	39
			Lead	42.5	MG/KG	400	39
			Zinc	399	MG/KG	24000	101
			Zinc	486	MG/KG	24000	101
09-7310	0 - 1 ft.	AAB2758	Copper	42762	MG/KG	3000	15.7
			Copper	10100	MG/KG	3000	15.7
			Lead	145	MG/KG	400	39
			Lead	162	MG/KG	400	39
			Mercury	0.25	MG/KG	24	0.1
			Mercury	0.28	MG/KG	24	0.1
			Silver	2.44	MG/KG	400	1.61
			Uranium-234	150.622	PCI/G	86	2.03
			Uranium-234	140.527	PCI/G	86	2.03
			Uranium-235	7.027	PCI/G	18	0.088
			Uranium-235	6.718	PCI/G	18	0.088
			Uranium-238	144.503	PCI/G	59	1.9
			Uranium-238	149.741	PCI/G	59	1.9
			Zinc	720.58	MG/KG	24000	101
			Zinc	3790	MG/KG	24000	101
09-7311	0 - 1 ft.	AAB2760	Copper	76.8	MG/KG	3000	15.7
			Lead	65.7	MG/KG	400	39
			Silver	5.9	MG/KG	400	1.61

MDA-M Soil Detects above UTL and/or SAL

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Zinc	151	MG/KG	24000	101
09-7312	0 - 1 ft.	AAB2762	Aroclor 1254	1.6	MG/KG	1	n/a
			Barium	1290	MG/KG	5600	1143
			Cadmium	12.4	MG/KG	80	2.7
			Copper	770	MG/KG	3000	15.7
			Lead	528	MG/KG	400	39
			Mercury	1.4	MG/KG	24	0.1
			Nickel	37.9	MG/KG	1600	26.7
			Silver	109	MG/KG	400	1.61
			Zinc	1680	MG/KG	24000	101
09-7313	0 - 1 ft.	AAB2764	Cadmium	4.4	MG/KG	80	2.7
			Copper	73.7	MG/KG	3000	15.7
			Lead	43.3	MG/KG	400	39
			Silver	10.6	MG/KG	400	1.61
			Zinc	137	MG/KG	24000	101
09-7314	0 - 1 ft.	AAB2766	Cadmium	5.5	MG/KG	80	2.7
			Calcium	122000	MG/KG	n/a	54362
			Copper	66.1	MG/KG	3000	15.7
			Lead	52	MG/KG	400	39
			Silver	6.8	MG/KG	400	1.61
			Zinc	185	MG/KG	24000	101
09-7315	0 - 1 ft.	AAB2770	Cadmium	13.2	MG/KG	80	2.7
			Copper	56.3	MG/KG	3000	15.7
			Iron	88600	MG/KG	n/a	35586
09-7316	0 - 1 ft.	AAB2772	Arsenic	14.4	MG/KG	n/a	11.6
			Benzo[a]anthracene	4.7	MG/KG	1	12.4
			Benzo[a]pyrene	3.1	MG/KG	0.1	12.1
			Benzo[b]fluoranthene	4.9	MG/KG	1	12.2
			Benzo[k]fluoranthene	1.5	MG/KG	1	19.4
			Cadmium	13.3	MG/KG	80	2.7
			Chromium	51.6	MG/KG	n/a	34.2
			Copper	262	MG/KG	3000	15.7
			Dibenzo[a,h]anthracene	0.58	MG/KG	0.1	2.9
			Indeno[1,2,3-cd]pyrene	1.8	MG/KG	1	6
			Iron	76400	MG/KG	n/a	35586
			Lead	472	MG/KG	400	39
			Mercury	0.24	MG/KG	24	0.1
			Nickel	53.1	MG/KG	1600	26.7
			Silver	10	MG/KG	400	1.61
			Zinc	1200	MG/KG	24000	101
09-7317	0 - 1 ft.	AAB2774	Cadmium	3.6	MG/KG	80	2.7
			Zinc	115	MG/KG	24000	101
09-7330	0 - 1 ft.	AAB2776	Cadmium	4.4	MG/KG	80	2.7
			Lead	212	MG/KG	400	39
			Zinc	173	MG/KG	24000	101
09-7502	0 - 1 ft.	AAB2782	Lead	165	MG/KG	400	39
09-7502	0 - 1 ft.	AAB2784	Copper	49.3	MG/KG	3000	15.7
n/a Not available.							

J - The associated numerical value is an estimated quantity.

R - The data are unusable (compound may or may not be present).

MDA-M Water Detects above SAL

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
09-7400	NA	AAB2787	Arsenic	200	UG/L	50
			Beryllium	23.8	UG/L	4
			Cadmium	7.2	UG/L	5
			Cadmium	16.3	UG/L	5
			Chromium	225	UG/L	100
			Manganese	884	UG/L	180
			Mercury	6.6	UG/L	2
			Mercury	10.5	UG/L	2
			Nickel	276	UG/L	100
09-7401	NA	AAB2788	Arsenic	120	UG/L	50
			Barium	2 80	UG/L	2000
09-7402	NA	AAB2789	Arsenic	91.9	UG/L	50
			Lead	57.5	UG/L	50
			Manganese	336	UG/L	180
09-7403	NA	AAB2790	Lead	168	UG/L	50
			Selenium	620	UG/L	50
09-7491	NA	AAB6101	Antimony	23.5	UG/L	6
			Beryllium	13	UG/L	4
			Beryllium	13.9	UG/L	4
			Cadmium	26.3	UG/L	5
			Cadmium	29.3	UG/L	5
			Chromium	111	UG/L	100
			Lead	123	UG/L	50
			Lead	123	UG/L	50
			Manganese	1937	UG/L	180
			Manganese	2000	UG/L	180
			Vanadium	266	UG/L	240
09-7492	NA	AAB6102	Antimony	94.8	UG/L	6
			Barium	2740	UG/L	2000
			Beryllium	19.3	UG/L	4
			Cadmium	40.2	UG/L	5
			Chromium	144	UG/L	100
			Lead	147	UG/L	50
			Manganese	2770	UG/L	180
			Nickel	112	UG/L	100
			Vanadium	370	UG/L	240
09-7493	NA	AAB5557	Antimony	24.6	UG/L	6
			Lead	119	UG/L	50
			Lead	121	UG/L	50
			Manganese	991	UG/L	180
			Manganese	794	UG/L	180
			Methylene chloride	6	UG/L	5
09-7550	0 - 0.5 ft.	AAC0206	Dinitrotoluene [2,4-]	1.52	UG/L	0.05
09-7561	0 - 0.5 ft.	AAC0209	Dinitrotoluene [2,4-]	0.9	UG/L	0.05

n/a Not available.

NA Not applicable.

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
09-7006	0 - 1 ft.	AAB0918	Aluminium	3040	MG/KG	n/a	123000
			Arsenic	7.3	MG/KG	n/a	11.6
			Barium	63.7	MG/KG	5600	1143
			Calcium	3160	MG/KG	n/a	54362
			Chromium	3.1	MG/KG	n/a	34.2
			Cyanide	0.53 (R)	MG/KG	1600	n/a
			Iron	3560	MG/KG	n/a	35586
			Lead	10.7	MG/KG	400	39
			Manganese	125	MG/KG	11000	1030
			Zinc	17.1	MG/KG	24000	101
09-7014	0 - 1 ft.	AAB0920	Aluminium	6303	MG/KG	n/a	123000
			Aluminium	8090	MG/KG	n/a	123000
			Arsenic	2.3	MG/KG	n/a	11.6
			Arsenic	2.3	MG/KG	n/a	11.6
			Barium	157	MG/KG	5600	1143
			Barium	117	MG/KG	5600	1143
			Beryllium	0.52	MG/KG	n/a	3.31
			Cadmium	1.5	MG/KG	80	2.7
			Cadmium	1.8	MG/KG	80	2.7
			Calcium	1041	MG/KG	n/a	54362
			Calcium	1090	MG/KG	n/a	54362
			Chromium	4.2	MG/KG	n/a	34.2
			Chromium	6.5	MG/KG	n/a	34.2
			Cobalt	11.8	MG/KG	n/a	51.1
			Cobalt	11.2	MG/KG	n/a	51.1
			Copper	13.7	MG/KG	3000	15.7
			Copper	13.3	MG/KG	3000	15.7
			Cyanide	0.54 (R)	MG/KG	1600	n/a
			Diethyl phthalate	0.46	MG/KG	64000	n/a
			Iron	7421	MG/KG	n/a	35586
			Iron	8740	MG/KG	n/a	35586
			Lead	19	MG/KG	400	39
			Lead	26.2	MG/KG	400	39
			Magnesium	1077	MG/KG	n/a	16147
			Magnesium	1650	MG/KG	n/a	16147
			Manganese	587	MG/KG	11000	1030
			Manganese	602	MG/KG	11000	1030
			Nickel	5.6	MG/KG	1600	26.7
			Potassium	1230	MG/KG	n/a	6179
			Potassium	927	MG/KG	n/a	6179
			Sodium	195	MG/KG	n/a	1884
			Vanadium	16.9	MG/KG	560	66
			Vanadium	14.7	MG/KG	560	66
			Zinc	22.3	MG/KG	24000	101
			Zinc	16.6	MG/KG	24000	101
09-7018	0 - 1 ft.	AAB0922	Aluminium	21900	MG/KG	n/a	123000
			Arsenic	6.3	MG/KG	n/a	11.6
			Barium	957	MG/KG	5600	1143
			Cadmium	10.1	MG/KG	80	2.7
			Calcium	25500	MG/KG	n/a	54362
			Chromium	33.5	MG/KG	n/a	34.2
			Copper	1620	MG/KG	3000	15.7

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Cyanide	0.62 (R)	MG/KG	1600	n/a
			Iron	37300	MG/KG	n/a	35586
			Lead	347	MG/KG	400	39
			Magnesium	8550	MG/KG	n/a	16147
			Manganese	920	MG/KG	11000	1030
			Mercury	0.25	MG/KG	24	0.1
			Nickel	43.8	MG/KG	1600	26.7
			Potassium	2690	MG/KG	n/a	6179
			Silver	26.4 (J)	MG/KG	400	1.61
			Vanadium	17	MG/KG	560	66
			Zinc	1650	MG/KG	24000	101
09-7037	0 - 1 ft.	AAB0924	Aluminium	8590	MG/KG	n/a	123000
			Anthracene	32	MG/KG	24000	4.29
			Arsenic	113	MG/KG	n/a	11.6
			Barium	128	MG/KG	5600	1143
			Benzo[a]anthracene	160	MG/KG	1	12.4
			Benzo[a]pyrene	130	MG/KG	0.1	12.1
			Benzo[b]fluoranthene	200	MG/KG	1	12.2
			Benzo[g,h,i]perylene	64	MG/KG	n/a	5.9
			Benzo[k]fluoranthene	77	MG/KG	1	19.4
			Cadmium	1.9	MG/KG	80	2.7
			Calcium	57700	MG/KG	n/a	54362
			Chlordane [alpha-]	0.016 (J)	MG/KG	n/a	n/a
			Chromium	7.9	MG/KG	n/a	34.2
			Chrysene	190	MG/KG	96	19.5
			Copper	25.1	MG/KG	3000	15.7
			DDE [p,p'-]	0.0099 (J)	MG/KG	2.1	n/a
			Dibenzo[a,h]anthracene	23	MG/KG	0.1	2.9
			Dieldrin	0.048 (J)	MG/KG	0.044	n/a
			Endosulfan I	0.017 (J)	MG/KG	n/a	n/a
			Endosulfan II	0.024 (J)	MG/KG	n/a	n/a
			Endrin	0.082 (J)	MG/KG	24	n/a
			Fluoranthene	310	MG/KG	3200	32.5
			Heptachlor	0.0061 (J)	MG/KG	0.16	n/a
			Indeno[1,2,3-cd]pyrene	80	MG/KG	1	6
			Iron	7570	MG/KG	n/a	35586
			Lead	41.6	MG/KG	400	39
			Lindane	0.0041 (J)	MG/KG	0.54	n/a
			Magnesium	2100	MG/KG	n/a	16147
			Manganese	330	MG/KG	11000	1030
			Methoxychlor	0.052 (J)	MG/KG	400	n/a
			Phenanthrene	150	MG/KG	n/a	24.2
			Pyrene	280	MG/KG	2400	12.8
			Vanadium	14.1	MG/KG	560	66
			Zinc	105	MG/KG	24000	101
09-7054	0 - 1 ft.	AAB0926	Aluminium	10600	MG/KG	n/a	123000
			Arsenic	5.5	MG/KG	n/a	11.6
			Barium	701	MG/KG	5600	1143
			Cadmium	4.6	MG/KG	80	2.7
			Calcium	9190	MG/KG	n/a	54362
			Chromium	15.6	MG/KG	n/a	34.2
			Copper	188	MG/KG	3000	15.7

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			DDE [p,p'-]	0.0048	MG/KG	2.1	n/a
			DDT [p,p'-]	0.0046	MG/KG	2.1	n/a
			Endosulfan I	0.0064	MG/KG	n/a	n/a
			Iron	15800	MG/KG	n/a	35586
			Lead	201	MG/KG	400	39
			Magnesium	3290	MG/KG	n/a	16147
			Manganese	532	MG/KG	11000	1030
			Mercury	0.26	MG/KG	24	0.1
			Nickel	32	MG/KG	1600	26.7
			Potassium	2020	MG/KG	n/a	6179
			Silver	9.6 (J)	MG/KG	400	1.61
			Vanadium	18.5	MG/KG	560	66
			Zinc	516	MG/KG	24000	101
09-7058	0 - 1 ft.	AAB0928	Aluminium	6120	MG/KG	n/a	123000
			Barium	126	MG/KG	5600	1143
			Cadmium	1.8	MG/KG	80	2.7
			Calcium	1580	MG/KG	n/a	54362
			Chromium	8	MG/KG	n/a	34.2
			Copper	48.3	MG/KG	3000	15.7
			Iron	6350	MG/KG	n/a	35586
			Lead	40.6	MG/KG	400	39
			Manganese	347	MG/KG	11000	1030
			Mercury	0.34	MG/KG	24	0.1
			Potassium	1470	MG/KG	n/a	6179
			Zinc	1660	MG/KG	24000	101
09-7061	0 - 1 ft.	AAB0930	Aluminium	6740	MG/KG	n/a	123000
			Arsenic	10.6	MG/KG	n/a	11.6
			Barium	112	MG/KG	5600	1143
			Cadmium	2.5	MG/KG	80	2.7
			Calcium	103000	MG/KG	n/a	54362
			Chromium	7.8	MG/KG	n/a	34.2
			Copper	24.2	MG/KG	3000	15.7
			Iron	11000	MG/KG	n/a	35586
			Lead	119	MG/KG	400	39
			Magnesium	2610	MG/KG	n/a	16147
			Manganese	175	MG/KG	11000	1030
			Zinc	185	MG/KG	24000	101
09-7085	0 - 1 ft.	AAB0932	Aluminium	12800	MG/KG	n/a	123000
			Arsenic	9.1	MG/KG	n/a	11.6
			Barium	1470	MG/KG	5600	1143
			Cadmium	25.6	MG/KG	80	2.7
			Calcium	38800	MG/KG	n/a	54362
			Chromium	43.1	MG/KG	n/a	34.2
			Copper	1190	MG/KG	3000	15.7
			Iron	30800	MG/KG	n/a	35586
			Lead	882	MG/KG	400	39
			Magnesium	9990	MG/KG	n/a	16147
			Manganese	785	MG/KG	11000	1030
			Mercury	0.58	MG/KG	24	0.1
			Nickel	62.9	MG/KG	1600	26.7
			Potassium	3010	MG/KG	n/a	6179
			Silver	107 (J)	MG/KG	400	1.61

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Vanadium	21.5	MG/KG	560	66
			Zinc	2790	MG/KG	24000	101
9-7093	0 - 1 ft.	AAB0934	Aluminium	16600	MG/KG	n/a	123000
			Antimony	22.2	MG/KG	32	2.5
			Arsenic	13	MG/KG	n/a	11.6
			Barium	2090	MG/KG	5600	1143
			Cadmium	13.7	MG/KG	80	2.7
			Calcium	39800	MG/KG	n/a	54362
			Chromium	38.6	MG/KG	n/a	34.2
			Cobalt	21.1	MG/KG	n/a	51.1
			Copper	2820	MG/KG	3000	15.7
			Iron	42800	MG/KG	n/a	35586
			Lead	4930	MG/KG	400	39
			Magnesium	7530	MG/KG	n/a	16147
			Manganese	924	MG/KG	11000	1030
			Nickel	85.9	MG/KG	1600	26.7
			Potassium	3200	MG/KG	n/a	6179
			Silver	102 (J)	MG/KG	400	1.61
			Sodium	1540 (J)	MG/KG	n/a	1884
			Vanadium	24.2	MG/KG	560	66
			Zinc	4550	MG/KG	24000	101
09-7104	0 - 1 ft.	AAB0936	Aluminium	6680	MG/KG	n/a	123000
			Barium	133	MG/KG	5600	1143
			Cadmium	3.4	MG/KG	80	2.7
			Calcium	1570	MG/KG	n/a	54362
			Chromium	6.9	MG/KG	n/a	34.2
			Copper	73.5	MG/KG	3000	15.7
			Iron	492	MG/KG	n/a	35586
			Lead	9850	MG/KG	400	39
			Magnesium	1380	MG/KG	n/a	16147
			Manganese	573	MG/KG	11000	1030
			Potassium	1450	MG/KG	n/a	6179
			Vanadium	17.6	MG/KG	560	66
			Zinc	109	MG/KG	24000	101
09-7104	0 - 1 ft.	AAB0938	Aluminium	7100	MG/KG	n/a	123000
			Barium	124	MG/KG	5600	1143
			Cadmium	2.3	MG/KG	80	2.7
			Calcium	1420	MG/KG	n/a	54362
			Chromium	6.6	MG/KG	n/a	34.2
			Copper	34	MG/KG	3000	15.7
			Cyanide	0.64 (R)	MG/KG	1600	n/a
			Iron	8780	MG/KG	n/a	35586
			Lead	60.6	MG/KG	400	39
			Magnesium	1440	MG/KG	n/a	16147
			Manganese	463	MG/KG	11000	1030
			Potassium	1510	MG/KG	n/a	6179
			Vanadium	16.8	MG/KG	560	66
			Zinc	59.6	MG/KG	24000	101
09-7104	0 - 1 ft.	AAB0939	Carbon disulfide	0.0098	MG/KG	7.4	n/a
09-7126	0 - 1 ft.	AAB0940	Aluminium	17400	MG/KG	n/a	123000
			Arsenic	3.3	MG/KG	n/a	11.6
			Barium	192	MG/KG	5600	1143

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Beryllium	1.2	MG/KG	n/a	3.31
			Cadmium	2.3	MG/KG	80	2.7
			Calcium	2310	MG/KG	n/a	54362
			Chromium	8.4	MG/KG	n/a	34.2
			Copper	9.3	MG/KG	3000	15.7
			Cyanide	0.62 (R)	MG/KG	1600	n/a
			Iron	14200	MG/KG	n/a	35586
			Lead	16.5	MG/KG	400	39
			Magnesium	2590	MG/KG	n/a	16147
			Manganese	348	MG/KG	11000	1030
			Potassium	2010	MG/KG	n/a	6179
			Vanadium	22.8	MG/KG	560	66
			Zinc	28.4	MG/KG	24000	101
09-7126	0 - 1 ft.	AAB0941	Carbon disulfide	0.012	MG/KG	7.4	n/a
09-7130	0 - 1 ft.	AAB0942	Aluminium	5980	MG/KG	n/a	123000
			Arsenic	2.7	MG/KG	n/a	11.6
			Barium	178	MG/KG	5600	1143
			Benzo(b)fluoranthene	0.39	MG/KG	1	12.2
			Cadmium	1.5	MG/KG	80	2.7
			Calcium	31700	MG/KG	n/a	54362
			Chromium	4.6	MG/KG	n/a	34.2
			Copper	21.4	MG/KG	3000	15.7
			Cyanide	0.58 (R)	MG/KG	1600	n/a
			Fluoranthene	0.87	MG/KG	3200	32.5
			Iron	7300	MG/KG	n/a	35586
			Lead	40.8	MG/KG	400	39
			Magnesium	1500	MG/KG	n/a	16147
			Manganese	194	MG/KG	11000	1030
			Mercury	0.33	MG/KG	24	0.1
			Phenanthrene	0.73	MG/KG	n/a	24.2
			Potassium	1240	MG/KG	n/a	6179
			Pyrene	0.72	MG/KG	2400	12.8
			Zinc	67	MG/KG	24000	101
09-7130	0 - 1 ft.	AAB0943	Carbon disulfide	0.007	MG/KG	7.4	n/a
09-7142	0 - 1 ft.	AAB0944	Aluminium	19600	MG/KG	n/a	123000
			Arsenic	3.7	MG/KG	n/a	11.6
			Barium	127	MG/KG	5600	1143
			Beryllium	1.2	MG/KG	n/a	3.31
			Cadmium	3.1	MG/KG	80	2.7
			Calcium	2600	MG/KG	n/a	54362
			Chromium	9.9	MG/KG	n/a	34.2
			Copper	14.6	MG/KG	3000	15.7
			Cyanide	0.62 (R)	MG/KG	1600	n/a
			Iron	16400	MG/KG	n/a	35586
			Lead	19.1	MG/KG	400	39
			Magnesium	2770	MG/KG	n/a	16147
			Manganese	359	MG/KG	11000	1030
			Potassium	2030	MG/KG	n/a	6179
			Vanadium	26.7	MG/KG	560	66
			Zinc	32.7	MG/KG	24000	101
09-7143	0 - 1 ft.	AAB0946	Aluminium	6920	MG/KG	n/a	123000
			Arsenic	2.7	MG/KG	n/a	11.6

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Barium	116	MG/KG	5600	1143
			Cadmium	2.2	MG/KG	80	2.7
			Calcium	1570	MG/KG	n/a	54362
			Chromium	7.5	MG/KG	n/a	34.2
			Cobalt	16.8	MG/KG	n/a	51.1
			Copper	6.2	MG/KG	3000	15.7
			Cyanide	0.59 (R)	MG/KG	1600	n/a
			Iron	10500	MG/KG	n/a	35586
			Lead	12.6	MG/KG	400	39
			Magnesium	1320	MG/KG	n/a	16147
			Manganese	1250	MG/KG	11000	1030
			Nickel	12.6	MG/KG	1600	26.7
			Potassium	1170	MG/KG	n/a	6179
			Vanadium	23.7	MG/KG	560	66
			Zinc	18.3	MG/KG	24000	101
09-7162	0 - 1 ft.	AAB2786	Aluminium	4720	MG/KG	n/a	123000
			Arsenic	4	MG/KG	n/a	11.6
			Barium	136	MG/KG	5600	1143
			Cadmium	3.5	MG/KG	80	2.7
			Chromium	6.7	MG/KG	n/a	34.2
			Iron	9410	MG/KG	n/a	35586
			Lead	28	MG/KG	400	39
			Manganese	243	MG/KG	11000	1030
			Methylene chloride	0.014	MG/KG	5.6	n/a
			Vanadium	20.6	MG/KG	560	66
			Zinc	69.2	MG/KG	24000	101
09-7300	0 - 1 ft.	AAB0948	Aluminium	11700	MG/KG	n/a	123000
			Barium	171	MG/KG	5600	1143
			Cadmium	2.3	MG/KG	80	2.7
			Calcium	1750	MG/KG	n/a	54362
			Chromium	6.6	MG/KG	n/a	34.2
			Copper	8.4	MG/KG	3000	15.7
			Iron	10900	MG/KG	n/a	35586
			Lead	13 (J)	MG/KG	400	39
			Magnesium	1920	MG/KG	n/a	16147
			Manganese	411	MG/KG	11000	1030
			Potassium	1650	MG/KG	n/a	6179
			Vanadium	21.4	MG/KG	560	66
			Zinc	27.4	MG/KG	24000	101
09-7300	0 - 1 ft.	AAB2737	Methylene chloride	0.033	MG/KG	5.6	n/a
09-7301	0 - 1 ft.	AAB2738	Aluminium	7480	MG/KG	n/a	123000
			Barium	479	MG/KG	5600	1143
			Cadmium	6.7	MG/KG	80	2.7
			Calcium	8500	MG/KG	n/a	54362
			Chromium	13.6	MG/KG	n/a	34.2
			Cobalt	14.2	MG/KG	n/a	51.1
			Copper	829	MG/KG	3000	15.7
			DDT [p,p'-]	0.0096	MG/KG	2.1	n/a
			Iron	21600	MG/KG	n/a	35586
			Lead	10200 (J)	MG/KG	400	39
			Magnesium	1980	MG/KG	n/a	16147
			Manganese	1240	MG/KG	11000	1030

MCA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Mercury	0.67	MG/KG	24	0.1
			Nickel	30.4	MG/KG	1600	26.7
			Potassium	1640	MG/KG	n/a	6179
			Silver	41.6	MG/KG	400	1.61
			Vanadium	16.9	MG/KG	560	66
			Zinc	604	MG/KG	24000	101
09-7302	0 - 1 ft.	AAB2740	Aluminium	7640	MG/KG	n/a	123000
			Barium	122	MG/KG	5600	1143
			Cadmium	1.6	MG/KG	80	2.7
			Calcium	2440	MG/KG	n/a	54362
			Chromium	5.3	MG/KG	n/a	34.2
			DDT [p,p'-]	0.0072	MG/KG	2.1	n/a
			Iron	7790	MG/KG	n/a	35586
			Lead	12.4 (J)	MG/KG	400	39
			Manganese	353	MG/KG	11000	1030
			Zinc	24.6	MG/KG	24000	101
09-7303	0 - 1 ft.	AAB2742	Aluminium	11500	MG/KG	n/a	123000
			Antimony	18.4	MG/KG	32	2.5
			Aroclor 1254	2.6	MG/KG	1	n/a
			Arsenic	8.3	MG/KG	n/a	11.6
			Barium	1300	MG/KG	5600	1143
			Benzo[a]anthracene	0.95	MG/KG	1	12.4
			Benzo[a]pyrene	1	MG/KG	0.1	12.1
			Benzo[b]fluoranthene	1.3	MG/KG	1	12.2
			Benzo[g,h,i]perylene	0.54	MG/KG	n/a	5.9
			Cadmium	13.4	MG/KG	80	2.7
			Calcium	36200	MG/KG	n/a	54362
			Chromium	29.6	MG/KG	n/a	34.2
			Chrysene	0.97	MG/KG	96	19.5
			Cobalt	24.9	MG/KG	n/a	51.1
			Copper	592	MG/KG	3000	15.7
			DDT [p,p'-]	0.032	MG/KG	2.1	n/a
			Dibenzo[a,h]anthracene	0.7	MG/KG	0.1	2.9
			Fluoranthene	1	MG/KG	3200	32.5
			Indeno[1,2,3-cd]pyrene	0.64	MG/KG	1	6
			Iron	30700	MG/KG	n/a	35586
			Lead	695 (J)	MG/KG	400	39
			Magnesium	4770	MG/KG	n/a	16147
			Manganese	643	MG/KG	11000	1030
			Mercury	0.78	MG/KG	24	0.1
			Nickel	52.4	MG/KG	1600	26.7
			Potassium	2710	MG/KG	n/a	6179
			Pyrene	1.1	MG/KG	2400	12.8
			Silver	61.4	MG/KG	400	1.61
			Vanadium	18.1	MG/KG	560	66
			Zinc	1620	MG/KG	24000	101
09-7303	0 - 1 ft.	AAB2743	Methylene chloride	0.011 (J)	MG/KG	5.6	n/a
09-7304	0 - 1 ft.	AAB2744	Aluminium	6950	MG/KG	n/a	123000
			Antimony	271	MG/KG	32	2.5
			Arsenic	11.5	MG/KG	n/a	11.6
			Barium	917	MG/KG	5600	1143
			Benzo[b]fluoranthene	0.88	MG/KG	1	12.2

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Benzo(b)fluoranthene	0.88	MG/KG	1	12.2
			Cadmium	5.4	MG/KG	80	2.7
			Calcium	7660	MG/KG	n/a	54362
			Chromium	31.4	MG/KG	n/a	34.2
			Chrysene	0.57	MG/KG	96	19.5
			Chrysene	0.57	MG/KG	96	19.5
			Copper	95.5	MG/KG	3000	15.7
			Cyanide	4.2 (R)	MG/KG	1600	n/a
			Endrin	0.13 (J)	MG/KG	24	n/a
			Fluoranthene	1.6	MG/KG	3200	32.5
			Fluoranthene	1.6	MG/KG	3200	32.5
			Iron	25200	MG/KG	n/a	35586
			Lead	11600 (J)	MG/KG	400	39
			Magnesium	3870	MG/KG	n/a	16147
			Manganese	432	MG/KG	11000	1030
			Mercury	29	MG/KG	24	0.1
			Nickel	12.2	MG/KG	1600	26.7
			Phenanthrene	1.5	MG/KG	n/a	24.2
			Phenanthrene	1.5	MG/KG	n/a	24.2
			Pyrene	1.2	MG/KG	2400	12.8
			Pyrene	1.2	MG/KG	2400	12.8
			Vanadium	13.8	MG/KG	560	66
			Zinc	1820	MG/KG	24000	101
09-7306	0 - 1 ft.	AAB2748	Aluminium	6230	MG/KG	n/a	123000
			Barium	273	MG/KG	5600	1143
			Cadmium	1.7	MG/KG	80	2.7
			Chromium	4.4	MG/KG	n/a	34.2
			Copper	27.3	MG/KG	3000	15.7
			Iron	7850	MG/KG	n/a	35586
			Lead	36 (J)	MG/KG	400	39
			Manganese	259	MG/KG	11000	1030
			Potassium	1280	MG/KG	n/a	6179
			Vanadium	14.3	MG/KG	560	66
			Zinc	54.3	MG/KG	24000	101
09-7306	0 - 1 ft.	AAB2749	Methylene chloride	0.03	MG/KG	5.6	n/a
09-7307	0 - 1 ft.	AAB2750	Aluminium	8690	MG/KG	n/a	123000
			Arsenic	3.8	MG/KG	n/a	11.6
			Barium	231	MG/KG	5600	1143
			Cadmium	3.8	MG/KG	80	2.7
			Calcium	7190	MG/KG	n/a	54362
			Chromium	10.4	MG/KG	n/a	34.2
			Copper	101	MG/KG	3000	15.7
			Iron	14900	MG/KG	n/a	35586
			Lead	2310 (J)	MG/KG	400	39
			Magnesium	2480	MG/KG	n/a	16147
			Manganese	481	MG/KG	11000	1030
			Potassium	1710	MG/KG	n/a	6179
			Silver	3.1	MG/KG	400	1.61
			Vanadium	20.2	MG/KG	560	66
			Zinc	499	MG/KG	24000	101
09-7308	0 - 1 ft.	AAB2752	Aluminium	11100	MG/KG	n/a	123000
			Aluminium	11425	MG/KG	n/a	123000

MCA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Arsenic	7.2	MG/KG	n/a	11.6
			Arsenic	8.1	MG/KG	n/a	11.6
			Barium	2130	MG/KG	5600	1143
			Barium	965	MG/KG	5600	1143
			Beryllium	0.63	MG/KG	n/a	3.31
			Cadmium	10	MG/KG	80	2.7
			Cadmium	10.7	MG/KG	80	2.7
			Calcium	15000	MG/KG	n/a	54362
			Calcium	14800	MG/KG	n/a	54362
			Chromium	28.2	MG/KG	n/a	34.2
			Chromium	21.2	MG/KG	n/a	34.2
			Cobalt	10.3	MG/KG	n/a	51.1
			Copper	725	MG/KG	3000	15.7
			Copper	4770	MG/KG	3000	15.7
			DDT [p,p'-]	0.0066	MG/KG	2.1	n/a
			Di-n-butyl phthalate	0.85	MG/KG	8000	n/a
			Iron	33700	MG/KG	n/a	35586
			Iron	29891	MG/KG	n/a	35586
			Lead	497 (J)	MG/KG	400	39
			Lead	1075	MG/KG	400	39
			Magnesium	4660	MG/KG	n/a	16147
			Magnesium	4093	MG/KG	n/a	16147
			Manganese	560	MG/KG	11000	1030
			Manganese	496	MG/KG	11000	1030
			Mercury	0.12	MG/KG	24	0.1
			Nickel	53.6	MG/KG	1600	26.7
			Nickel	66.6	MG/KG	1600	26.7
			Potassium	3170	MG/KG	n/a	6179
			Potassium	3302	MG/KG	n/a	6179
			Selenium	0.83	MG/KG	400	1.7
			Silver	71.4	MG/KG	400	1.61
			Silver	85.3	MG/KG	400	1.61
			Sodium	589	MG/KG	n/a	1884
			Vanadium	19	MG/KG	560	66
			Vanadium	17.7	MG/KG	560	66
			Zinc	1120	MG/KG	24000	101
			Zinc	1039	MG/KG	24000	101
09-7308	0 - 1 ft.	AAB2754	Aldrin	0.0024	MG/KG	0.04	n/a
			Aluminium	17000	MG/KG	n/a	123000
			Arsenic	7.5	MG/KG	n/a	11.6
			Barium	1160	MG/KG	5600	1143
			Cadmium	24.4	MG/KG	80	2.7
			Calcium	15800	MG/KG	n/a	54362
			Chromium	29.8	MG/KG	n/a	34.2
			Copper	2110	MG/KG	3000	15.7
			DDT [p,p'-]	0.0043	MG/KG	2.1	n/a
			Iron	64600	MG/KG	n/a	35586
			Lead	422 (J)	MG/KG	400	39
			Magnesium	4100	MG/KG	n/a	16147
			Manganese	630	MG/KG	11000	1030
			Mercury	0.13	MG/KG	24	0.1
			Nickel	57.7	MG/KG	1600	26.7

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Potassium	3000	MG/KG	n/a	6179
			Silver	83.7	MG/KG	400	1.61
			Vanadium	19.4	MG/KG	560	66
			Zinc	900	MG/KG	24000	101
09-7308	0 - 1 ft.	AAB2755	Acetone	0.053 (J)	MG/KG	8000	n/a
			Methylene chloride	0.064 (J)	MG/KG	5.6	n/a
09-7309	0 - 1 ft.	AAB2756	Aluminium	6560	MG/KG	n/a	123000
			Aluminium	6977	MG/KG	n/a	123000
			Arsenic	2.9	MG/KG	n/a	11.6
			Arsenic	2.8	MG/KG	n/a	11.6
			Barium	285	MG/KG	5600	1143
			Barium	282	MG/KG	5600	1143
			Beryllium	0.62	MG/KG	n/a	3.31
			Cadmium	4.4	MG/KG	80	2.7
			Cadmium	2.8	MG/KG	80	2.7
			Calcium	2273	MG/KG	n/a	54362
			Calcium	2190	MG/KG	n/a	54362
			Chromium	8.3	MG/KG	n/a	34.2
			Chromium	8.3	MG/KG	n/a	34.2
			Cobalt	8.9	MG/KG	n/a	51.1
			Copper	81	MG/KG	3000	15.7
			Copper	131	MG/KG	3000	15.7
			Iron	27200	MG/KG	n/a	35586
			Iron	16943	MG/KG	n/a	35586
			Lead	49.6	MG/KG	400	39
			Lead	42.5	MG/KG	400	39
			Magnesium	1456	MG/KG	n/a	16147
			Manganese	710	MG/KG	11000	1030
			Manganese	516	MG/KG	11000	1030
			Nickel	15.1	MG/KG	1600	26.7
			Nickel	11	MG/KG	1600	26.7
			Potassium	1300	MG/KG	n/a	6179
			Potassium	1341	MG/KG	n/a	6179
			Sodium	134	MG/KG	n/a	1884
			Vanadium	19.3	MG/KG	560	66
			Vanadium	20.8	MG/KG	560	66
			Zinc	399	MG/KG	24000	101
			Zinc	486	MG/KG	24000	101
09-7309	0 - 1 ft.	AAB2757	Methylene chloride	0.015	MG/KG	5.6	n/a
09-7310	0 - 1 ft.	AAB2758	Aluminium	5520	MG/KG	n/a	123000
			Aluminium	5094	MG/KG	n/a	123000
			Arsenic	1.6	MG/KG	n/a	11.6
			Barium	1009	MG/KG	5600	1143
			Barium	800	MG/KG	5600	1143
			Beryllium	0.28	MG/KG	n/a	3.31
			Bis(2-ethylhexyl)phthalate	2.9 (J)	MG/KG	50	n/a
			Cadmium	1.2	MG/KG	80	2.7
			Cadmium	1.4	MG/KG	80	2.7
			Calcium	1470	MG/KG	n/a	54362
			Calcium	1692	MG/KG	n/a	54362
			Chromium	5.7	MG/KG	n/a	34.2
			Chromium	6.5	MG/KG	n/a	34.2

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Cobalt	1.3	MG/KG	n/a	51.1
			Copper	42762	MG/KG	3000	15.7
			Copper	10100	MG/KG	3000	15.7
			Cyanide	0.23	MG/KG	1600	n/a
			DDT [p,p'-]	0.0038 (J)	MG/KG	2.1	n/a
			Di-n-butyl phthalate	92 (J)	MG/KG	8000	n/a
			Iron	5350	MG/KG	n/a	35586
			Iron	6527	MG/KG	n/a	35586
			Lead	145	MG/KG	400	39
			Lead	162	MG/KG	400	39
			Magnesium	816	MG/KG	n/a	16147
			Manganese	203	MG/KG	11000	1030
			Manganese	188	MG/KG	11000	1030
			Mercury	0.25	MG/KG	24	0.1
			Mercury	0.28	MG/KG	24	0.1
			Nickel	10.3	MG/KG	1600	26.7
			Nickel	7.5	MG/KG	1600	26.7
			Potassium	460	MG/KG	n/a	6179
			Silver	2.44	MG/KG	400	1.61
			Sodium	107	MG/KG	n/a	1884
			Uranium-234	150.622	PCI/G	86	2.03
			Uranium-234	140.527	PCI/G	86	2.03
			Uranium-235	7.027	PCI/G	18	0.088
			Uranium-235	6.718	PCI/G	18	0.088
			Uranium-238	144.503	PCI/G	59	1.9
			Uranium-238	149.741	PCI/G	59	1.9
			Vanadium	9	MG/KG	560	66
			Zinc	720.58	MG/KG	24000	101
			Zinc	3790	MG/KG	24000	101
09-7311	0 - 1 ft.	AAB2760	Aluminium	9420	MG/KG	n/a	123000
			Arsenic	3.3	MG/KG	n/a	11.6
			Barium	209	MG/KG	5600	1143
			Cadmium	2.6	MG/KG	80	2.7
			Calcium	3590	MG/KG	n/a	54362
			Chromium	8.4	MG/KG	n/a	34.2
			Copper	76.8	MG/KG	3000	15.7
			DDT [p,p'-]	0.0097	MG/KG	2.1	n/a
			Iron	11100	MG/KG	n/a	35586
			Lead	65.7	MG/KG	400	39
			Magnesium	2030	MG/KG	n/a	16147
			Manganese	416	MG/KG	11000	1030
			Methoxychlor	0.027	MG/KG	400	n/a
			Potassium	1680	MG/KG	n/a	6179
			Silver	5.9	MG/KG	400	1.61
			Vanadium	21	MG/KG	560	66
			Zinc	151	MG/KG	24000	101
09-7312	0 - 1 ft.	AAB2762	Aluminium	12600	MG/KG	n/a	123000
			Aroclor 1254	1.6	MG/KG	1	n/a
			Arsenic	7.3	MG/KG	n/a	11.6
			Barium	1290	MG/KG	5600	1143
			Cadmium	12.4	MG/KG	80	2.7
			Calcium	21300	MG/KG	n/a	54362

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Chromium	27.3	MG/KG	n/a	34.2
			Copper	770	MG/KG	3000	15.7
			DDE [p,p'-]	0.039	MG/KG	2.1	n/a
			DDT [p,p'-]	0.051	MG/KG	2.1	n/a
			Iron	26600	MG/KG	n/a	35586
			Lead	528	MG/KG	400	39
			Magnesium	4970	MG/KG	n/a	16147
			Manganese	704	MG/KG	11000	1030
			Mercury	1.4	MG/KG	24	0.1
			Nickel	37.9	MG/KG	1600	26.7
			Potassium	2970	MG/KG	n/a	6179
			Silver	109	MG/KG	400	1.61
			Vanadium	21.4	MG/KG	560	66
			Zinc	1680	MG/KG	24000	101
09-7312	0 - 1 ft.	AAB2763	Methylene chloride	0.042 (J)	MG/KG	5.6	n/a
09-7313	0 - 1 ft.	AAB2764	Aluminium	14600	MG/KG	n/a	123000
			Arsenic	3.9	MG/KG	n/a	11.6
			Barium	232	MG/KG	5600	1143
			Cadmium	4.4	MG/KG	80	2.7
			Calcium	3380	MG/KG	n/a	54362
			Chromium	9	MG/KG	n/a	34.2
			Copper	73.7	MG/KG	3000	15.7
			DDE [p,p'-]	0.0045	MG/KG	2.1	n/a
			DDT [p,p'-]	0.0058	MG/KG	2.1	n/a
			Iron	16100	MG/KG	n/a	35586
			Lead	43.3	MG/KG	400	39
			Magnesium	1970	MG/KG	n/a	16147
			Manganese	463	MG/KG	11000	1030
			Nickel	11.3	MG/KG	1600	26.7
			Potassium	1770	MG/KG	n/a	6179
			Silver	10.6	MG/KG	400	1.61
			Vanadium	23.6	MG/KG	560	66
			Zinc	137	MG/KG	24000	101
09-7313	0 - 1 ft.	AAB2765	Methylene chloride	0.014	MG/KG	5.6	n/a
09-7314	0 - 1 ft.	AAB2766	Aluminium	25500	MG/KG	n/a	123000
			Arsenic	10.3	MG/KG	n/a	11.6
			Barium	360	MG/KG	5600	1143
			Cadmium	5.5	MG/KG	80	2.7
			Calcium	122000	MG/KG	n/a	54362
			Chromium	14.8	MG/KG	n/a	34.2
			Copper	66.1	MG/KG	3000	15.7
			Iron	23900	MG/KG	n/a	35586
			Lead	52	MG/KG	400	39
			Magnesium	8040	MG/KG	n/a	16147
			Manganese	481	MG/KG	11000	1030
			Nickel	22.6	MG/KG	1600	26.7
			Potassium	2520	MG/KG	n/a	6179
			Silver	6.8	MG/KG	400	1.61
			Vanadium	33.6	MG/KG	560	66
			Zinc	185	MG/KG	24000	101
09-7314	0 - 1 ft.	AAB2767	Methylene chloride	0.012	MG/KG	5.6	n/a
			Toluene	0.005	MG/KG	910	n/a

MCA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
09-7315	0 - 1 ft.	AAB2768	Aluminium	6510	MG/KG	n/a	123000
			Barium	119	MG/KG	5600	1143
			Cadmium	2	MG/KG	80	2.7
			Chromium	6.4	MG/KG	n/a	34.2
			Copper	7.3	MG/KG	3000	15.7
			Iron	9710	MG/KG	n/a	35586
			Lead	14.9	MG/KG	400	39
			Magnesium	1680	MG/KG	n/a	16147
			Manganese	426	MG/KG	11000	1030
			Potassium	1330	MG/KG	n/a	6179
			Vanadium	18.5	MG/KG	560	66
			Zinc	21	MG/KG	24000	101
09-7315	0 - 1 ft.	AAB2769	Methylene chloride	0.012	MG/KG	5.6	n/a
			Toluene	0.008	MG/KG	910	n/a
09-7315	0 - 1 ft.	AAB2770	Acenaphthene	0.51	MG/KG	4800	n/a
			Aluminium	5990	MG/KG	n/a	123000
			Arsenic	2.7	MG/KG	n/a	11.6
			Barium	133	MG/KG	5600	1143
			Cadmium	13.2	MG/KG	80	2.7
			Calcium	2140	MG/KG	n/a	54362
			Chromium	29.2	MG/KG	n/a	34.2
			Copper	56.3	MG/KG	3000	15.7
			Iron	88600	MG/KG	n/a	35586
			Lead	23	MG/KG	400	39
			Magnesium	2150	MG/KG	n/a	16147
			Manganese	637	MG/KG	11000	1030
			Nickel	20.7	MG/KG	1600	26.7
			Vanadium	18.5	MG/KG	560	66
			Zinc	61.2	MG/KG	24000	101
09-7315	0 - 1 ft.	AAB2771	Methylene chloride	0.016	MG/KG	5.6	n/a
09-7316	0 - 1 ft.	AAB2772	Aluminium	20200	MG/KG	n/a	123000
			Anthracene	1.2	MG/KG	24000	4.29
			Arsenic	14.4	MG/KG	n/a	11.6
			Barium	691	MG/KG	5600	1143
			Benzo[a]anthracene	4.7	MG/KG	1	12.4
			Benzo[a]pyrene	3.1	MG/KG	0.1	12.1
			Benzo[b]fluoranthene	4.9	MG/KG	1	12.2
			Benzo[g,h,i]perylene	0.95	MG/KG	n/a	5.9
			Benzo[k]fluoranthene	1.5	MG/KG	1	19.4
			Beryllium	1.3	MG/KG	n/a	3.31
			Cadmium	13.3	MG/KG	80	2.7
			Calcium	9380	MG/KG	n/a	54362
			Chromium	51.6	MG/KG	n/a	34.2
			Chrysene	3.2	MG/KG	96	19.5
			Cobalt	17.4	MG/KG	n/a	51.1
			Copper	262	MG/KG	3000	15.7
			Dibenzo[a,h]anthracene	0.58	MG/KG	0.1	2.9
			Fluoranthene	6.6	MG/KG	3200	32.5
			Indeno[1,2,3-cd]pyrene	1.8	MG/KG	1	6
			Iron	76400	MG/KG	n/a	35586
			Lead	472	MG/KG	400	39
			Magnesium	4100	MG/KG	n/a	16147

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Manganese	615	MG/KG	11000	1030
			Mercury	0.24	MG/KG	24	0.1
			Nickel	53.1	MG/KG	1600	26.7
			Phenanthrene	4.3	MG/KG	n/a	2[illegible].2
			Potassium	2560	MG/KG	n/a	6179
			Silver	10	MG/KG	400	1.61
			Vanadium	34.1	MG/KG	560	66
			Zinc	1200	MG/KG	24000	101
09-7317	0 - 1 ft.	AAB2774	Aluminium	11100	MG/KG	n/a	123000
			Arsenic	2.7	MG/KG	n/a	11.6
			Barium	140	MG/KG	5600	1143
			Cadmium	3.6	MG/KG	80	2.7
			Calcium	1910	MG/KG	n/a	54362
			Chromium	12	MG/KG	n/a	34.2
			Copper	11.6	MG/KG	3000	15.7
			Iron	23300	MG/KG	n/a	35586
			Lead	17.3	MG/KG	400	39
			Magnesium	2570	MG/KG	n/a	16147
			Manganese	309	MG/KG	11000	1030
			Potassium	2060	MG/KG	n/a	6179
			Vanadium	22.7	MG/KG	560	66
			Zinc	115	MG/KG	24000	101
09-7317	0 - 1 ft.	AAB2775	Methylene chloride	0.014	MG/KG	5.6	n/a
09-7330	0 - 1 ft.	AAB2776	Aluminium	5880	MG/KG	n/a	123000
			Arsenic	4.3	MG/KG	n/a	11.6
			Barium	105	MG/KG	5600	1143
			Benzo[b]fluoranthene	0.39	MG/KG	1	12.2
			Bis(2-ethylhexyl)phthalate	0.38	MG/KG	50	n/a
			Cadmium	4.4	MG/KG	80	2.7
			Calcium	2560	MG/KG	n/a	54362
			Chromium	13.2	MG/KG	n/a	34.2
			Copper	15.1	MG/KG	3000	15.7
			DDT [p,p'-]	0.015	MG/KG	2.1	n/a
			Fluoranthene	0.44	MG/KG	3200	32.5
			Iron	27900	MG/KG	n/a	35586
			Lead	212	MG/KG	400	39
			Manganese	373	MG/KG	11000	1030
			Nickel	10.2	MG/KG	1600	26.7
			Pyrene	0.51	MG/KG	2400	12.8
			Vanadium	27.1	MG/KG	560	66
			Zinc	173	MG/KG	24000	101
09-7330	0 - 1 ft.	AAB2777	Methylene chloride	0.012	MG/KG	5.6	n/a
09-7500	0 - 1 ft.	AAB2778	Aluminium	6180	MG/KG	n/a	123000
			Aluminium	6809	MG/KG	n/a	123000
			Arsenic	3.2	MG/KG	n/a	11.6
			Arsenic	2.6	MG/KG	n/a	11.6
			Barium	68.4	MG/KG	5600	1143
			Barium	77.7	MG/KG	5600	1143
			Beryllium	0.69	MG/KG	n/a	3.31
			Cadmium	2.3	MG/KG	80	2.7
			Cadmium	2.2	MG/KG	80	2.7
			Calcium	936	MG/KG	n/a	54362

MCA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Chromium	5.2	MG/KG	n/a	34.2
			Chromium	5.5	MG/KG	n/a	34.2
			Cobalt	8.3	MG/KG	n/a	51.1
			Copper	3.2	MG/KG	3000	15.7
			Iron	11317	MG/KG	n/a	35586
			Iron	9290	MG/KG	n/a	35586
			Lead	19.5	MG/KG	400	39
			Lead	13.7	MG/KG	400	39
			Magnesium	1250	MG/KG	n/a	16147
			Magnesium	1180	MG/KG	n/a	16147
			Manganese	570	MG/KG	11000	1030
			Manganese	473	MG/KG	11000	1030
			Nickel	4.5	MG/KG	1600	26.7
			Potassium	1110	MG/KG	n/a	6179
			Potassium	1073	MG/KG	n/a	6179
			Selenium	0.54	MG/KG	400	1.7
			Sodium	130	MG/KG	n/a	1884
			Vanadium	24.8	MG/KG	560	66
			Vanadium	22.2	MG/KG	560	66
			Zinc	16.9	MG/KG	24000	101
			Zinc	17.4	MG/KG	24000	101
09-7501	0 - 1 ft.	AAB2780	Aluminium	7790	MG/KG	n/a	123000
			Barium	162	MG/KG	5600	1143
			Cadmium	1.8	MG/KG	80	2.7
			Calcium	1320	MG/KG	n/a	54362
			Chromium	5	MG/KG	n/a	34.2
			Cobalt	16.5	MG/KG	n/a	51.1
			Copper	13.1	MG/KG	3000	15.7
			Iron	9710	MG/KG	n/a	35586
			Lead	31.7	MG/KG	400	39
			Magnesium	1290	MG/KG	n/a	16147
			Manganese	941	MG/KG	11000	1030
			Vanadium	19.1	MG/KG	560	66
			Zinc	22.3	MG/KG	24000	101
09-7501	1 - 2 ft.	AAB2807	Aluminium	9510	MG/KG	n/a	123000
			Barium	56.9	MG/KG	5600	1143
			Calcium	1760	MG/KG	n/a	54362
			Chromium	3.9	MG/KG	n/a	34.2
			Iron	8570	MG/KG	n/a	35586
			Lead	7	MG/KG	400	39
			Magnesium	1310	MG/KG	n/a	16147
			Manganese	133	MG/KG	11000	1030
			Zinc	19.1	MG/KG	24000	101
09-7502	0 - 1 ft.	AAB2782	Aluminium	7540	MG/KG	n/a	123000
			Barium	131	MG/KG	5600	1143
			Cadmium	1.6	MG/KG	80	2.7
			Calcium	6970	MG/KG	n/a	54362
			Chromium	6.9	MG/KG	n/a	34.2
			Copper	8.3	MG/KG	3000	15.7
			Iron	7790	MG/KG	n/a	35586
			Lead	165	MG/KG	400	39
			Magnesium	1340	MG/KG	n/a	16147

MDA-M Soil Detects

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Manganese	481	MG/KG	11000	1030
			Potassium	1460	MG/KG	n/a	6179
			Vanadium	15.9	MG/KG	560	66
			Zinc	35.9	MG/KG	24000	101
09-7502	0 - 1 ft.	AAB2784	Aluminium	7490	MG/KG	n/a	123000
			Barium	162	MG/KG	5600	1143
			Cadmium	1.6	MG/KG	80	2.7
			Calcium	1350	MG/KG	n/a	54362
			Chromium	4.5	MG/KG	n/a	34.2
			Cobalt	16.1	MG/KG	n/a	51.1
			Copper	49.3	MG/KG	3000	15.7
			Iron	9160	MG/KG	n/a	35586
			Lead	16.8	MG/KG	400	39
			Magnesium	1240	MG/KG	n/a	16147
			Manganese	994	MG/KG	11000	1030
			Vanadium	17.6	MG/KG	560	66
			Zinc	22.8	MG/KG	24000	101

n/a Not available.

J - The associated numerical value is an estimated quantity.

R - The data are unusable (compound may or may not be present).

MDA-M Water Detects

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
09-0000	NA	AAB0746	Butanone [2-]	15	UG/L	1700
09-7400	NA	AAB2787	Aluminium	2.3	UG/L	n/a
			Aluminium	9360	UG/L	n/a
			Arsenic	200	UG/L	50
			Barium	1.9	UG/L	2000
			Barium	698	UG/L	2000
			Beryllium	23.8	UG/L	4
			Cadmium	7.2	UG/L	5
			Cadmium	16.3	UG/L	5
			Calcium	18600	UG/L	n/a
			Calcium	1.7	UG/L	n/a
			Chromium	225	UG/L	100
			Chromium	1.9	UG/L	100
			Cobalt	4	UG/L	n/a
			Copper	2	UG/L	1300
			Copper	371	UG/L	1300
			Iron	40100	UG/L	n/a
			Iron	1.6	UG/L	n/a
			Lead	16.3	UG/L	50
			Lead	15.9	UG/L	50
			Magnesium	3	UG/L	n/a
			Manganese	884	UG/L	180
			Manganese	1.5	UG/L	180
			Mercury	6.6	UG/L	2
			Mercury	10.5	UG/L	2
			Nickel	0.8	UG/L	100
			Nickel	276	UG/L	100
			Potassium	1	UG/L	n/a
			Silver	18	UG/L	170
			Silver	6.9	UG/L	170
			Sodium	8300	UG/L	n/a
			Sodium	2.2	UG/L	n/a
			Vanadium	7.5	UG/L	240
			Zinc	1050	UG/L	10000
			Zinc	2.5	UG/L	10000
09-7401	NA	AAB2788	Aluminium	2860	UG/L	n/a
			Arsenic	120	UG/L	50
			Barium	2580	UG/L	2000
			Calcium	68500	UG/L	n/a
			Iron	237	UG/L	n/a
			Lead	16.3	UG/L	50
			Manganese	22.2	UG/L	180
			Potassium	6340	UG/L	n/a
			Sodium	107000	UG/L	n/a
09-7402	NA	AAB2789	Aluminium	2460	UG/L	n/a
			Arsenic	91.9	UG/L	50

MDA-M Water Detects

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
			Barium	275	UG/L	2000
			Calcium	34000	UG/L	n/a
			Copper	56.4	UG/L	1300
			Iron	2270	UG/L	n/a
			Lead	57.5	UG/L	50
			Magnesium	5800	UG/L	n/a
			Manganese	336	UG/L	180
			Potassium	54000	UG/L	n/a
			Sodium	145000	UG/L	n/a
			Zinc	75.8	UG/L	10000
09-7403	NA	AAB2790	Aluminium	787	UG/L	n/a
			Calcium	7510	UG/L	n/a
			Chromium	22.8	UG/L	100
			Iron	166	UG/L	n/a
			Lead	168	UG/L	50
			Manganese	102	UG/L	180
			Potassium	6880	UG/L	n/a
			Selenium	620	UG/L	50
			Sodium	916000	UG/L	n/a
			Zinc	170	UG/L	10000
09-7491	NA	AAB6101	Aluminium	227000	UG/L	n/a
			Aluminium	189363	UG/L	n/a
			Antimony	23.5	UG/L	6
			Arsenic	8.6	UG/L	50
			Barium	1808	UG/L	2000
			Barium	1930	UG/L	2000
			Beryllium	13	UG/L	4
			Beryllium	13.9	UG/L	4
			Cadmium	26.3	UG/L	5
			Cadmium	29.3	UG/L	5
			Calcium	28124	UG/L	n/a
			Calcium	28700	UG/L	n/a
			Chromium	93	UG/L	100
			Chromium	111	UG/L	100
			Cobalt	38.7	UG/L	n/a
			Copper	319	UG/L	1300
			Copper	332	UG/L	1300
			Iron	155799	UG/L	n/a
			Iron	167000	UG/L	n/a
			Lead	123	UG/L	50
			Lead	123	UG/L	50
			Magnesium	32630	UG/L	n/a
			Magnesium	35400	UG/L	n/a
			Manganese	1937	UG/L	180
			Manganese	2000	UG/L	180
			Mercury	0.44	UG/L	2

MDA-M Water Detects

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
			Mercury	0.45	UG/L	2
			Nickel	82.2	UG/L	100
			Nickel	79.7	UG/L	100
			Potassium	30100	UG/L	n/a
			Potassium	24525	UG/L	n/a
			Sodium	6496	UG/L	n/a
			Sodium	7760	UG/L	n/a
			Total Suspended Solids	4645000	UG/L	n/a
			Uranium	11	UG/L	n/a
			Uranium	10.98	UG/L	n/a
			Vanadium	240	UG/L	240
			Vanadium	266	UG/L	240
			Zinc	340	UG/L	10000
			Zinc	368	UG/L	10000
09-7492	NA	AAB6102	Aluminium	317000	UG/L	n/a
			Antimony	94.8	UG/L	6
			Barium	2740	UG/L	2000
			Beryllium	19.3	UG/L	4
			Cadmium	40.2	UG/L	5
			Calcium	37300	UG/L	n/a
			Chromium	144	UG/L	100
			Cobalt	64.1	UG/L	n/a
			Copper	126	UG/L	1300
			Iron	223000	UG/L	n/a
			Lead	147	UG/L	50
			Magnesium	46300	UG/L	n/a
			Manganese	2770	UG/L	180
			Nickel	112	UG/L	100
			Potassium	38700	UG/L	n/a
			Sodium	9420	UG/L	n/a
			Total Suspended Solids	5965000	UG/L	n/a
			Uranium	13.4	UG/L	n/a
			Vanadium	370	UG/L	240
			Zinc	446	UG/L	10000
09-7492	NA	AAB8395	Acetone	23	UG/L	3500
09-7493	NA	AAB5557	Acetone	23	UG/L	3500
			Aluminium	39238	UG/L	n/a
			Aluminium	36000	UG/L	n/a
			Antimony	24.6	UG/L	6
			Arsenic	3.5	UG/L	50
			Barium	348	UG/L	2000
			Barium	410	UG/L	2000
			Beryllium	1.5	UG/L	4
			Cadmium	4.6	UG/L	5
			Calcium	7300	UG/L	n/a
			Calcium	9084	UG/L	n/a

MDA-M Water Detects

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
			Chromium	24.4	UG/L	100
			Chromium	26.5	UG/L	100
			Cobalt	19.2	UG/L	n/a
			Copper	700	UG/L	1300
			Copper	560	UG/L	1300
			Iron	34150	UG/L	n/a
			Iron	28600	UG/L	n/a
			Lead	119	UG/L	50
			Lead	121	UG/L	50
			Magnesium	7410	UG/L	n/a
			Magnesium	6210	UG/L	n/a
			Manganese	991	UG/L	180
			Manganese	794	UG/L	180
			Methylene chloride	6	UG/L	5
			Nickel	30.9	UG/L	100
			Potassium	8620	UG/L	n/a
			Potassium	9488	UG/L	n/a
			Selenium	2.2	UG/L	50
			Sodium	1605	UG/L	n/a
			Total Suspended Solids	1600000	UG/L	n/a
			Total Suspended Solids	1600000	UG/L	n/a
			Uranium	2.31	UG/L	n/a
			Vanadium	67	UG/L	240
			Vanadium	57.3	UG/L	240
			Zinc	1224	UG/L	10000
			Zinc	990	UG/L	10000
09-7550	0 - 0.5 ft.	AAB0741	Alpha	1.44 (J)	PCI/L	15
			Aluminium	1560	UG/L	n/a
			Barium-140	24.437	PCI/L	n/a
			Beta	2.65 (J)	PCI/L	n/a
			Calcium	12600	UG/L	n/a
			Cesium-137	0.368	PCI/L	110
			Chlorine	26000	UG/L	n/a
			Iron	838	UG/L	n/a
			Nitrate Nitrogen	300	UG/L	n/a
			Sodium	15100	UG/L	n/a
			Total Alkalinity	34000	UG/L	n/a
			Uranium	0.949 (R)	UG/L	n/a
09-7550	0 - 0.5 ft.	AAB5550	Aluminium	512.9	UG/L	n/a
			Aluminium	420	UG/L	n/a
			Arsenic	2.8	UG/L	50
			Barium	35.3	UG/L	2000
			Beryllium	0.7	UG/L	4
			Beta	2.64	PCI/L	n/a
			Calcium	6930	UG/L	n/a
			Calcium	8054.4	UG/L	n/a

MDA-M Water Detects

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
			Chlorine	6500	UG/L	n/a
			Gamma	0	PCI/L	n/a
			Iron	456.2	UG/L	n/a
			Magnesium	2590.1	UG/L	n/a
			Nitrate Nitrogen	240	UG/L	n/a
			Potassium	1667.7	UG/L	n/a
			Sodium	7500	UG/L	n/a
			Sodium	8683.7	UG/L	n/a
			Sulfate	5000	UG/L	n/a
			Total Alkalinity	44000	UG/L	n/a
			Total Dissolved Solids	113000	UG/L	n/a
			Uranium	0.111	UG/L	n/a
			Vanadium	14	UG/L	240
			Zinc	27.4	UG/L	10000
			Zinc	20.2	UG/L	10000
09-7550	0 - 0.5 ft.	AAC0205	HMX	1.99	UG/L	1800
09-7550	0 - 0.5 ft.	AAC0206	Dinitrotoluene [2.4-]	1.52	UG/L	0.05
09-7551	0 - 0.5 ft.	AAB0742	Alpha	0.992 (J)	PCI/L	15
			Alpha	0.992 (J)	PCI/L	15
			Aluminium	2225	UG/L	n/a
			Aluminium	2380	UG/L	n/a
			Americium-241	0.296	PCI/L	15
			Barium	58.9	UG/L	2000
			Barium-140	9.841	PCI/L	n/a
			Beta	4.38 (J)	PCI/L	n/a
			Calcium	11743	UG/L	n/a
			Calcium	11800	UG/L	n/a
			Cerium-144	0.992	PCI/L	n/a
			Chlorine	24000	UG/L	n/a
			Cobalt-60	0.856	PCI/L	200
			Europium-152	1.04	PCI/L	n/a
			Iron	983	UG/L	n/a
			Iron	1050	UG/L	n/a
			Magnesium	3509	UG/L	n/a
			Nitrate Nitrogen	240	UG/L	n/a
			Potassium	2689	UG/L	n/a
			Ruthenium-106	10.389	PCI/L	200
			Sodium	13900	UG/L	n/a
			Sodium	13826	UG/L	n/a
			Sodium-22	1.505	PCI/L	480
			Total Alkalinity	27000	UG/L	n/a
			Uranium	0.801 (R)	UG/L	n/a
09-7551	0 - 0.5 ft.	AAB5551	Alpha	0.25	PCI/L	15
			Aluminium	694	UG/L	n/a
			Americium-241	7	PCI/L	15

MDA-M Water Detects

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
			Americium-241	7.294	PCI/L	15
			Beta	1.92	PCI/L	n/a
			Calcium	6980	UG/L	n/a
			Cesium-137	0.736	PCI/L	110
			Chlorine	5200	UG/L	n/a
			Cobalt-60	0.518	PCI/L	200
			Cobalt-60	2.803	PCI/L	200
			Gamma	0	PCI/L	n/a
			Gamma	0	PCI/L	n/a
			Iron	403	UG/L	n/a
			Nitrate Nitrogen	470	UG/L	n/a
			Sodium	6930	UG/L	n/a
			Sulfate	5200	UG/L	n/a
			Total Alkalinity	40000	UG/L	n/a
			Total Dissolved Solids	108000	UG/L	n/a
			Uranium	0.018	UG/L	n/a
09-7560	0 - 0.5 ft.	AAB0743	Alpha	1.81 (J)	PCI/L	15
			Aluminium	1950	UG/L	n/a
			Americium-241	2.774	PCI/L	15
			Beta	4.32 (J)	PCI/L	n/a
			Calcium	13500	UG/L	n/a
			Cerium-144	15.124	PCI/L	n/a
			Cesium-137	2.291	PCI/L	110
			Chlorine	39000	UG/L	n/a
			Cobalt-60	0.736	PCI/L	200
			Iron	908	UG/L	n/a
			Nitrate Nitrogen	250	UG/L	n/a
			Ruthenium-106	3.287	PCI/L	200
			Selenium	11	UG/L	50
			Sodium	15700	UG/L	n/a
			Total Alkalinity	26000	UG/L	n/a
			Total Alkalinity	21000	UG/L	n/a
			Uranium	0.446 (R)	UG/L	n/a
			Uranium	0.634 (R)	UG/L	n/a
09-7560	0 - 0.5 ft.	AAB5552	Alpha	1.18	PCI/L	15
			Alpha	2.1	PCI/L	15
			Aluminium	874	UG/L	n/a
			Americium-241	3.044	PCI/L	15
			Beta	4.46	PCI/L	n/a
			Beta	4.14	PCI/L	n/a
			Chlorine	8000	UG/L	n/a
			Cobalt-60	1.096	PCI/L	200
			Gamma	0	PCI/L	n/a
			Iron	426	UG/L	n/a
			Nitrate Nitrogen	140	UG/L	n/a
			Sodium	5350	UG/L	n/a

MDA-M Water Detects

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
			Sulfate	4900	UG/L	n/a
			Total Alkalinity	34000	UG/L	n/a
			Total Dissolved Solids	111000	UG/L	n/a
			Uranium	0.22	UG/L	n/a
09-7560	0 - 0.5 ft.	AAB5554	Alpha	0.09	PCI/L	15
			Aluminium	846	UG/L	n/a
			Americium-241	3.17	PCI/L	15
			Beta	2.55	PCI/L	n/a
			Calcium	5230	UG/L	n/a
			Cesium-137	0.58	PCI/L	110
			Chlorine	8000	UG/L	n/a
			Cobalt-60	0.024	PCI/L	200
			Gamma	0	PCI/L	n/a
			Iron	439	UG/L	n/a
			Nitrate Nitrogen	180	UG/L	n/a
			Ruthenium-106	2.634	PCI/L	200
			Sodium	6100	UG/L	n/a
			Sulfate	4700	UG/L	n/a
			Total Alkalinity	32000	UG/L	n/a
			Total Dissolved Solids	113000	UG/L	n/a
			Uranium	0.138	UG/L	n/a
09-7560	0 - 0.5 ft.	AAC0208	HMX	1.48	UG/L	1800
09-7561	0 - 0.5 ft.	AAB0744	Alpha	0.44 (J)	PCI/L	15
			Aluminium	869	UG/L	n/a
			Americium-241	2.315	PCI/L	15
			Barium-140	11.464	PCI/L	n/a
			Barium-140	12.393	PCI/L	n/a
			Beta	2.44 (J)	PCI/L	n/a
			Calcium	7580	UG/L	n/a
			Cerium-144	1.13	PCI/L	n/a
			Cesium-137	0.889	PCI/L	110
			Cesium-137	0.25	PCI/L	110
			Chlorine	5000	UG/L	n/a
			Europium-152	0.503	PCI/L	n/a
			Europium-152	4.776	PCI/L	n/a
			Iron	342	UG/L	n/a
			Nitrate Nitrogen	120	UG/L	n/a
			Nitrate Nitrogen	140	UG/L	n/a
			Ruthenium-106	1.992	PCI/L	200
			Ruthenium-106	5.165	PCI/L	200
			Sodium	5100	UG/L	n/a
			Sodium-22	1.108	PCI/L	480
			Sodium-22	1.853	PCI/L	480
			Total Alkalinity	27000	UG/L	n/a
			Total Alkalinity	30000	UG/L	n/a

MDA-M Water Detects

Location ID	Depth of Sample	Sample ID	ANALYTE	Results	Units	SAL
			Uranium	0.15 (R)	UG/L	n/a
09-7561	0 - 0.5 ft.	AAB0745	Alpha	0.65 (J)	PCI/L	15
			Aluminium	961	UG/L	n/a
			Americium-241	7.126	PCI/L	15
			Barium-140	9.525	PCI/L	n/a
			Beta	2.32 (J)	PCI/L	n/a
			Calcium	7730	UG/L	n/a
			Cerium-144	3.02	PCI/L	n/a
			Chlorine	5000	UG/L	n/a
			Cobalt-60	0.654	PCI/L	200
			Europium-152	0.88	PCI/L	n/a
			Iron	362	UG/L	n/a
			Nitrate Nitrogen	130	UG/L	n/a
			Ruthenium-106	14.305	PCI/L	200
			Sodium	5090	UG/L	n/a
			Total Alkalinity	30000	UG/L	n/a
			Uranium	0.161 (R)	UG/L	n/a
09-7561	0 - 0.5 ft.	AAB5553	Alpha	0.09	PCI/L	15
			Aluminium	247	UG/L	n/a
			Americium-241	3.546	PCI/L	15
			Beta	1.45	PCI/L	n/a
			Cesium-137	1.326	PCI/L	110
			Chlorine	620	UG/L	n/a
			Cobalt-60	0.993	PCI/L	200
			Gamma	0	PCI/L	n/a
			Iron	120	UG/L	n/a
			Nitrate Nitrogen	220	UG/L	n/a
			Ruthenium-106	13.079	PCI/L	200
			Sodium-22	1.767	PCI/L	480
			Sulfate	3600	UG/L	n/a
			Total Alkalinity	28000	UG/L	n/a
			Total Dissolved Solids	83000	UG/L	n/a
09-7561	0 - 0.5 ft.	AAC0209	Dinitrotoluene [2,4-]	0.9	UG/L	0.05
n/a Not available.						
NA Not applicable.						

J - The associated numerical value is an estimated quantity.

R - The data are unusable (compound may or may not be present).

ANNEX 6.10

RISK-BASED CLEANUP LEVEL CALCULATIONS

Methodology for Establishing Cleanup Levels for Lead in Soil

LEAD EXPOSURES

EPA has not derived CSFs or RfDs for evaluating the toxicity of lead or lead compounds. Previously, EPA had considered the concentration range of 500 to 1,000 mg/kg lead in soil to be acceptable as an interim cleanup level for residential Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites (EPA 1992). This interim cleanup level was proposed in a Centers for Disease Control document (CDC 1985) on lead poisoning in children, as children and fetuses are considered the most sensitive receptors for lead's toxic end points. Even more current EPA (1994) guidance has suggested a lead concentration in soil of 400 mg/kg as the threshold level. However, more recently for residential CERCLA and RCRA sites, EPA has recommended replacing the 500 to 1,000 mg/kg cleanup range and 400 mg/kg threshold level with levels derived by its Integrated Exposure Uptake Biokinetic (IEUBK) model (version 0.99d).

Because of the anticipated future use of the Laboratory site for industrial/commercial purposes, the residential exposures are not considered relevant for the site. The California Environmental Protection Agency (Cal/EPA) has developed its own model (1993) to predict blood lead (PbB) levels in adults as well as children. The Cal/EPA model was employed in this assessment to evaluate potential adverse health effects to adults from lead in soil at the Laboratory site (see attached table).

Cal/EPA Lead Model

Similar to the EPA IEUBK model, the Cal/EPA model is used to estimate blood lead concentrations resulting from exposures via several pathways (inhalation of particulates, ingestion of food, dust, soil, water, and dermal uptake). The contribution from the pathways are added to derive an estimate median PbB concentration resulting from multipathway exposure. In addition, the model calculates the 90th, 95th, and 99th percentile concentrations by assuming a lognormal distribution with a standard deviation of 1.42 mg/dl.

A PbB concentration of 10 mg/dl is the target PbB level for exposure to lead in the environment, regardless of the source. Sources include drinking water, grocery story food products, soil (incidental soil ingestion and dermal contact), and the air. Therefore, the calculation of a soil lead cleanup level for an industrial exposure scenario includes the contribution to blood lead levels from non-site sources.

The soil lead cleanup level includes the contribution to PbB levels from non-site sources as well as on-site soil contact, soil ingestion, and inhalation pathways and was calculated not to exceed the target level of 10 mg/dl at the 95th percentile concentration. The contact rate for soil ingestion was changed from 0.03 g soil/day to 0.0[illegible] soil/day to reflect the on-site industrial exposure pathway. The lead concentrations in the water and food ingestion pathways are default values and represent background lead levels that may be encountered in tap water and grocery store food products. All other exposure input parameters are default values based on a residential exposure scenario.

REFERENCES

Cal/EPA (California Environmental Protection Agency. Department of Toxic Substance Control). 1993. Cal-Tox, a Multimedia Total Exposure Model for Hazardous Waste Sites. Office of Science Affairs, Department of Toxic Substances Control. June.

EPA (U.S. Environmental Protection Agency). 1992. Revised Guidance on Establishing Soil Lead Cleanup Levels at CERCLA/RCRA Sites. OSWER Directive 9355. 4-08.

EPA (U.S. Environmental Protection Agency). 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive No. 9355.4-12. July 14, 1994.

RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

INPUT		OUTPUT					
Variable	Level		Percentiles				
LEAD IN AIR (ug/m^3)	0.01		50th	60th	80th	90th	95th
LEAD IN SOIL (ug/g)	3385	BLOOD Pb, ADULT (ug/dl)	5.7	6.9	10.0	11.6	12.8
LEAD IN WATER (ug/l)	15						
[illegible]	0						
[illegible] (ug/m^2)	50						

EQUATIONS, ADULTS

Pathway	Blood Pb ug/dl		Route-specific constant		concentration in medium		contact rate		percent of total
SOIL CONTACT:	0.66	=	1E-04 (ug/dl)/(ug/day)	*	3385 ug/g	*	1.85 g soil/day (5 g/m^2 * 0.37 m^2)		12%
SOIL INGESTION:	2.98	=	0.018 (ug/dl)/(ug/day)	*	3385 ug/g	*	0.05 g soil/day		53%
INHALATION:	0.29	=	1.64 (ug/dl)/(ug/m^3)	*	0.18 ug/m^3				5%
WATER INGESTION:	0.84	=	0.04 (ug/dl)/(ug/day)	*	15 ug/l	*	1.4 l water/day		15%
FOOD INGESTION:	0.88	=	0.04 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	2.2 kg diet/day		16%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (ug/kg) = 10.0 ug/kg

LEAD IN PRODUCE = 10 ug/kg or 0.00045 * soil lead = 10.0 ug/kg

The following equation was used to derive cleanup levels for carcinogenic compounds in commercial/industrial soil:

$$C\ (mg/kg) = \frac{TR \times BW \times AT \times 365\ d/yr}{EF \times ED \times \left[\left(SF_o \times 10^{-6}\ kg/mg \times IR_{soil}\right) + \left(SF_i \times IR_{air} \times (1/Y)\right)\right]}$$

Where:

Parameter	Definition	Units	Default
C	cleanup level - chemical concentration in soil	mg/kg	---
TR	target excess individual lifetime cancer risk	unitless	10^{-6} or 10^{-5}
BW	adult body weight	kg	70
AT	carcinogenic averaging time	yr	70
EF	exposure frequency	days/yr	250
ED	exposure duration	yr	25
SF_o	oral cancer slope factor	$(mg/kg\text{-}day)^{-1}$	chemical-specific
IR_{soil}	soil ingestion rate	mg/day	50
SF_i	inhalation cancer slope factor	$(mg/kg\text{-}day)^{-1}$	chemical-specific
IR_{air}	workday inhalation rate	m^3/day	20
Y	volatilization factor (VF) for volatiles	m^3/kg	chemical-specific
	particulate emission factor (PEF) for non-volatiles	m^3/kg	1.11×10^7

The following equation was used to derive cleanup levels for noncarcinogenic contaminants in commercial/industrial soil:

$$ActionLevel(mg/kg) = \frac{THI \times BW \times AT \times 365\,d/yr}{EF \times ED \times \left[\left((1/RfD_o) \times 10^{-6}\,kg/mg \times IR_{soil}\right) + \left((1/RfD_i) \times IR_{air} \times 1/Y\right)\right]}$$

Where:

Parameter	Definition	Units	Default
THI	target hazard index	unitless	0.1
BW	adult body weight	kg	70
AT	noncarcinogenic averaging time	yr	25 (always equal to ED)
EF	exposure frequency	days/yr	250
ED	exposure duration	yr	25
RfD_o	oral chronic reference dose	mg/kg-day	chemical-specific
IR_{soil}	soil ingestion rate	mg/day	50
RfD_i	inhalation chronic reference dose	mg/kg-day	chemical-specific
IR_{air}	workday inhalation rate	m^3/day	20
Y	volatilization factor (VF) for volatiles	m^3/kg	chemical-specific
	particulate emission factor (PEF) for non-volatiles	m^3/kg	1.11×10^7 (LANL)

ANNEX 6.11

PHASE I SAMPLING CALCULATIONS

Phase 2 Sampling Calculations

The required number of samples is computed using the following equation:

$$n_0 = \frac{\left(z_{1-\beta} + z_{1-\alpha}\right)^2}{\tau^2} \quad where \quad \tau = \frac{(C_s - \mu_1)}{\sigma}$$

The required number of samples is computed using the following parameters and assumptions:

Parameter	Assumption	Value
α	alpha - the desired false positive rate	0.05
β	beta - the desired false negative rate	0.2
$z_{1-\alpha}$	critical value for the normal distribution with a probability of 1 - α	1.645
$z_{1-\beta}$	critical value for the normal distribution with a probability of 1 - β	0.842
τ	tau - an expression of relative difference	calculated
C_s	cleanup standard for the sample area	3000 mg/kg for lead
μ_1	the mean concentration where the site should be declared clean with a high probability	assume 50% of C_s
σ	the estimate of the standard deviation of the individual contaminant concentrations within the CU	assume a coefficient of variation of 1.08 as measured in the existing RFI data, therefore, σ = 108% of μ_1.

Los Alamos National Laboratory

Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 3-056(c)

June 1995
Revision 0

Environmental
Restoration

ACRONYMS

AR	administrative requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	chemical of potential concern
DOE-LAAO	Department of Energy Los Alamos Area Office
EC	expedited cleanup
EPA	US Environmental Protection Agency
ER	Environmental Restoration
HASP	health and safety plan
Laboratory	Los Alamos National Laboratory
PCE	tetrachloroethylene
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
RFI	Resource Conservation and Recovery Act facility investigation
SAL	screening action level
SOP	standard operating procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TCA	trichloroethane
TSCA	Toxic Substance Control Act
TSD	treatment, storage, and disposal
UTL	upper tolerance limit
VOC	volatile organic compound
WAC	waste acceptance criteria
XRF	x-ray fluorescence

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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan addresses Solid Waste Management Unit (SWMU) 3-056(c), located in the northwest portion of Los Alamos National Laboratory (the Laboratory), in Los Alamos, New Mexico (Figure 1-1). This EC Plan is being proposed as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in the Operable Unit (OU) 1114 RFI Work Plan (LANL 1993, 1090).

SWMU 3-056(c) is included in Table A of the Hazardous and Solid Waste Amendments (HSWA) module of the Laboratory's RCRA permit.

SWMU 3-056(c) is an inactive electrical equipment storage area located at Technical Area (TA)-3. Preliminary results from the Phase I RFI sampling efforts indicate that soils within the SWMU boundaries contain elevated levels of polychlorinated biphenyls (PCBs). These data indicate that this soil contamination may pose an immediate threat to the environment and possibly to worker safety. Wastes generated by the cleanup of SWMU 3-056(c) may be classified as a Toxic Substance Control Act (TSCA)-regulated waste.

Activities comprising this EC include the removal of PCB-contaminated soil from the SWMU. The level of effort required from initial transmittal of the plan to EPA for review, through implementation, to the completion of the final project report is identified in this EC Plan. In the development of this EC Plan, the following assumptions were made:

- The PCB concentrations and expected volume of PCB-contaminated soil are consistent with interpretations based on the existing data;
- Based on current Laboratory land use planning, future land use at the location of this SWMU will continue to be for industrial purposes;
- Minimal delays in EC operations will be experienced as a result of inclement weather and site access problems. Delays that may result from the acquisition and scheduling of heavy equipment and from waste acceptance at a permitted disposal facility cannot be anticipated and, therefore, are not considered within this plan;
- A Site-Specific Health and Safety Plan (SSHASP) and Waste Management Checklist will be developed specifically to address contaminants of concern (COCs) identified in this EC Plan. Deviations from the anticipated concentrations and locations of COCs may necessitate adjustments to both plans;
- Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC Plan. Activities will be performed on a continuous basis during regular business hours, weather permitting, until verification samples indicate that all cleanup levels are met; and
- Cost estimates are based on completing the proposed cleanup by removing contaminated soil to a depth of approximately 18 inches.

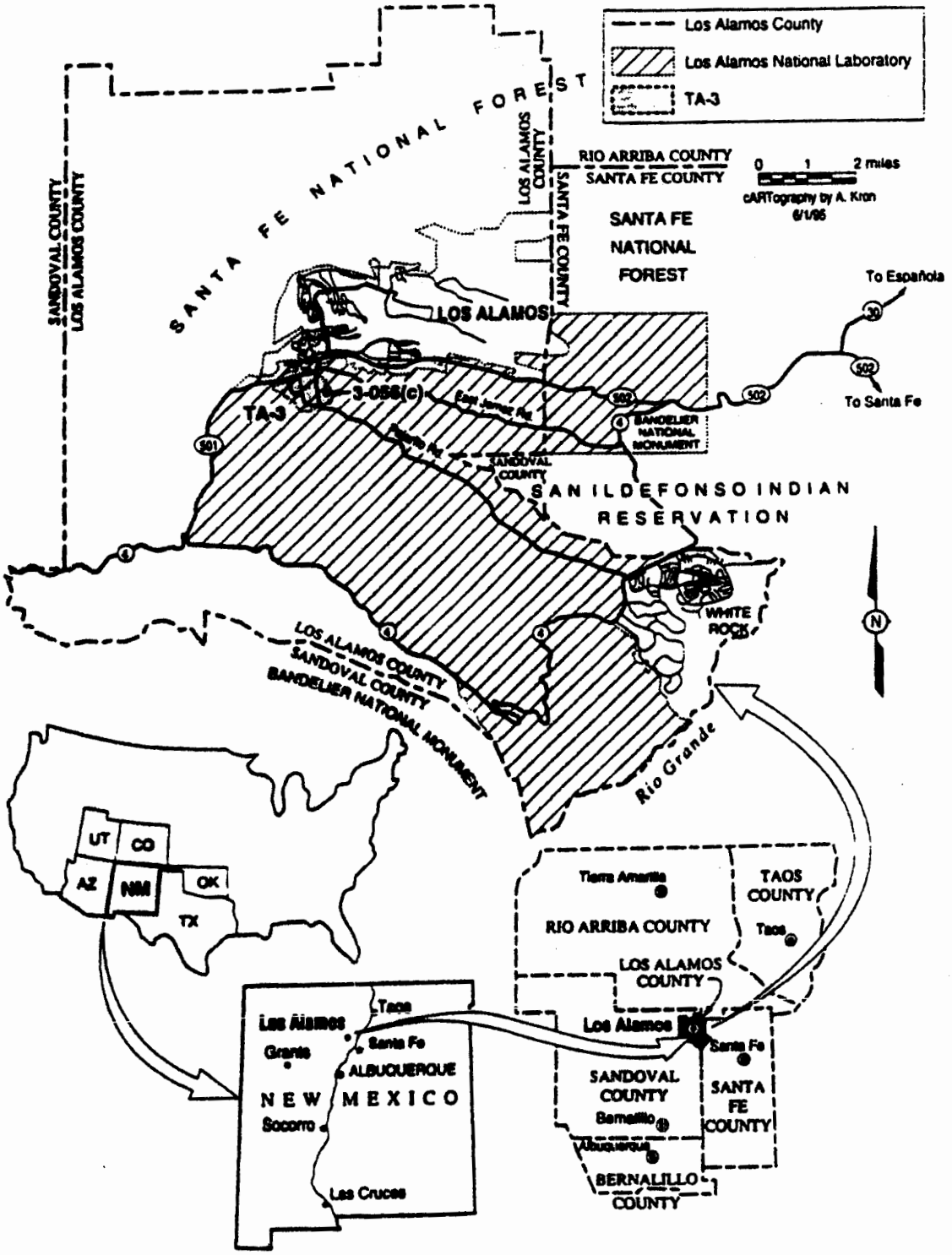


Figure 1-1. Regional location map.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Detailed Description of SWMU 3-056(c)

SWMU 3-056(c) is an inactive storage area located on the north side of a Utilities Shop, TA-3-223 (Figure 2-1). The SWMU extends along the length of TA-3-223, and is bounded by a fence to the north and TA-3-223 to the south. Included within the SWMU boundary is an area downgradient from the storage area that drains to a tributary of Sandia Canyon. A small portion of this area (located north of northeast corner of TA-3-223 near the fenceline) was used as a storage area for electrical equipment. Items previously stored in this area include capacitors and transformers with PCB-containing dielectric fluids as well as unmarked drums that may have contained waste oils and solvents (LANL 1993, 1090).

2.1.1 Operational History

SWMU 3-056(c) was used as a storage area for electrical equipment, new and used dielectric fluids, and waste solvent from 1967 to approximately 1992. Solvents were used to clean electrical equipment; the types of cleaning solvents potentially used and stored at the site include an unknown solvent from 1967 to approximately 1981 and Viking R30 (trichloroethane - TCA) from 1981 to 1990. Since 1990, a nonhazardous citrus-based solvent has been used to clean electrical equipment. Transclene (tetrachloroethylene - PCE) may have been stored at the site as it was used by an electrical equipment maintenance subcontractor to retrofill transformers in the field. The subcontractor was responsible for the disposal of all waste materials from this activity; hence no wastes were returned to the SWMU 3-056(c) storage area. In 1991, approximately one to two feet of clean fill was placed on the site and surrounding area to correct drainage patterns. The SWMU 3-056(c) storage area was decommissioned in 1992 (LANL 1995, 3-1232).

2.1.2 Physical Setting

SWMU 3-056(c) is located on Sigma Mesa on the southern flank of Sandia Canyon in Los Alamos County. Los Alamos County has a semi-arid, temperate mountain climate. Precipitation at the site averages approximately 18 inches per year. Recorded extremes in precipitation range from 6.8 to 30.3 inches per year. Snowfall averages 51 inches per year.

The prevalent soil type on the mesa top is the Carjo loam, which consists of moderately deep, well-drained soils that formed in material weathered from tuff. Pleistocene ash flows of the Bandelier Tuff directly underlie the soil at depths ranging from 1.5 to 3.5 feet. The depth to the main aquifer is estimated to be from 950 to 1200 feet below ground surface.

SWMU 3-056(c) lies entirely on US Department of Energy (DOE)-owned land, and is removed from public access roads. In the foreseeable future, it is anticipated that the land will continue to be used for industrial purposes (Laboratory operations) based on current Laboratory land use planning (LANL 1994, 1171).

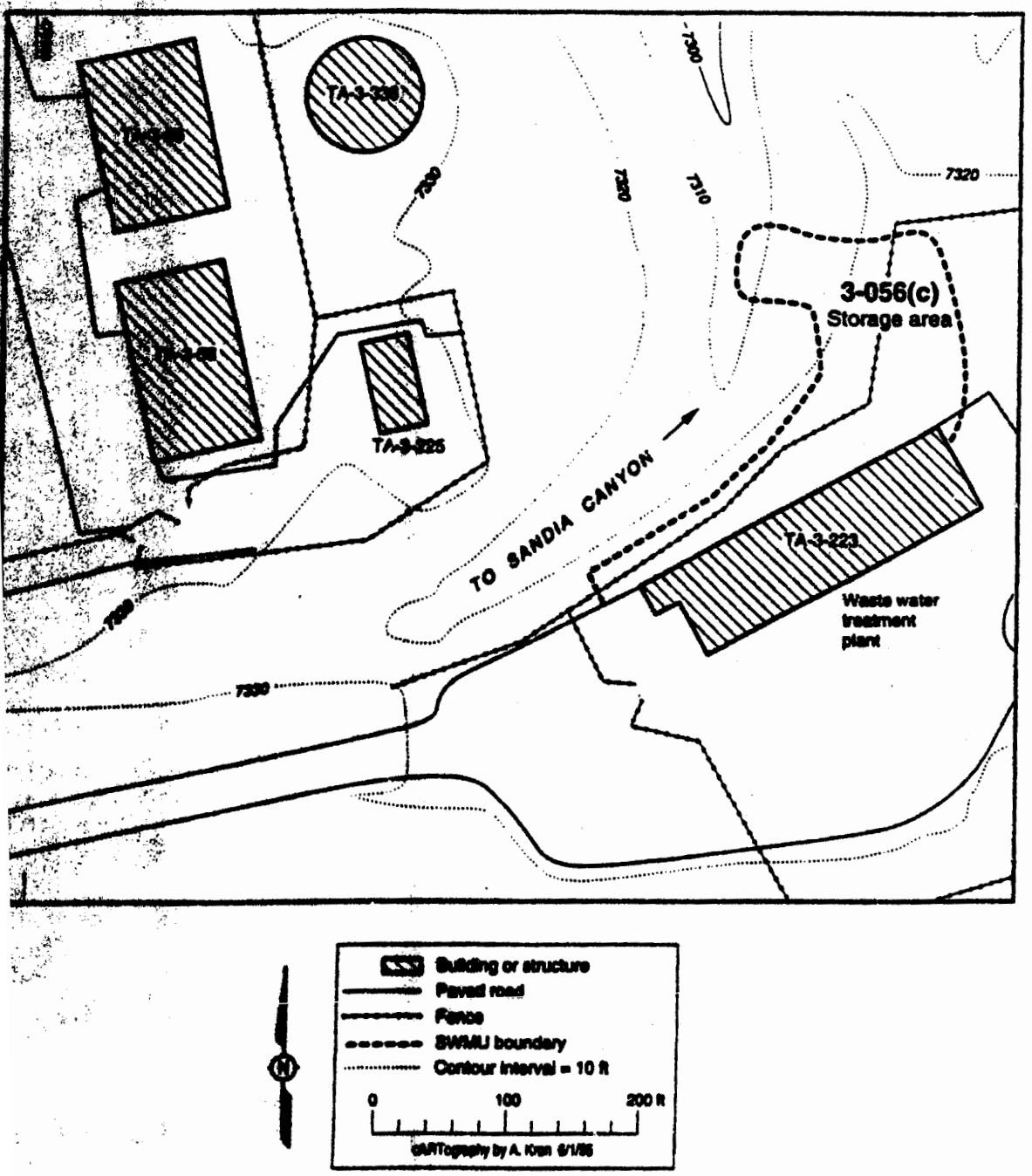


Figure 3-1. Location map for SWMU 3-056(c).

2.2 Summary of Investigations

2.2.1 Investigations Prior to RFI

In November 1991, five surface (0 to 3 inches) soil samples were collected along the fence north of TA-3-223 as part of an interim action reconnaissance survey prior to initiation of a slope stabilization project (LANL 1991, 3-498). The approximate locations of these samples are shown on Figure 2-2. The soil samples were screened for gross alpha, beta, and gamma radioactivity before submittal for metals, tritium, and volatile organic compounds (VOCs) analyses. Analytical results from the interim action reconnaissance survey indicated that PCB concentrations in one sample (PF-223-5) were 9600 ppm and the mercury concentration in one sample (PF-223-1) was 0.471 ppm.

2.2.2 RCRA Facility Investigation

In August 1994, SWMU 3-056(c) was sampled as part of the Phase I RFI for OU 1114. The sampling approach was designed to determine the extent of PCB contamination. Information from the RFI Work Plan for Operable Unit 1114 (LANL 1993, 1090) and results from field test kit analyses and the previous investigation were utilized to assist in the selection of 18 sample locations. These 18 sample locations are shown on Figure 2-2. These locations were sampled from depths ranging from 0 to 36 inches; the soil/tuff interface was encountered before reaching a depth of 36 inches at several locations. Samples were submitted to a fixed laboratory for one or more of the following analyses: Appendix VIII metals, PCB/pesticides, semivolatile organic compounds (SVOCs), and/or volatile organic compounds (VOCs). Twenty-two samples were submitted for analysis of metals, 13 samples were submitted for analysis of PCBs/pesticides/SVOCs, and 11 samples were submitted for analysis of VOCs. Specific details of sampling locations, sample intervals, and associated analyses are outlined below:

- Samples collected from the 0- to 6-inch interval at locations 3-2200 through 3-2206 and from the 0- to 18-inch interval at locations 3-2207 through 3-2217 were submitted for analysis of Appendix VIII metals.

- Samples collected from the 0- to 6-inch interval and the 12- to 18-inch interval at locations 3-2207, 3-2208, 3-2209, 3-2212, 3-2213, and 3-2214 were submitted for analysis of PCBs/pesticides/SVOCs and VOCs, respectively.

- Samples collected from the 0- to 6-inch interval and the 18- to 24-inch interval at location 3-2200 and were submitted for analysis of PCBs/pesticides/SVOCs; the 18- to 24-inch interval was also submitted for analysis of Appendix VIII metals.

- Samples collected from the 0- to 6-inch interval and the 12- to 18-inch interval at location 3-2201 were submitted for analysis of PCBs/pesticides/SVOCs; the 12- to 18-inch sample interval was also submitted for analysis of Appendix VIII metals.

- Samples collected from the 0- to 6-inch interval, the 12- to 18-inch interval, and the 30- to 36-inch interval at location 3-2202 were all submitted for analysis of PCBs/pesticides/SVOCs. In addition, the 12- to 18-inch sample interval was submitted for analysis of Appendix VIII metals, and the 30- to 36-inch sample interval was submitted for analysis of Appendix VIII metals and VOCs.

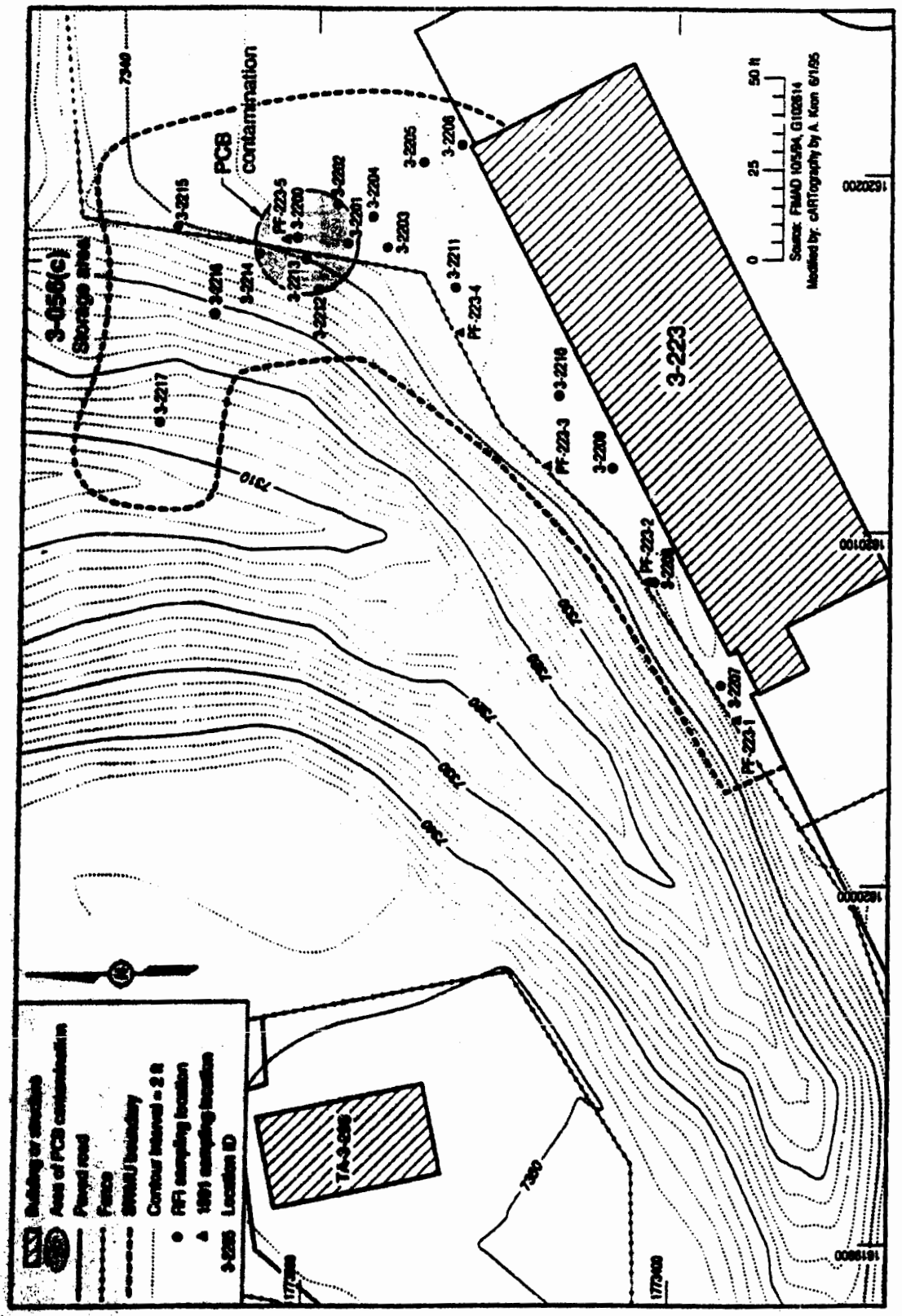


Figure 3-2. SWMU 3-056(c) site sketch.

- A sample collected from the 12- to 18-inch interval at location 3-2205 was submitted for analysis of VOCs.

- Samples collected (based on field-screening) from the 12- to 18-inch interval, 18- to 24-interval, and the 30- to 36-inch interval at location 3-2206 and were submitted for analysis of VOCs.

2.2.3 Summary and Evaluation of Results

Annex 6.9 presents a summary of the RFI analytical sampling results reported above detection limits for all RFI samples collected at the site. The detected concentrations, screening action levels (SALs), and upper tolerance limits (UTLs) for background concentrations in soil are also presented for comparison. Based on preliminary review of the RFI sampling data, the results are summarized as follows:

- PCBs were detected at eight of the 18 sample locations on the mesa and north of the fence on the slope; the PCB compounds detected include Aroclors 1242, 1254, and 1260. The PCBs were detected in the same vicinity as the high PCB concentration detected (PF-223 #5) from the interim action reconnaissance survey. The highest concentrations (980 ppm maximum at location 3-2201) occur in surface soils (0 to 18 inches) and diminish dramatically with depth. The areal extent of PCB contamination is shown on Figure 2-2.

- Tetrachloroethylene (PCE) was detected significantly below the Laboratory screening action level (SAL) of 1 ppm at locations 3-2202 and 3-2206 at concentrations of 0.044 and 0.009 ppm, respectively. These concentrations were detected at a depth interval of 30 to 36 inches in each sample and are not collocated with high PCB concentrations.

- Mercury was detected in three samples significantly below the Laboratory SAL of 24 ppm at locations 3-2201, 3-2207, 3-2216 at concentrations of 0.04, 1.7 and 0.2 ppm, respectively. These concentrations were detected to a depth of 18 inches.

Results from the previous investigations indicate that PCBs are the COCs for this site and require remediation. Based on the site history presented in Section 2.1 and the limited detections of PCE and mercury at concentrations below SALs and established cleanup levels, these constituents should not pose an unacceptable risk to human health and the environment.

2.3 Types and Volumes of Waste Present

The nature of the wastes expected to be generated by the proposed cleanup is presented in Table 2-1.

Surface and subsurface soil samples revealed the presence of elevated levels of PCBs in soils to a depth of approximately 18 inches. Once excavated, the soil will be considered TSCA-regulated waste. As described in Section 3.3, PCB-contaminated soils will be excavated and placed directly into bulk containers on site prior to transport to and disposal at a permitted chemical waste landfill.

In addition, a small volume of solid and liquid wastes will be generated from verification sampling; this activity is described in Section 3.5. Wastes associated with this effort include disposable sampling equipment, personal protective equipment (PPE), and decontamination water. Pending characterization, these waste materials will be handled in accordance with the site-specific Waste Management Checklist as potentially PCB-contaminated (TSCA-regulated) waste.

TABLE 2-1
ANTICIPATED WASTE VOLUMES

Item	Type	Anticipated Volume
Sampling waste/PPE	solid - potentially PCB contaminated	6 cubic feet
Contaminated soils	solid - PCB contaminated	740 cubic feet
Decontamination waste	liquid - potentially PCB contaminated	35 cubic feet

2.4 Potential Impacts on Public Health and the Environment

Receptors of possible PCB contamination include animals and humans. Potential exposure routes to receptors include the following:

- Dermal contact with PCB-contaminated soil or sediment;
- Inhalation of PCB-contaminated soil or sediments; and
- Ingestion of PCB-contaminated soil or sediments.

2.4.1 Potential Pathways

2.4.1.1 SWMU In Place

If the contaminated soil remains in place, several mechanisms are available to transport contaminants from their current location. These mechanisms include:

- surface water runoff (across the contaminated area);
- erosion of soil and sediments; and
- wind dispersion.

Because PCB contamination was also detected downgradient of the area where electrical equipment was stored (north of the fence), the primary mode of migration appears to be via sediment transport in surface water runoff. The relative insolubility of PCBs limits migration via dissolution into surface water runoff and infiltration.

2.4.1.2 SWMU Remediation

Potential pathways for PCB migration during remediation/excavation of the soils are generally the same as those described above in Section 2.4.1.1. While excavation activities will increase the potential for sediment transport and wind dispersion, precautions will be taken to minimize these pathways during remediation/excavation activities. Appropriate dust suppression techniques will be utilized to prevent contaminants from becoming airborne. Covered storage containers for excavated materials and plastic sheeting covering the excavated area will prohibit rainwater and/or runoff from contacting potentially contaminated material.

2.4.2 Future Land Use

SWMU 3-056(c) lies entirely on DOE-owned land on Sigma Mesa. The entire area is used strictly for industrial purposes and is expected to remain so for the foreseeable future, as stated in the Laboratory's *Site Development Plan Annual Update 1994* (LANL 1994, 1171).

2.4.3 Cleanup Levels

Results from the previous investigations indicate that PCBs are the only COCs for this EC, and therefore, cleanup levels have been determined for these compounds. Based on the site history presented in Section 2.1, and the limited detections at concentrations below SALs and established cleanup levels, the PCE and mercury at this site should not pose an unacceptable risk to human health and the environment. Also, the reported low concentrations are at locations and depths that should allow for the remediation of soils contaminated with PCBs above cleanup levels without triggering additional waste management and disposal requirements.

For PCBs, the cleanup levels identified are based on the 28 October 1994 position paper prepared by the ER Assessments Council entitled *Guidance for Evaluation and Cleanup of PCBs in Soil* (LANL, 1994) and the TSCA PCB Spill Cleanup Policy. A PCB cleanup level of 25 ppm is proposed for the portion of the area to the north of TA-3-223 where access is restricted by a fence (see Figure 2-2), which meets the definition of an "other restricted access area" under 40 CFR 761.123. For portions of the SWMU located north of the fence, but still on Laboratory property and designated for continued industrial use, a PCB cleanup level of 10 ppm is proposed, in accordance with requirements for "commercial non-restricted access areas."

As previously discussed in Section 2.1, releases of PCBs from electrical equipment stored at this site likely occurred predominantly from 1964 through approximately 1992. Some of these releases appear to have occurred after 11 May 1987 since many of the PCB detections were located in fill material that was placed within the fenced yard in approximately 1991. Although the PCB Spill Cleanup Policy described in Subpart G of TSCA applied to spills which occur after 11 May 1987, the policy has also been used in the cleanup of historical spills, particularly in the context of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remediation. According to the preamble of EPA's proposed PCB rules dated 6 December 1994, "it has been the Agency's experience that the essential features of the 1987 TSCA policy are workable and yield protective cleanup results for historical spills of PCBs."

Attainment of these cleanup levels will be considered achieved when the upper 95% confidence level of the mean concentration of PCBs remaining in the excavated area, as demonstrated by verification sampling, is equal to or less than the established cleanup levels.

3.0 EXPEDITED CLEANUP

3.1 Overview and Rationale

Phase I RFI sampling results indicate that PCBs exceeding cleanup levels exist in the surface soils on the north side of building TA-3-223, and the excavated soils will be classified as a TSCA-regulated waste. Excavation of PCB-contaminated soils at the site will be conducted to prevent the contaminants from spreading beyond the current location. This action will minimize the potential risk to human health and the environment. Verification samples will be collected to confirm that the PCBs have been removed and disposed in accordance with this plan.

3.2 Permitting, Approval, and Notification Requirements

An excavation permit will be prepared and submitted for approval before execution of this plan.

Documentation will be prepared in accordance with Laboratory Environmental Restoration (ER) Administrative Procedure (AP) LANL-ER-AP-05.1, Rev. 0, Readiness Review for Environmental Restoration Program Field Activities (LANL 1993, 0951). Key documents to be prepared for this review include a Site-Specific Health and Safety Plan (SSHASP) and site-specific Waste Management Checklist. Personnel training requirements will be specified and will require completion prior to implementation of this EC Plan. Site workers must have received all required training for this project as specified in the SSHASP.

3.2.1 Regulatory Notification/Permit Modifications

SWMU 3-056(c) is included in Table A of the original HSWA Module. Implementation of this EC will require a Class III modification to the Laboratory's HSWA Module. EPA and the New Mexico Environment Department (NMED) have been notified of this project, and a request for a permit modification has been submitted. Implementation of this EC will proceed after receipt of EPA approval.

3.2.2 DOE Approval

If the Laboratory intends to implement this EC prior to receiving EPA approval, DOE approval must be documented through receipt of the signed Field Work Approval Form (Annex 6.7).

3.3 Cleanup Activities

Excavation, transportation, and disposal of PCB-contaminated soil from this site will be conducted by an approved and permitted waste treatment, storage, and disposal (TSD) subcontractors currently under contract with the Laboratory. Site access, preparation, and restoration will be arranged and completed by JCI, the Laboratory maintenance subcontractor.

Prior to excavation, soil samples will be collected from approximately 10 locations at the site to confirm, 1) the areal extent of PCB contamination, and 2) that the reported existence of low levels of PCE at depth do not pose an unacceptable risk to human health and the environment. Soil samples will be collected around the perimeter of the identified PCB contamination (atop the mesa and on the slope) as well as in the vicinity of the two PCE detections (locations 3-2202 and 3-2206). Samples will be collected from surface and near-

surface soils (0- to 18-inch depth) for analysis of PCBs while samples will be collected from the soil/tuff interface for analysis of VOCs (i.e., PCE). During sample collection, three headspace screening analyses will be conducted along the length of each sample core to confirm the presence or absence of VOCs. These samples will be field-analyzed in a mobile analytical laboratory using EPA Method (SW-846) 8080 for PCBs and EPA Method (SW-846) 8260 for volatile organic compounds (VOCs), respectively. All analytical tests and reports will include EPA Level 3 data. Any additionally identified PCB contamination will be marked for excavation. If VOCs are detected, additional samples will be collected and field-analyzed to determine nature, concentrations, and extent; these results will be evaluated to determine whether an unacceptable risk exists. Based on the RFI Phase I analytical results, the PCBs and PCE are not collocated; hence, the cleanup of PCB contamination will proceed as proposed in this EC Plan.

Based on the RFI Phase I analytical results, the PCB contamination exceeding the cleanup levels at this site extends to a maximum depth of 18 inches (both atop the mesa and on the slope). PCB-contaminated soil will be removed in the proposed cleanup area using a backhoe or shovels, as required by site conditions and as determined by the approved waste TSD subcontractor. The expected volume of PCB-contaminated soil to be excavated, transported, and land disposed is approximately 30 cubic yards (740 cubic feet). During excavation activities, samples from bulk soils will be collected and analyzed in accordance with the waste acceptance criteria (WAC) of the TSD subcontractor (to ensure waste is properly characterized). Initial verification samples will be collected on the nodes of a 5-ft. by 5-ft. grid within the excavated area; these samples will be submitted for on-site field laboratory analysis of PCBs and VOCs (by the methods described above). Additional soil will be excavated in 6-inch lifts where results indicated that PCB cleanup levels have not been met, until field laboratory analytical results indicate that any remaining PCB concentrations meet the cleanup criteria. Final verification samples will be collected and submitted for fixed laboratory analysis of PCBs and VOCs, as described in Section 3.5.

VOCs (i.e., PCE) are not anticipated to be encountered during sampling. However, if VOCs are detected, additional samples will be collected and field-analyzed to determine nature, concentrations, and extent. The VOC results will be used to evaluate, 1) whether further VOC characterization is required, 2) an unacceptable risk exists and cleanup is required, or 3) specific VOC cleanup criteria are already met. These results will also be used to ensure that all waste management, disposal, and health and safety issues have been addressed. If cleanup is required, the soil cleanup level for PCE is 31 mg/kg. This level was set at a concentration that would result in an estimated noncarcinogenic hazard index of one or less for the occupational exposure scenario. The equation and assumptions used for the calculation of this cleanup level is provided in Annex 6.10. It should be noted that this cleanup level is based on an excess cancer risk of 1E-06, which is conservative given that exposure is highly unlikely due to the restricted access of this area. Attainment of this cleanup level will be considered achieved as described in Section 2.4.3.

3.4 Waste Management Issues

As discussed in Section 2.3, wastes to be generated during this EC include contaminated soil, used personal protective equipment (PPE), and decontamination rinse water. Solid wastes will be disposed at a permitted chemical waste landfill, as arranged by the waste TSD subcontractor, and decontamination rinse water will be characterized in accordance with the site-specific Waste Management Checklist.

3.4.1 Characterization of Materials for Disposal

Previous analyses and/or field laboratory analytical results from samples collected will be used to initially profile the excavated soils, PPE, and sampling equipment in accordance with the site-specific Waste Management Checklist and waste acceptance criteria (WAC) for the

TSD facility. During excavation activities, samples from bulk soils will be collected and analyzed in accordance with the waste acceptance criteria (WAC) of the TSD subcontractor (to ensure waste is properly characterized prior to transportation offsite).

3.4.2 Treatment, Storage, and Disposal Plans for Waste

The excavated soils, PPE, and sampling equipment will be transported to a permitted chemical waste landfill facility for final disposal, as arranged by the waste TSD subcontractor. No treatment of these solid wastes is required. Decontamination rinse water will be disposed in accordance with the site-specific Waste Management Checklist. These liquid wastes may require treatment and disposal at the Laboratory Wastewater Treatment Facility (TA-50).

3.5 Verification Plan

The verification plan prepared for this EC Plan is based upon the guidance outlined in the EPA guidance document entitled *Verification of PCB Spill Cleanup by Sampling and Analysis* (EPA 1985). The applicable section of this document are in Annex 6.11. The geometry of the PCB contamination is approximately circular and centered along the fenceline. The sampling strategy will employ grab samples collected according to a hexagonal grid pattern as proposed in the guidance document. A seven-point grid will be used to collect samples located equidistant from each other within the excavated area representing the area of contamination.

Soil samples collected during the RFI detected PCBs oriented in a circular area approximately 28 feet in diameter and centered along the fenceline. The EPA verification guidance proposes that the distance, *s*, between sampling points be calculated according to the following formula:

$$s = (0.87)\ R$$

where R is the radius of the sampling circle.

The distance between sampling points for SWMU 3-056(c) is calculated to be 12.2 feet, when R for this site is 14 feet. Seven grab samples are considered sufficient coverage for verification since the distribution of residual PCBs has been spread over several years due to water transport and erosion. A summary of verification samples and analysis for SWMU 3-056(c) is presented in Table 3-1. Samples will be collected from these seven locations and submitted for fixed laboratory analysis of PCBs; VOC analysis will also be performed to ensure that all waste management and disposal issues have been addressed.

3.6 Site Restoration

When verification sample results confirm that the site has been remediated in accordance with this plan, the excavated area will be returned to the original grade and revegetated if necessary. Backfill material will consist of uncontaminated soil excavated from the site and clean backfill obtained from the Laboratory maintenance contractor.

3.7 Acceptance Inspection

The Laboratory proposes an Acceptance Inspection as the mechanism for DOE and EPA to assess that the Laboratory has implemented this EC Plan effectively. A minimum of 10 days' notification will be provided to the agencies before the start of field activities. At this time, a tentative date for the inspection will be agreed upon.

TABLE 3-1
SUMMARY OF VERIFICATION SAMPLES AND ANALYSES FOR SWMU 3-056(c)

	Field Screening					Field Laboratory Analysis					Fixed Laboratory Analysis					
Sample Description	Beta-Gamma	Alpha	Organic Vapor (head space)	Radiological Smear & Swipe Techniques	XRF	PCBs	VOCs (SW 8260)*	SVOCs (SW 8270)*	Metals (ICPES)	Gross Gamma, Alpha, Beta	PCBs	VOCs (SW 8260)*	Metals (SW 6010/7000)*	SVOCs (SW8270)*	Total Uranium	Gamma Spectrometry
Initial Soil Samples			30			10	10									
Surface Soil Samples						35	35				7	7				
Duplicate						2	2				1	1				
Decontamination Water						1	1									
Excavation Equipment																

: Additional samples may be taken based on field surveys and observations.
*Applicable EPA SW 846 methods.

An inspection checklist will be used to document the scope of the inspection and will become part of the EC Report. The checklist and the timing of the inspection will be developed by the Laboratory and agreed to by the other agencies. This inspection checklist will contain specific items, components, and requirements agreed upon by all parties to be inspected that will constitute acceptance of remediation activities. Possible checkpoints at which the inspection is conducted are: during excavation, at completion of verification sampling, or after final site restoration.

3.8 Final Report

After field activities are completed and all analytical results from the verification samples obtained a final report on the EC will be prepared. This report will outline the EC process and the "as left" condition of the site. A proposed outline for this report is presented as Annex 6.8. The final report will be submitted to EPA within 14 days of receipt of verification sample results.

4.0 PROJECT MANAGEMENT

Overall implementation of this EC will be managed by Garry Allen, the Field Unit One Project Leader (FPL). Derek Faulk will serve as Field Team Manager (FTM) for the EC field activities

4.1 Staff and Resource Requirements

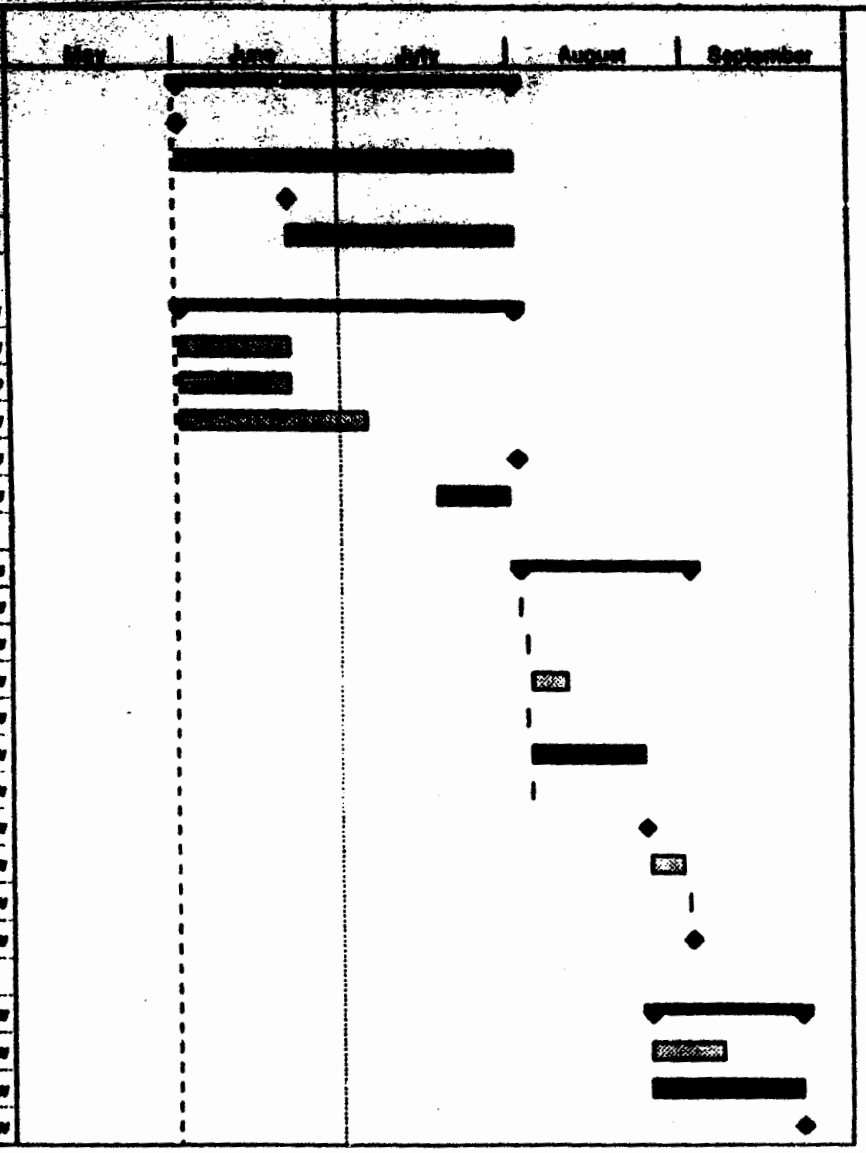
Total anticipated cost for the EC is $60,200 as detailed below:

Pre-Field Activities		
Preparation of Waste Management Checklist		$2,500
Preparation of Site-Specific Health and Safety Plan		2,500
Site Preparation/Subcontracting Scheduling		3,500
Subtotal		$8,500
Field Activities		
TSD Subcontractor (excavation, transportation, disposal of waste)		$21,000
Site restoration		3,600
Subtotal		$24,600
Personnel Costs		
FTL	$70/hr x 5 days	$2,800
Site Health & Safety Officer	$70/hr x 5 days	2,800
Sample Technician	$60/hr x 5 days	2,400
Subtotal		$8,000
Analytical Costs		
Mobile analytical van	$2000/day x 5 days	$10,000
Verification sampling	8 samples x ($125 + $200)	2,600
Subtotal		$12,600
Post-Field Activities		
Acceptance Inspection (including preparation of checklist)		$4,000
Final Report		2,500
Subtotal		$6,500
TOTAL ESTIMATED COST		**$60,200**

4.2 Schedule

The proposed EC schedule is shown in Table 4-1. The submittal of this EC Plan to EPA in June 1995 will initiate the 60-day public review/comment period. No sooner than 15 days after the start of this period, a public meeting will be held. Preparation for field work will be conducted concurrent to the public review period. Field work will be initiated within 10 days of agency and public approval or receipt of EPA temporary authorization to proceed.

ID	Name	Duration
1	1.0 PUBLIC ACCEPTANCE	8.77ew
2	1.1 SUBMIT EC PLAN TO EPA	0w
3	1.2 PUBLIC COMMENTS	44d
4	1.3 PUBLIC MEETING	0ew
5	1.4 RESPOND TO PUBLIC COMMENT	6w
6		
7	2.0 PLANNING	8.77ew
8	2.1 PREPARE/REVISE HEALTH AND SAFETY PLAN	3w
9	2.2 PREPARE/REVISE WASTE MANAGEMENT CHECKLIST	3w
10	2.3 FIELD WORK PLANNING	5w
11	2.4 FIELD WORK APPROVAL FORM SIGNED	0w
12	2.5 10-DAY NOTIFICATION OF FIELD WORK	2w
13		
14	3.0 IMPLEMENT EXPEDITED CLEANUP	4.34ew
15	3.1 MOBILIZATION	0.2w
16	3.2 INITIAL SAMPLING	0.2w
17	3.3 PERFORM EXCAVATION	1w
18	3.4 VERIFICATION SAMPLING	0.2w
19	3.5 VERIFICATION ANALYSIS	3w
20	3.6 ACCEPTANCE INSPECTION	0.2w
21	3.7 ANALYSIS COMPLETE	0w
22	3.8 SITE RESTORATION	1w
23	3.9 DEMOBILIZATION	0.2w
24	3.10 COMPLETE EC	0w
25		
26	4.0 REPORT PREPARATION	3.91ew
27	4.1 VALIDATE SAMPLE DATA	2w
28	4.2 PREPARE FINAL REPORT	4w
29	4.3 SUBMIT REPORT	0w



Project:
Date: 5/31/95

Critical
Noncritical
Progress
Milestone
Summary

Los Alamos National Laboratory

4.3 Stakeholder Notifications

Stakeholder notifications are an integral part of the procedure for conducting ECs. ER Project personnel will notify state and local governments, external and internal stakeholders, and individuals on the ER Project mailing list of the availability of the EC Plan. The EC Plan will be available to the stakeholders at the Laboratory Community Reading Room in Los Alamos; the document repositories at the public libraries in Los Alamos, Espanola, and Santa Fe; and the San Ildefonso Pueblo Governor's office.

The submission to EPA of this EC Plan will trigger publication of a public notice starting a 60-day comment period.

[illegible] REFERENCES

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LANL (Los Alamos National Laboratory), February 17, 1995. "Los Alamos National Laboratory Environmental Restoration (ER) Project Health and Safety Plan (HASP)." Los Alamos, NM. (LANL, 1995)

LANL (Los Alamos National Laboratory), June 1993. "RFI Work Plan for Operable Unit [illegible]," Los Alamos National Laboratory report, Los Alamos, NM. (LANL 1993, 1090).

LANL (Los Alamos National Laboratory), October 28, 1994. "Guidance for Evaluation and Remediation of PCBs in Soil," position paper prepared by the Environmental Restoration Technical Support Council, Los Alamos National Laboratory Los Alamos, NM. (LANL, 1994).

LANL (Los Alamos National Laboratory), 1994. "Site Development Plan Annual Update [illegible]," Los Alamos National Laboratory report, Los Alamos, NM. (LANL 1994, 1171)

6.0 ANNEXES

6.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II (LANL 1993, 0875).

6.2 Quality Assurance Plan

See Quality Program Plan and Quality Assurance Project Plan for Environmental Restoration (LANL 1993, 0951).

6.3 Site-Specific Health and Safety Plan

See Los Alamos National Laboratory ER Project Health and Safety Plan (HASP) (LANL, 1995).

6.4 Records Management Plan

See Installation Work Plan for Environmental Restoration, Records Management Program Plan, Chapter IV (LANL 1993, 1017).

6.5 Public Involvement Plan

See Installation Work Plan for Environment Restoration, Public Involvement Program Plan, Chapter V (LANL 1993, 1017).

6.6 Waste Management Checklist

6.7 Field Work Approval Form

6.8 Proposed Outline for Expedited Cleanup Final Report

6.9 RFI Analytical Results

6.10 Risk-Based Cleanup Level Calculations

6.11 Verification of PCB Spill Cleanup by Sampling and Analysis

ANNEX 6.7

FIELD WORK APPROVAL FORM

ANNEX 6.7

FIELD WORK APPROVAL FORM

This form must be completed prior to starting remediation field work for Expedited Cleanups that do not have an EPA-approved plan.

I, _____, DOE-LAAO, APPROVE the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU _____.

I, _____, DOE-LAAO, DO NOT APPROVE the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU _____.

The following reasons reflect the decision for disapproval:

Signed: _____ Date _____

ANNEX 6.8

PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORT

ANNEX 6.8 PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORT

1.0 Introduction

- 1.1 Overview
- 1.2 Expedited Cleanup

2.0 Discussion of Sampling and Analysis

- 2.1 Verification Sampling and Analysis
  - 2.1.1 Sampling Objectives
  - 2.1.2 Quality Assurance/Quality Control
  - 2.1.3 Sampling Activities
- 2.2 Site Restoration

3.0 Modifications to the EC Plan

4.0 Quantities and Types of Waste Generated

5.0 Outstanding Problems from the Acceptance Inspection

6.0 Problems Encountered and Lessons Learned

<u>Appendices</u>

A Analytical Data
B Acceptance Inspection Checklist
C Waste Stream Inventory
D Photographs
E Certification of Completion

ANNEX 6.9

RFI ANALYTICAL RESULTS

03-056(c) Detects
Soil samples

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
03-2	0.0 - 0.5 ft.	AAB5960	Aluminium	8870 (J)	MG/KG	n/a	123000
			Barium	145	MG/KG	5600	1143
			Calcium	1990	MG/KG	n/a	54362
			Chromium	11 (J)	MG/KG	n/a	34.2
			Copper	5.6	MG/KG	3000	15.7
			Iron	11200	MG/KG	n/a	35586
			Lead	16.3	MG/KG	400	39
			Magnesium	1580	MG/KG	n/a	16147
			Manganese	164	MG/KG	11000	1030
			Potassium	1140	MG/KG	n/a	6179
			Vanadium	11.7	MG/KG	560	66
			Zinc	59.8	MG/KG	24000	101
03-2200	0.0 - 0.5 ft.	AAB5977	Aroclor 1242	680 (J)	MG/KG	1	n/a
			Aroclor 1254	34	MG/KG	1	n/a
			Aroclor 1260	48	MG/KG	1	n/a
			Benzo(b)fluoranthene	0.56 (UJ)	MG/KG	1	12.2
03-2200	1.5 - 2.0 ft.	AAB5983	Aluminium	5770 (J)	MG/KG	n/a	123000
			Aroclor 1242	10 (J)	MG/KG	1	n/a
			Aroclor 1254	2.4	MG/KG	1	n/a
			Aroclor 1260	3.7	MG/KG	1	n/a
			Barium	57	MG/KG	5600	1143
			Calcium	2150	MG/KG	n/a	54362
			Chromium	6.9 (J)	MG/KG	n/a	34.2
			Iron	8110	MG/KG	n/a	35586
			Lead	12.1	MG/KG	400	39
			Manganese	242	MG/KG	11000	1030
			Zinc	33.2	MG/KG	24000	101
03-2201	0.0 - 0.5 ft.	AAB5961	Aluminium	5860 (J)	MG/KG	n/a	123000
			Barium	48.2	MG/KG	5600	1143
			Calcium	1330	MG/KG	n/a	54362
			Chromium	6.6 (J)	MG/KG	n/a	34.2
			Copper	16.8	MG/KG	3000	15.7
			Iron	9350	MG/KG	n/a	35586
			Lead	15.8	MG/KG	400	39
			Magnesium	1130	MG/KG	n/a	16147
			Manganese	251	MG/KG	11000	1030
			Zinc	96.7	MG/KG	24000	101
03-2201	0.0 - 0.5 ft.	AAB5975	Aluminium	6980 (J)	MG/KG	n/a	123000
			Barium	69.1	MG/KG	5600	1143
			Calcium	1820	MG/KG	n/a	54362
			Chromium	8.2 (J)	MG/KG	n/a	34.2
			Copper	10	MG/KG	3000	15.7
			Iron	9870	MG/KG	n/a	35586
			Lead	15.1	MG/KG	400	39
			Magnesium	1250	MG/KG	n/a	16147
			Manganese	260	MG/KG	11000	1030
			Zinc	67.5	MG/KG	24000	101
03-2201	0.0 - 0.5 ft.	AAB5978	Aroclor 1242	880 (J)	MG/KG	1	n/a
			Aroclor 1254	24	MG/KG	1	n/a

03-056(c) Detects
Soil samples

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Aroclor 1260	76	MG/KG	1	n/a
03-2201	1.0 - 1.5 ft.	AAB5981	Aluminium	3690 (J)	MG/KG	n/a	123000
			Aroclor 1242	120 (J)	MG/KG	1	n/a
			Aroclor 1254	17 (J)	MG/KG	1	n/a
			Aroclor 1260	47 (J)	MG/KG	1	n/a
			Chromium	3.9 (J)	MG/KG	n/a	34.2
			Iron	6780	MG/KG	n/a	35586
			Lead	12.8	MG/KG	400	39
			Manganese	336	MG/KG	11000	1030
			Mercury	0.04	MG/KG	24	0.1
			Zinc	35.3	MG/KG	24000	101
03-2202	0.0 - 0.5 ft.	AAB5962	Aluminium	5500 (J)	MG/KG	n/a	123000
			Barium	60	MG/KG	5600	1143
			Chromium	5.3 (J)	MG/KG	n/a	34.2
			Iron	9320	MG/KG	n/a	35586
			Lead	15	MG/KG	400	39
			Manganese	189	MG/KG	11000	1030
			Zinc	93.4	MG/KG	24000	101
03-2202	0.0 - 0.5 ft.	AAB5979	Aroclor 1242	12 (J)	MG/KG	1	n/a
			Aroclor 1254	5.1 (J)	MG/KG	1	n/a
			Aroclor 1260	14 (J)	MG/KG	1	n/a
03-2202	1.0 - 1.5 ft.	AAB5982	Aluminium	4170 (J)	MG/KG	n/a	123000
			Aroclor 1242	3.9 (J)	MG/KG	1	n/a
			Aroclor 1254	2.8	MG/KG	1	n/a
			Aroclor 1260	6.3	MG/KG	1	n/a
			Calcium	1360	MG/KG	n/a	54362
			Chromium	2.9 (J)	MG/KG	n/a	34.2
			Iron	7960	MG/KG	n/a	35586
			Lead	7.8	MG/KG	400	39
			Manganese	125	MG/KG	11000	1030
			Zinc	24.5	MG/KG	24000	101
03-2202	2.5 - 3.0 ft.	AAB5985	Aluminium	5480 (J)	MG/KG	n/a	123000
			Aroclor 1260	2.5	MG/KG	1	n/a
			Calcium	2120	MG/KG	n/a	54362
			Chromium	5.8 (J)	MG/KG	n/a	34.2
			Iron	8830	MG/KG	n/a	35586
			Lead	10	MG/KG	400	39
			Manganese	140	MG/KG	11000	1030
			Tetrachloroethylene	0.044 (J)	MG/KG	5.9	n/a
			Zinc	36	MG/KG	24000	101
03-2203	0.0 - 0.5 ft.	AAB5963	Aluminium	5510 (J)	MG/KG	n/a	123000
			Chromium	3.9 (J)	MG/KG	n/a	34.2
			Iron	9410	MG/KG	n/a	35586
			Lead	14.2	MG/KG	400	39
			Manganese	160	MG/KG	11000	1030
			Zinc	38.9	MG/KG	24000	101
03-2204	0.0 - 0.5 ft.	AAB5964	Aluminium	6110 (J)	MG/KG	n/a	123000
			Calcium	1310	MG/KG	n/a	54362
			Chromium	5.9 (J)	MG/KG	n/a	34.2

03-056(c) Detects
Soil samples

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Iron	9250	MG/KG	n/a	35586
			Lead	18.9	MG/KG	400	39
			Manganese	155	MG/KG	11000	1030
			Zinc	30.1	MG/KG	24000	101
03-2205	0.0 - 0.5 ft.	AAB5965	Aluminium	5750 (J)	MG/KG	n/a	123000
			Barium	44.8	MG/KG	5600	1143
			Calcium	1250	MG/KG	n/a	54362
			Chromium	5.2 (J)	MG/KG	n/a	34.2
			Iron	8370	MG/KG	n/a	35586
			Lead	22	MG/KG	400	39
			Manganese	344	MG/KG	11000	1030
			Zinc	79.2	MG/KG	24000	101
03-2206	0.0 - 0.5 ft.	AAB5966	Aluminium	5030 (J)	MG/KG	n/a	123000
			Chromium	4.8 (J)	MG/KG	n/a	34.2
			Iron	9170	MG/KG	n/a	35586
			Lead	17.5	MG/KG	400	39
			Manganese	226	MG/KG	11000	1030
			Zinc	62.4	MG/KG	24000	101
03-2206	2.5 - 3.0 ft.	AAB5974	Tetrachloroethylene	0.009	MG/KG	5.9	n/a
03-2207	0.0 - 0.5 ft.	AAB5994	Aroclor 1242	0.44	MG/KG	1	n/a
			Aroclor 1260	0.25	MG/KG	1	n/a
03-2207	0.0 - 1.5 ft.	AAB5988	Aluminium	8420 (J)	MG/KG	n/a	123000
			Barium	116	MG/KG	5600	1143
			Calcium	2770	MG/KG	n/a	54362
			Chromium	7.3 (J)	MG/KG	n/a	34.2
			Copper	8.7	MG/KG	3000	15.7
			Iron	12600	MG/KG	n/a	35586
			Lead	8.8	MG/KG	400	39
			Magnesium	1780	MG/KG	n/a	16147
			Manganese	406	MG/KG	11000	1030
			Mercury	1.7 (J)	MG/KG	24	0.1
			Vanadium	15.5	MG/KG	560	66
			Zinc	35.7	MG/KG	24000	101
03-2207	1.0 - 1.5 ft.	AAB6000	Methylene chloride	0.007	MG/KG	5.6	n/a
03-2208	0.0 - 0.5 ft.	AAB5995	Aroclor 1242	0.043	MG/KG	1	n/a
			Aroclor 1260	0.046	MG/KG	1	n/a
03-2208	0.0 - 1.5 ft.	AAB5989	Aluminium	6160 (J)	MG/KG	n/a	123000
			Barium	59.5	MG/KG	5600	1143
			Calcium	2860	MG/KG	n/a	54362
			Chromium	7.2 (J)	MG/KG	n/a	34.2
			Iron	7880	MG/KG	n/a	35586
			Lead	12.1	MG/KG	400	39
			Magnesium	1700	MG/KG	n/a	16147
			Manganese	188	MG/KG	11000	1030
			Zinc	43.4	MG/KG	24000	101
03-2209	0.0 - 1.5 ft.	AAB5990	Aluminium	6940 (J)	MG/KG	n/a	123000
			Calcium	1350	MG/KG	n/a	54362
			Chromium	17 (J)	MG/KG	n/a	34.2
			Iron	10400	MG/KG	n/a	35586

03-056(c) Detects
Soil samples

Location ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
			Lead	6.1	MG/KG	400	39
			Manganese	210	MG/KG	11000	1030
			Zinc	32.4	MG/KG	24000	101
03-2209	0.0 - 1.5 ft.	AAB5993	Aluminium	6260 (J)	MG/KG	n/a	123000
			Arsenic	2.7	MG/KG	n/a	11.6
			Chromium	16.1 (J)	MG/KG	n/a	34.2
			Iron	10300	MG/KG	n/a	35586
			Lead	8.4	MG/KG	400	39
			Manganese	235	MG/KG	11000	1030
			Zinc	36	MG/KG	24000	101
03-2210	0.0 - 1.5 ft.	AAB5991	Aluminium	6000 (J)	MG/KG	n/a	123000
			Barium	47.2	MG/KG	5600	1143
			Calcium	1220	MG/KG	n/a	54362
			Chromium	10.9 (J)	MG/KG	n/a	34.2
			Iron	9950	MG/KG	n/a	35586
			Lead	7.4	MG/KG	400	39
			Manganese	210	MG/KG	11000	1030
			Zinc	34.3	MG/KG	24000	101
03-2211	0.0 - 1.0 ft.	AAB5992	Aluminium	7055	MG/KG	n/a	123000
			Aluminium	7010 (J)	MG/KG	n/a	123000
			Arsenic	2	MG/KG	n/a	11.6
			Barium	51.8	MG/KG	5600	1143
			Barium	53	MG/KG	5600	1143
			Beryllium	0.84	MG/KG	n/a	3.31
			Cadmium	0.48	MG/KG	80	2.7
			Calcium	1420	MG/KG	n/a	54362
			Calcium	1479	MG/KG	n/a	54362
			Chromium	14.8	MG/KG	n/a	34.2
			Chromium	16.1 (J)	MG/KG	n/a	34.2
			Cobalt	2.1	MG/KG	n/a	51.1
			Copper	3.7	MG/KG	3000	15.7
			Iron	12108	MG/KG	n/a	35586
			Iron	12500	MG/KG	n/a	35586
			Lead	10	MG/KG	400	39
			Lead	11	MG/KG	400	39
			Magnesium	1148	MG/KG	n/a	16147
			Magnesium	1170	MG/KG	n/a	16147
			Manganese	237	MG/KG	11000	1030
			Manganese	245	MG/KG	11000	1030
			Nickel	3	MG/KG	1600	26.7
			Potassium	940	MG/KG	n/a	6179
			Sodium	118	MG/KG	n/a	1884
			Vanadium	10.4	MG/KG	560	66
			Vanadium	11.3	MG/KG	560	66
			Zinc	45.4	MG/KG	24000	101
			Zinc	45.4	MG/KG	24000	101
03-2212	0.0 - 0.5 ft.	AAB6007	Aroclor 1242	4.7 (J)	MG/KG	1	n/a
			Aroclor 1254	1.5	MG/KG	1	n/a
			Aroclor 1260	6.5	MG/KG	1	n/a

03-056(c) Detects
Soil samples

ation ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
2212	0.0 - 1.5 ft.	AAB6001	Aluminium	7460 (J)	MG/KG	n/a	123000
			Barium	82.4	MG/KG	5600	1143
			Calcium	4060	MG/KG	n/a	54362
			Chromium	7.1 (J)	MG/KG	n/a	34.2
			Iron	10900	MG/KG	n/a	35586
			Lead	14.5	MG/KG	400	39
			Magnesium	1590	MG/KG	n/a	16147
			Manganese	229	MG/KG	11000	1030
			Potassium	1050	MG/KG	n/a	6179
			Vanadium	11.9	MG/KG	560	66
			Zinc	67.1	MG/KG	24000	101
03-2213	0.0 - 0.5 ft.	AAB6008	Aroclor 1242	6.2 (J)	MG/KG	1	n/a
			Aroclor 1254	6.4	MG/KG	1	n/a
			Aroclor 1254	6.4	MG/KG	1	n/a
			Aroclor 1260	19	MG/KG	1	n/a
03-2213	0.0 - 1.5 ft.	AAB6002	Aluminium	6770 (J)	MG/KG	n/a	123000
			Barium	61	MG/KG	5600	1143
			Calcium	2490	MG/KG	n/a	54362
			Chromium	6 (J)	MG/KG	n/a	34.2
			Iron	10300	MG/KG	n/a	35586
			Lead	12.5	MG/KG	400	39
			Magnesium	1160	MG/KG	n/a	16147
			Manganese	201	MG/KG	11000	1030
			Vanadium	11.5	MG/KG	560	66
			Zinc	36.5	MG/KG	24000	101
2214	0.0 - 0.5 ft.	AAB6009	Aroclor 1242	4.3 (J)	MG/KG	1	n/a
			Aroclor 1254	15 (J)	MG/KG	1	n/a
			Aroclor 1260	58	MG/KG	1	n/a
			Benzo(b)fluoranthene	0.4	MG/KG	1	12.2
			Chrysene	0.45	MG/KG	96	19.5
			Fluoranthene	0.45	MG/KG	3200	32.5
			Pyrene	0.88	MG/KG	2400	12.8
03-2214	0.0 - 1.5 ft.	AAB6003	Aluminium	6250 (J)	MG/KG	n/a	123000
			Barium	54	MG/KG	5600	1143
			Calcium	1840	MG/KG	n/a	54362
			Chromium	7.1 (J)	MG/KG	n/a	34.2
			Copper	6.6	MG/KG	3000	15.7
			Iron	10800	MG/KG	n/a	35586
			Lead	23.2	MG/KG	400	39
			Magnesium	1180	MG/KG	n/a	16147
			Manganese	226	MG/KG	11000	1030
			Zinc	133	MG/KG	24000	101
03-2215	0.0 - 1.5 ft.	AAB6004	Aluminium	6910 (J)	MG/KG	n/a	123000
			Calcium	1700	MG/KG	n/a	54362
			Chromium	5.8 (J)	MG/KG	n/a	34.2
			Iron	11400	MG/KG	n/a	35586
			Lead	9.7	MG/KG	400	39
			Manganese	193	MG/KG	11000	1030
			Zinc	50.9	MG/KG	24000	101

03-056(c) Detects
Soil samples

ocation ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
3-2216	0.0 - 1.5 ft.	AAB6005	Aluminium	5340 (J)	MG/KG	n/a	123000
			Barium	43.9	MG/KG	5600	1143
			Calcium	1330	MG/KG	n/a	54362
			Chromium	6.2 (J)	MG/KG	n/a	34.2
			Copper	8.4	MG/KG	3000	15.7
			Iron	9510	MG/KG	n/a	35586
			Lead	17.1	MG/KG	400	39
			Manganese	102	MG/KG	11000	1030
			Mercury	0.16 (J)	MG/KG	24	0.1
			Zinc	64.3	MG/KG	24000	101
-2216	0.0 - 1.5 ft.	AAB6014	Aluminium	5200 (J)	MG/KG	n/a	123000
			Barium	53.8	MG/KG	5600	1143
			Calcium	1260	MG/KG	n/a	54362
			Chromium	5.7 (J)	MG/KG	n/a	34.2
			Copper	7.7	MG/KG	3000	15.7
			Iron	9030	MG/KG	n/a	35586
			Lead	14.9	MG/KG	400	39
			Manganese	89.5	MG/KG	11000	1030
			Mercury	0.15	MG/KG	24	0.1
			Mercury	0.2 (J)	MG/KG	24	0.1
			Zinc	56.1	MG/KG	24000	101
-2217	0.0 - 1.0 ft.	AAB6006	Aluminium	7040 (J)	MG/KG	n/a	123000
			Barium	52.6	MG/KG	5600	1143
			Calcium	2020	MG/KG	n/a	54362
			Chromium	6.7 (J)	MG/KG	n/a	34.2
			Copper	7.3	MG/KG	3000	15.7
			Iron	9640	MG/KG	n/a	35586
			Lead	18.2	MG/KG	400	39
			Manganese	175	MG/KG	11000	1030
			Potassium	1200	MG/KG	n/a	6179
			Zinc	65.3	MG/KG	24000	101

03-056(c) Detects above SAL and/or UTL
Soil samples

ation ID	Depth of sample	Sample ID	Analyte	Results	Units	SAL	UTL
2200	0.0 - 0.5 ft.	AAB5977	Aroclor 1242	680 (J)	MG/KG	1	n/a
			Aroclor 1254	34	MG/KG	1	n/a
			Aroclor 1260	48	MG/KG	1	n/a
03-2200	1.5 - 2.0 ft.	AAB5983	Aroclor 1242	10 (J)	MG/KG	1	n/a
			Aroclor 1254	2.4	MG/KG	1	n/a
			Aroclor 1260	3.7	MG/KG	1	n/a
03-2201	0.0 - 0.5 ft.	AAB5961	Copper	16.8	MG/KG	3000	15.7
03-2201	0.0 - 0.5 ft.	AAB5978	Aroclor 1242	880 (J)	MG/KG	1	n/a
			Aroclor 1254	24	MG/KG	1	n/a
			Aroclor 1260	76	MG/KG	1	n/a
03-2201	1.0 - 1.5 ft.	AAB5981	Aroclor 1242	120 (J)	MG/KG	1	n/a
			Aroclor 1254	17 (J)	MG/KG	1	n/a
			Aroclor 1260	47 (J)	MG/KG	1	n/a
03-2202	0.0 - 0.5 ft.	AAB5979	Aroclor 1242	12 (J)	MG/KG	1	n/a
			Aroclor 1254	5.1 (J)	MG/KG	1	n/a
			Aroclor 1260	14 (J)	MG/KG	1	n/a
03-2202	1.0 - 1.5 ft.	AAB5982	Aroclor 1242	3.9 (J)	MG/KG	1	n/a
			Aroclor 1254	2.8	MG/KG	1	n/a
			Aroclor 1260	6.3	MG/KG	1	n/a
03-2202	2.5 - 3.0 ft.	AAB5985	Aroclor 1260	2.5	MG/KG	1	n/a
03-2207	0.0 - 1.5 ft.	AAB5988	Mercury	1.7 (J)	MG/KG	24	0.1
03-2212	0.0 - 0.5 ft.	AAB6007	Aroclor 1242	4.7 (J)	MG/KG	1	n/a
			Aroclor 1254	1.5	MG/KG	1	n/a
			Aroclor 1260	6.5	MG/KG	1	n/a
03-2213	0.0 - 0.5 ft.	AAB6008	Aroclor 1242	6.2 (J)	MG/KG	1	n/a
			Aroclor 1254	6.4	MG/KG	1	n/a
			Aroclor 1254	6.4	MG/KG	1	n/a
			Aroclor 1260	19	MG/KG	1	n/a
2214	0.0 - 0.5 ft.	AAB6009	Aroclor 1242	4.3 (J)	MG/KG	1	n/a
			Aroclor 1254	15 (J)	MG/KG	1	n/a
			Aroclor 1260	58	MG/KG	1	n/a
03-2214	0.0 - 1.5 ft.	AAB6003	Zinc	133	MG/KG	24000	101
03-2216	0.0 - 1.5 ft.	AAB6005	Mercury	0.16 (J)	MG/KG	24	0.1
		AAB6014	Mercury	0.15	MG/KG	24	0.1
		AAB6014	Mercury	0.2 (J)	MG/KG	24	0.1

03-056(c) Detects
Water samples

Location ID	Depth of sample	Sample ID	Analyte	Results	Units
03-N/A	N/A	AAB7615	Aroclor 1242	1.3 (J)	UG/L

ANNEX 6.10

RISK-BASED CLEANUP LEVEL CALCULATIONS

Chemical	EPA Cancer Class	Risk Range		Cleanup Level mg/kg Occupational Scenario Carcinogenic Range			Noncarc.
Arsenic	A	1.00E-04 -	1.00E-06	250	-	2	613
Barium	D						7,530
Cadmium	B1	1.00E-04 -	1.00E-06	2,523	-	25	2,044
Chromium VI	A	1.00E-04 -	1.00E-06	378	-	4	10,220
Copper							75,628
Manganese							793
Mercury	D						279
Nickel	A						40,880
Silver	D						10,220
Thallium							164
Vanadium							14,308
Zinc	D						613,200
Benzene	A	1.00E-04 -	1.00E-06	277	-	3	
cis-1,2-Dichloroethene							20,440
Methylene Chloride	B2	1.00E-04 -	1.00E-06	2,508	-	25	11,545
Tetrachlorethene	B-C	1.00E-04 -	1.00E-06	3,088	-	31	20,440
1,1,1-Trichloroethane	D						7,259
Trichloroethene	B-C	1.00E-04 -	1.00E-06	1,347	-	13	
Benzo[a]pyrene	B2	1.00E-04 -	1.00E-06	78	-	1	
PCBs	B2	1.00E-04 -	1.00E-06	74	-	1	
2,4-DNT	B2	1.00E-04 -	1.00E-06	842	-	8	4,088
2,6-DNT	B2	1.00E-04 -	1.00E-06	842	-	8	2,044
HMX							102,200
PETN							40,880
RDX	C	1.00E-04 -	1.00E-06	5,203	-	52	6,132
TNT	C	1.00E-04 -	1.00E-06	19,077	-	191	1,022

Residential PRGs are based on the following assumptions:

Carcinogenic averaging time (years) =	70
Non carcinogenic Averaging time (years) =	30
Exposure frequency (days/year) =	350
Age adjusted soil ingestion factor (mg-yr/kg-day) =	114
Age adjusted inhalation factor (m^3-yr/kg-day) =	13

$$C = \frac{TR \times AT \times 365\ days/year}{(SF_o \times 10^6\ kg/mg \times EF \times IF_{soil}) + [SF_i \times EF \times IF_{air} \times (1/Y)]}$$

$$C = \frac{THI \times AT \times 365\ days/year}{((1/RfD_o) \times 10^6\ kg/mg \times EF \times IF_{soil}) + [(1/RfD_i) \times EF \times IF_{air} \times (1/Y)]}$$

Occupational PRGs are based on the following assumptions:

Adult body weight (kg) =	70
Carcinogenic averaging time (years) =	70
Non carcinogenic Averaging time (years) =	25
Exposure frequency (days/year) =	250
Exposure duration (years) =	25
Soil ingestion rate (mg/day) =	50
Workday inhalation rate (m^3/day) =	20
Particualte emission factor (m^3/kg) =	1.11E+07

$$C = \frac{TR \times BW \times AT \times 365\ days/year}{EF \times ED \times [(SF_o \times 10^6\ kg/mg \times IF_{soil}) + (SF_i \times IF_{air} \times (1/Y))]}$$

$$C = \frac{THI \times BW \times AT \times 365\ days/year}{EF \times ED \times [((1/RfDo) \times 10^6\ kg/mg \times IR_{soil}) + ((1/RfDi) \times IR_{air} \times (1/Y))]}$$

Recreational PRGs are based on the following assumptions:

Carcinogenic averaging time (years) =	70
Non carcinogenic Averaging time (years) =	20
Exposure frequency (days/year) =	28
Age adjusted soil ingestion factor (mg-yr/kg-day) =	93
Age adjusted inhalation factor (m^3-yr/kg-day) =	9.5

$$C = \frac{TR \times AT \times 365\ days/year}{(SF_o \times 10^6\ kg/mg \times EF \times IF_{soil}) + [SF_i \times EF \times IF_{air} \times (1/Y)]}$$

$$C = \frac{THI \times AT \times 365\ days/year}{((1/RfD_o) \times 10^6\ kg/mg \times EF \times IF_{soil}) + [(1/RfD_i) \times EF \times IF_{air} \times (1/Y)]}$$

Y = VF for volatiles; PEF for nonvolatiles

Chemical	EPA Cancer Class	Carcinogenic Slope Factors (kg-day/mg) Oral	Carcinogenic Slope Factors (kg-day/mg) Inhalation	Chronic RfDs (mg/kg-day) Oral	Chronic RfDs (mg/kg-day) Inhalation	VF m^3/kg
Arsenic	A	1.75	15	0.0003		
Barium	D			0.07	0.00014	
Cadmium	B1		6.3	0.001		
Chromium VI	A		42	0.005		
Copper				0.037		
Manganese				0.14	0.000014	
Mercury	D			0.0003	0.00009	
Nickel	A			0.02		
Silver	D			0.005		
Thallium				0.00008		
Vanadium				0.007		
Zinc	D			0.3		
Benzene	A	0.029	0.029			5700
cis-1,2-Dichloroethene				0.01		4600
Methylene Chloride	B2	0.0075	0.0016	0.06	0.86	2900
Tetrachloroethene	B-C	0.052	0.002	0.01		6000
1,1,1-Trichloroethane	D			0.09	0.29	5100
Trichloroethene	B-C	0.011	0.006			5800
Benzo(a)pyrene	B2	7.3				
PCBs	B2	7.7				
2,4-DNT	B2	0.68		0.002		
2,6-DNT	B2	0.68		0.001		
HMX				0.05		
PETN				0.02		
RDX	C	0.11		0.003		
TNT	C	0.03		0.0005		

ANNEX 6.11

VERIFICATION OF PCB SPILL CLEANUP BY SAMPLING AND ANALYSIS

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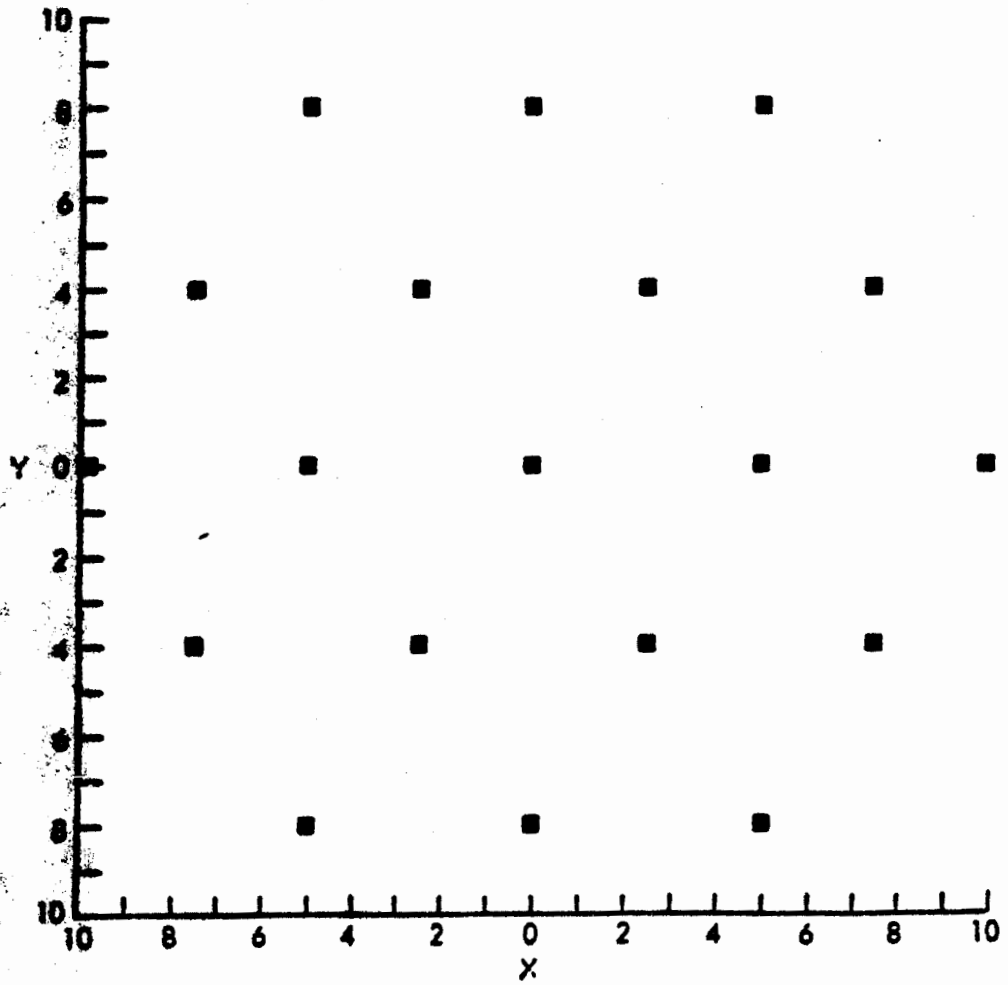
United States
Environmental Protection
Agency

Office of
Toxic Substances
Washington DC 20460

EPA-560/5-85-026
August, 1985

Toxic Substances

VERIFICATION OF PCB SPILL CLEANUP BY SAMPLING AND ANALYSIS



PUBLIC SERVICE CO. OF COLO.
CHEMISTRY DEPARTMENT

VERIFICATION OF PCB SPILL CLEANUP BY SAMPLING AND ANALYSIS

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IV. GUIDELINES ON SAMPLING AND ANALYSIS

Reliable analytical measurements of environmental samples are an essential ingredient of sound decisions for safeguarding public health and improving the quality of the environment. Effective enforcement monitoring should follow the general operational model for conducting analytical measurements of environmental samples, including: planning, quality assurance/quality control, verification and validation, precision and accuracy, sampling, measurements, documentation, and reporting. Although many options are available when analyzing environmental samples, differing degrees of reliability, dictated by the objectives, time, and resources available, influence the protocol chosen for enforcement monitoring. The following section outlines the factors critically influencing the outcome and reliability of enforcement monitoring of PCB spill cleanup.

A. Sampling Design

This section presents a sampling scheme, for use by EPA enforcement staff, for detecting residual PCB contamination above a limit designated by EPA-OPTS after the site has been cleaned up. Two types of error traceable to sampling and analysis are possible. The first is false positive, i.e., concluding that PCBs are present at levels above the allowable limit when, in fact, they are not. The false positive rate for the present situation should be low because an enforcement finding of noncompliance must be legally defensible; that is, a violator must not be able to claim that the sampling results could easily have been obtained by chance alone. Moreover, all sampling designs used must be documented or referenced.

The second type of error possible is a false negative, i.e., failure to detect the presence of PCB levels above the allowable limit. The false negative rate will depend on the size of the contaminated area and on the level of contamination. For large areas contaminated at levels well above the allowable limit, the false negative rate must, of course, be low to ensure that the site is brought into compliance. The false negative rate can increase as the area or level of contamination decrease.

1. Proposed Sampling Design

In practice, the contaminated area from a spill will be irregular in shape. In order to standardize sample design and layout in the field, and to protect against underestimation of the spill area by the cleanup crew, sampling within a circular area surrounding the contaminated area is proposed. [illegible] choosing the center and radius of the circle, as well as the number of sample points to be used is provided in Section 2 below.

The detection problem was modeled as follows: try to detect a circular area of uniform residual contamination whose center is randomly placed within the sampling circle. Figure 1 illustrates the model. The figure shows a sampling circle of 10 ft centered on a utility pole (site of the spill). After cleanup, a residually contaminated circle remains. However, in choosing locations at which to sample, the sampler has no knowledge of either the location of the circle or the level of contamination. This

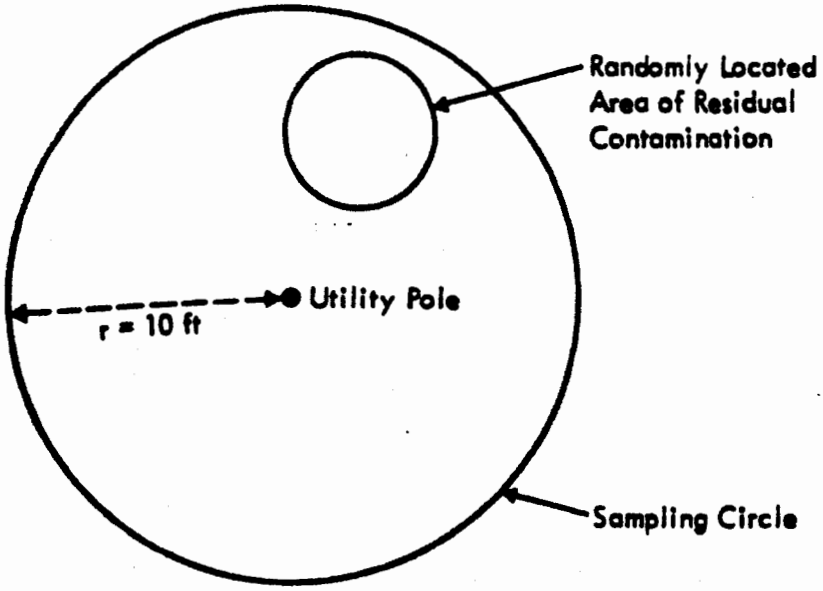


Figure 1. Randomly located area of residual contamination within the sampling circle.

lack of knowledge was modeled by treating the sampling locations as fixed and the center of the contaminated circle as a randomly located point in the circle of radius [illegible] ft. The implicit assumption that residual contamination is equally likely to be present anywhere within the sampling area is reasonable, at least as a first approximation (Lingle 1985). This is because more effort is likely to have been expended in cleaning up the areas which were obviously highly contaminated.

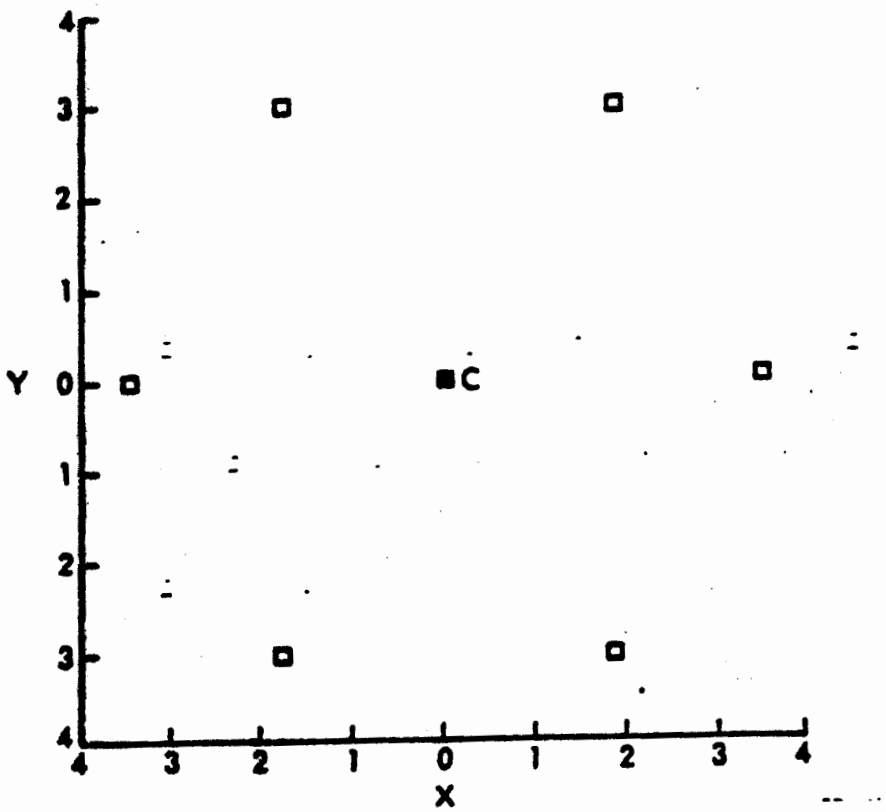
Two general types of design are possible for this detection problem: grid designs and random designs. Random designs have two disadvantages compared to grid designs for this application. First, random designs are more difficult to implement in the field, since the sampling crew must be trained to generate random locations onsite, and since the resulting pattern is irregular. Second, grid designs are more efficient for this type of problem than random designs. A grid design is certain to detect a sufficiently large contaminated area while some random designs are not. For example, the suggested design with a sample size of 19 has a 100% chance to detect a contaminated area of radius 2.8 ft within a sampling circle of radius 10 ft. By contrast, a design based on a simple random sample of 19 points has only a [illegible] chance of detecting such an area.

Therefore, a grid design is proposed. A hexagonal grid based on equilateral triangles has two advantages for this problem. First, such a grid minimizes the circular area certain to be detected (among all grids with the same number of points covering the same area). Second, some previous experience (Gilbert 1982; Matern 1960) suggests that the hexagonal grid performs well for a variety of sampling problems. The hexagonal grid may, at first sight, appear to be complicated to lay out in the field. Guidance is provided in Section 3 below and shows that the hexagonal grid is quite practical in the field and is not significantly more difficult to deploy than other types of grid.

The smallest hexagonal grid has 7 points, the next 19 points, the third 37 points as shown in Figures 2 through 4. In general, the grid has $3n^2 - 3n + 1$ points. To completely specify a hexagonal grid, the distance between adjacent points, s, must be determined. The distance s was chosen to minimize, as far as possible, the size of the residual contaminated circle which is certain to be sampled. Values of s so chosen, together with number of sampling points and radius of smallest circle certain to be sampled are shown in Table 2. For example, the grid spacing for a circle of radius 20 ft for the suggested design is $s = (0.87)(20) = 17.4$ ft. For a given size circle, the more points on the grid, the smaller the residual contamination area which can be detected with a given probability.

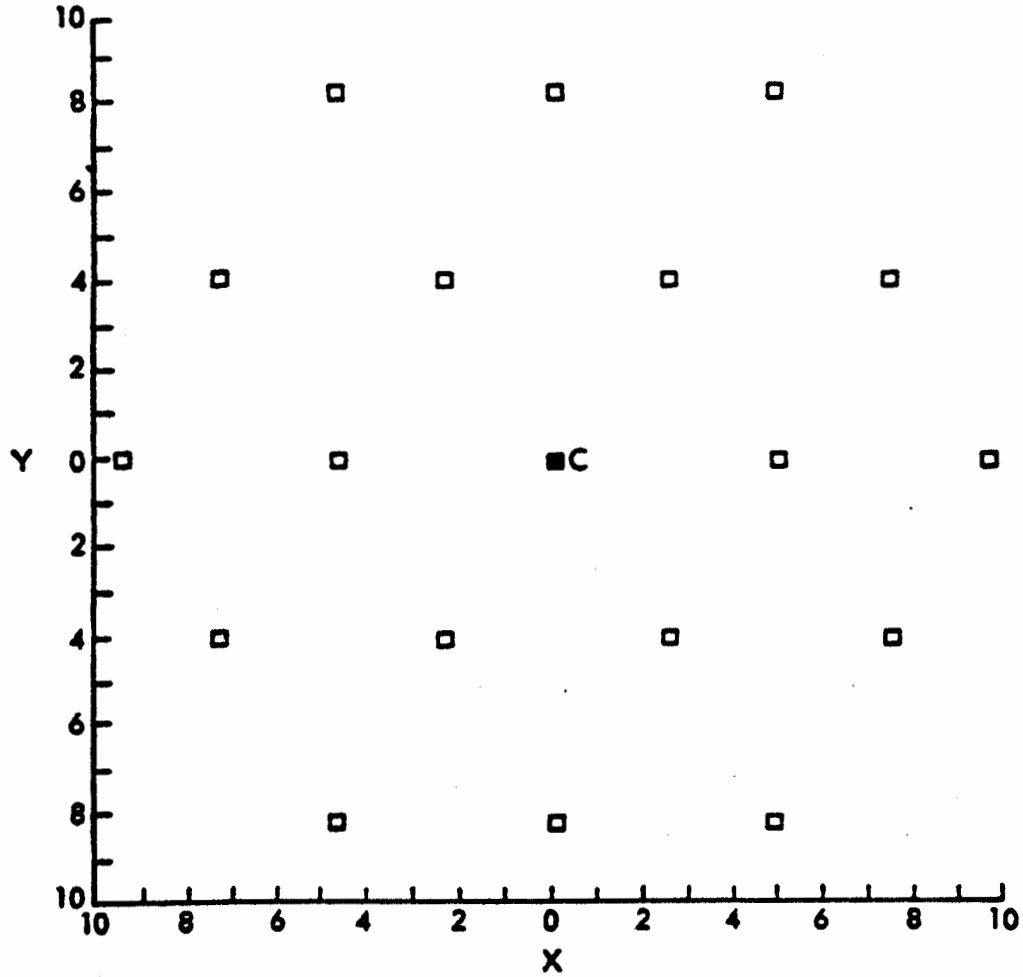
Table 2. Parameters of Hexagonal Sampling Designs for a Sampling Circle of Radius r Feet

No. of points	Distance between adjacent points, s (ft)	Radius of smallest circle certain to be sampled
7	0.87r	0.5r
19	0.48r	0.28r
37	0.3r	0.19r



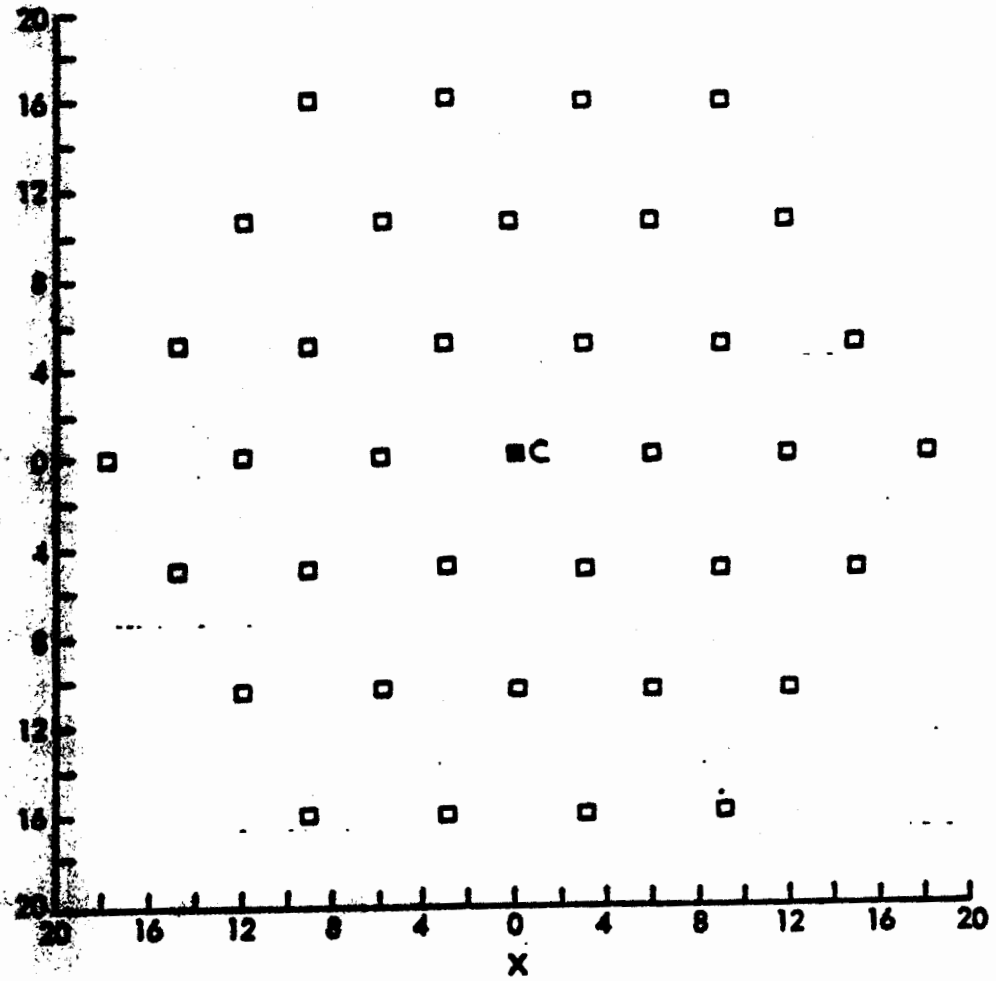
The outer boundary of the contaminated area is assumed to be 4 feet from the center (C) of the spill site.

Figure 2. Location of sampling points in a 7-point grid.



The outer boundary of the contaminated area is assumed to be 10 feet from the center (C) of the spill site.

Figure 3. Location of sampling points in a 19-point grid.



The outer boundary of the contaminated area is assumed to be 20 feet from the center (C) of the spill site.

Figure 4. Location of sampling points in a 37-point grid.

The first three hexagonal designs are shown in Figures 2 to 4, for sampling circle radius of r = 10 ft. The choice of sample size depends on the cost of analyzing each sample and the reliability of detection desired for various residually contaminated areas. Subsection 2 below provides some suggested sample sizes for different spill areas, based on the distribution of spill areas provided by the Utility Solid Waste Activities Group (USWAG 1984; Lingle 1985).

2. Sample Size and Design Layout in the Field

a. Sample Size

The distribution of cleanup areas for PCB capacitor spill sites, based on data collected by USWAG (1984; Lingle 1985) is shown in Table 3. The smallest spill recorded in the USWAG database is 5 ft^2, the largest 1,700 ft^2. The median cleanup area is 100 ft, the mean 249 ft^2; the wide discrepancy between the mean and the median reflects the presence of a small percentage of relatively large spills in the database.

Recommended sample sizes are given in Table 4. Several considerations were involved in arriving at these recommendations. First, the maximum number of samples recommended for the largest spills is 37, in recognition of practical constraints on the number of samples that can be taken. Even so, it is important to note that not all samples collected will need to be analyzed. The calculations in Section 5 below show that, even for the 37 sample case, no more than 8 analyses will usually be required to reach a decision. Since the cost of chemical analyses is a substantial component of sampling and analysis costs, even the 37-sample case should not, therefore, be prohibitively expensive. Second, the typical spill will require 19 samples. Small spills, with sampling radius no greater than 4 ft, will have 7 samples, while the largest spills, with sampling radius 11.3 ft and up, will require 37 samples. It should be noted that only capacitor spills are represented in Table 3. Transformer spills, however, would be expected to be generally smaller than capacitor spills because energetic releases are less likely from transformers. Thus, one would expect the smaller sample sizes to be relatively more likely for transformer spills than capacitor spills.

Table 3. Distribution of PCB Capacitor Spill Cleanup Areas Based on 80 Cases

Cleanup area (ft^2)	Percent of cases
≤ 50	32.5
51-100	18.8
101-200	15.0
201-300	12.5
301-400	3.8
401-700	7.5
701-1,300	8.8
≥ 1,300	1.3

Source: Lingle 1985.

Table 4. Recommended Sample Sizes

Sampling area (ft^2)	Radius of sampling circle (ft)	Percent of PCB capacitor spills	Sample size
≤ 50	≤ 4	32.5	7
51-400	4-11.3	50.0	19
> 400	> 11.3	17.5	37

The final consideration in recommending sample sizes was to achieve roughly comparable detection capability for different size spills. The radius of the smallest contaminated circle certain to be sampled at least once by the sampling scheme is used for comparative purposes (see Table 2). Table 5 presents some calculations of this quantity. The absolute detection capability of the sampling scheme is seen to be relatively constant for different spill sizes. This means that a given area of residual contamination is about as likely to be detected in any sized spill.

Table 5. Detection Capability of the Recommended Sampling Schemes

Sampling area (ft^2)	Radius (ft)	Sample size	Radius of smallest circle to be sampled (ft)
50	4.0	7	2.0
150	6.9	19	1.9
400	11.3	19	3.2
875	16.7	37	3.2

b. Design Layout in the Field

Figure 5 presents a typical illustration of design layout in the field. The first step is to determine the boundaries of the original cleanup area (from records of the cleanup). Next, find the center and radius of the sampling circle which is to be drawn surrounding the cleanup area. The following approach is recommended:

(a) Draw the longest dimension, L_1, of the spill area.

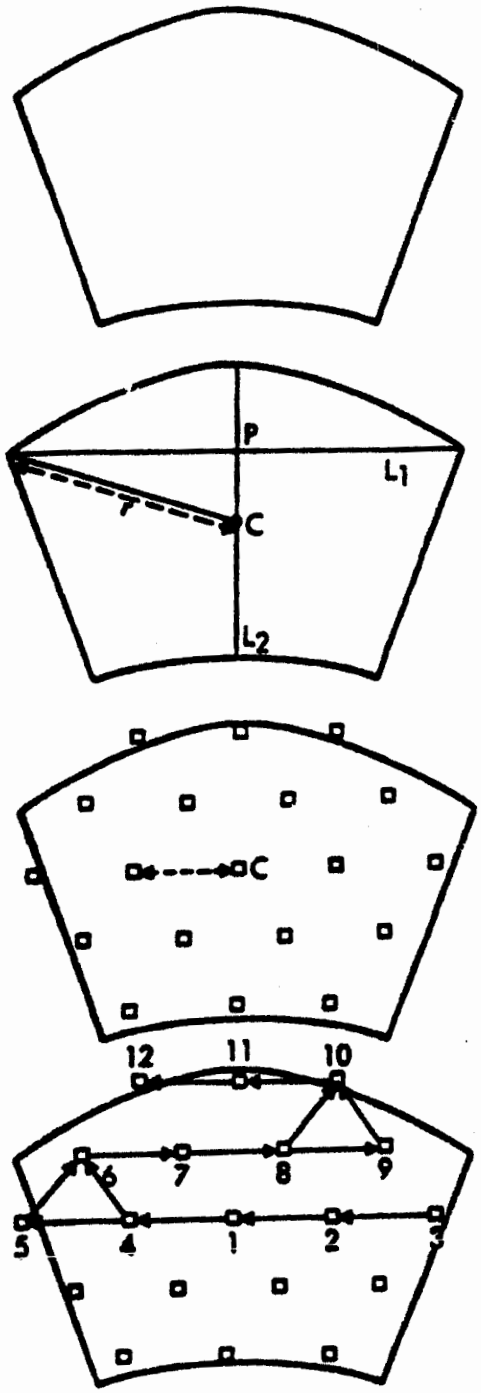
(b) Determine the midpoint, P, of L_1.

(c) Draw a second dimension, L_2, through P perpendicular to L_1.

(d) The midpoint, C, of L_2 is the required center.

(e) The distance from C to the extremes of L_1 is the required radius, r.

Figure 5 shows an example of the procedure; Figure 6 demonstrates how the center is determined for several spill shapes. Even if the center determined is slightly off, the sampling design will not be adversely affected.



(a) Original cleanup area

(b) Locating the center of the sampling circle

(c) Centering the hexagonal grid

(d) Staking out the grid points

Figure 5

Once the sampling radius, r, has been found, the sample size can be selected based on Table 4.

> Example: Suppose r = 5 ft. From Table 4, a sample size of 19 should be used.

Having selected the sample size, the grid spacing can be calculated from Table 2.

> Example (continued): For a 19-point design with radius r = 5, the grid spacing is s = 0.48r = (0.48)(5) = 2.4 ft.

The procedure for laying out a 19 point design is as follows. The first sampling location is the center C of the sampling circle, as shown in Figure 5. Next, draw a diameter through C and stake out locations 2 through 5 on it as shown; adjacent locations are a distance s apart. The orientation of the diameter (for example east-west) used is not important; it may be chosen at random or for the convenience of the samplers. The next 4 locations, Nos. 6-9, are laid out parallel to the first row, again a distance s apart. The only difficulty is in locating the starting point, No. 6, for this row. To accomplish this the sampler needs two pieces of rope (or surveyor's chain, or equivalent measuring device) of length s. Attach one piece of rope to the stake at each location 4 and 5. Draw the ropes taut horizontally until they touch at location 6. Once the second row is laid out, the third and final row of 3 locations in the top half of the design is found similarly, starting with number 10. In the same way, the bottom half of the design is staked out. The 7-point or 37-point designs are laid out in an analogous fashion.

Once the sampling locations are staked out the actual samples can be collected. In the example in Figure 5, three of the sampling locations fall outside the original cleanup area. Samples should be taken at these points, to detect contamination beyond the original cleanup boundaries. This verifies that the original spill boundaries were accurately assessed.

In practice, various obstacles may be encountered in laying out the sampling grid. Many "obstacles" can be handled by taking a different type of sample, e.g., if a fire hydrant is located at a point in a sampling grid otherwise consisting of soil samples, then a wipe sample should be taken at the hydrant, rather than taking a sample of nearby soil. The obstacle most likely to be encountered is a vertical surface such as a wall. To determine the sampling location on such a surface, draw taut the ropes (chains) of length s attached to two nearby stakes and find the point on the vertical surface where their common ends touch. See Figure 7 for an illustration of the procedure. If more samples from the vertical surface are called for, the same principle may be applied, always using the last two points located to find the next one.

3. Judgemental Sampling

The inspector or sampling crew may use best judgement to collect samples wherever residual PCB contamination is suspected. These samples are

Los Alamos National Laboratory

Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 39-002(a)

June 1995
Revision 0

Environmental
Restoration

ACRONYMS

AOC	area of concern
AP	Administrative Procedure
CEARP	Comprehensive Environmental Assessment and Response Program
COC	chemical of concern
COPC	chemical of potential concern
CST	Chemical Science and Technology (Division)
CST-3	Analytical Services (Group)
DOE	U.S. Department of Energy
EC	expedited cleanup
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FPL	Field Project Leader
FTL	Field Team Leader
HSWA	Hazardous and Solid Waste Amendments
LANL, the Laboratory	Los Alamos National Laboratory
PPE	personal protective equipment
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
VOC	volatile organic compound

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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan is for Solid Waste Management Unit (SWMU) 39-002(a), located at Technical Area (TA)-39. This EC Plan is proposed as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) described in the RFI Work Plan for Operable Unit 1132 (LANL 1993, 1088).

TA-39 is located in the southeastern portion of the Los Alamos National Laboratory (the Laboratory), Los Alamos, New Mexico, and is bordered on the south by Bandelier National Monument (Figure 1-1). A number of canyons dissect the area, including Water, Ancho, and Indio canyons. SWMU 39-002(a) consists of three separate areas in which various chemicals of concern (COC) are being stored or have been stored in the recent past. SWMU 39-002(a) is associated with operations at TA-39-2 (Figure 1-2), is a shop used to support the open-air testing of high explosives (HE) for the Shock Wave Physics Group.

A 1993 RFI Phase I investigation at TA-39 involved the sampling of several SWMUs to determine if corrective action was necessary or if the SWMUs could be designated for no further action (NFA). After reviewing the analytical results of the sampling, it was determined that PRS 39-002(a) requires corrective action, which will be performed as an EC.

Preparation for field activities will be conducted through the development of this EC Plan, a task-specific waste management checklist, and a site-specific health and safety plan (SSHASP). Implementation of this EC will be consistent with the Installation Work Plan for Environmental Restoration (LANL 1993, 1017) and the requirements and guidelines of the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA).

In preparing this EC Plan, the following assumptions were made that affect the nature of the proposed cleanup and the associated cost and schedule:

- Boundaries of the expedited cleanup were chosen based on site conditions and topographic considerations for the purpose of estimating potential waste volumes. Laboratory samples and/or field testing will be used to delineate actual site boundaries.

- Contamination would be limited to the upper 6 to 12 in. of soil. This will be confirmed by laboratory sampling and field testing. Excavation to additional depths will increase costs associated with the expedited cleanup proportional to the additional time required to accomplish the task and the waste volumes generated.

- Cleanup criteria were established using human health-based risk. Ecologically based risk may necessitate additional evaluation and cleanup.

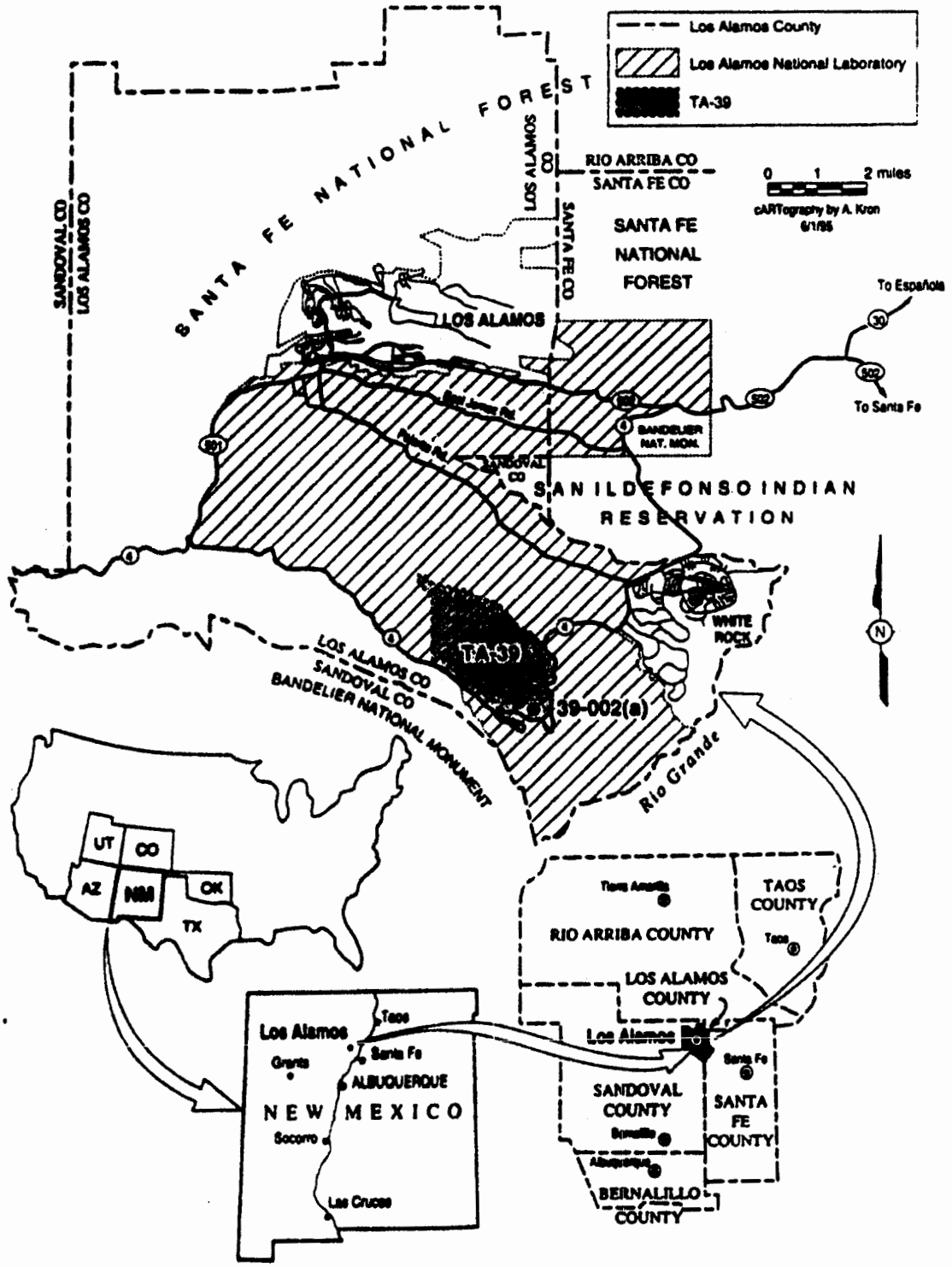


Figure 1-1. Regional location map.

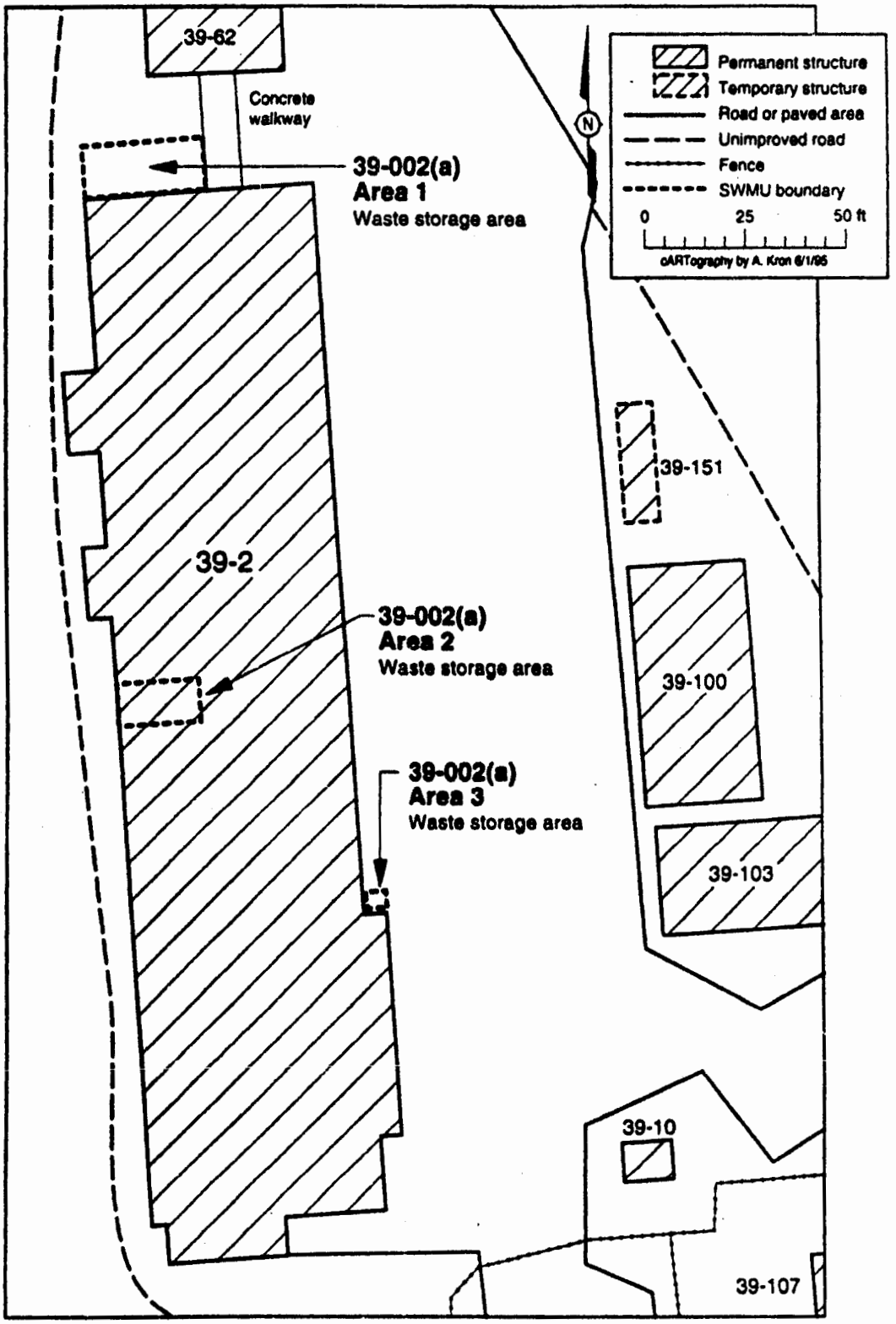


Figure 1-2. Location of SWMU 39-002(a).

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1. Description of SWMU 39-002(a)

SWMU 39-002(a) contains three separate storage areas (Figure 1-2):

- Area 1 is a waste accumulation/storage area with no protective roof located at the outside northwest corner of TA-39-2 on an earth/gravel surface. A 30-gal. drum containing small quantities of solvents (acetone and ethanol) and adhesives along with rags and paper wipes contaminated with solvents and adhesives previously was located in this area. The area has been used as a storage area during the last 10 years; it is currently used as a vehicle parking and loading area.

- Area 2 is a storage area inside Room 18-A of TA-39-2. It has been used for the last 10 years to store waste photographic processing chemicals; currently, it contains approximately 5 gal. of chemicals. Because this storage area is inside a building, the potential for release to the environment is negligible. No releases have been documented or are known to have occurred.

- Area 3 is located outside at the north end of the asphalt loading dock on the southeast side of TA-39-2. Various materials used during firing site experiments are delivered here and picked up as needed, including transformer oil in 55-gal. drums, and small quantities of vacuum-pump oil and solvents (ethanol, acetone, and trichloroethane). Area 3 is currently used as an asphalt parking area with heavy foot traffic. No releases have been documented or are known to have occurred. Further evidence of no releases is indicated by the integrity of the asphaltic concrete. No sampling was conducted in this area.

2.1.1 Operational History

TA-39 was established in 1953 primarily as an open-air HE testing area for the former Shock Wave Physics Group and has been continuously occupied since that time. The site was selected because of its remote location. It originally consisted of three firing sites (TA-39-6,-7, and -8); a main building containing offices, a laboratory, and a shop (TA-39-2); a HE assembly building (TA-39-4); two magazines (TA-39-3 and -5); and a single-stage gas gun.

By the 1960s, two additional firing sites (TA-39-57 and -88), a capacitor bank enclosure (TA-39-77), a metal shed enclosure for the single-stage gas gun, and two gas-gun support buildings (TA-39-56 and -89) had been added (DOE 1987, 0264). The transportable units (TA-39-100,-103, and -107) are the most recent additions (1984-1989) and serve as office buildings. In 1987, the shop was relocated from TA-39-2 to a separate metal building (TA-39-98). In 1989, the pulsed-power assembly building (TA-39-111) and its septic system, PRS 39-008(b), were constructed.

TA-39 continues to be used as a remote HE firing site. Experiments conducted at the site involve research on equations of state, shock wave phenomena, development of implosion systems, development and application of explosively produced pulses of electrical power, and production of high magnetic fields. The area includes active and inactive open-air firing sites and a high-velocity gas gun facility. Public access to TA-39 is restricted.

2.1.2 Physical Setting

Most of the facilities at TA-39 are located within canyons, which are underlain and flanked by Bandelier Tuff. At TA-39, the Bandelier Tuff ranges in thickness from several feet (along the northeastern margin of the site) to 600 ft (in Borehole DT9, located just west of TA-39).

Soils at TA-39 can be divided into three major categories according to topographic position: mesa top, canyon wall, and canyon bottom. At TA-39, the last category is the most important because all the SWMUs are located in the canyon bottom. The Totavi series soils, typical of canyon-bottom soils in the Pajarito Plateau area, are deep, well-drained soils having a gravely-loamy-sand or sandy-loam texture. Although specific geological data are lacking for the TA-39 canyons, information from other Pajarito Plateau canyons having a similar geologic situation shows that alluvial deposits vary greatly, from less than 3 ft to more than 100 ft (Devaurs and Purtymun 1985, 0049).

TA-39 is drained by a number of ephemeral streams. These streams are tributaries of the main stream channel that runs through Ancho Canyon and joins the Rio Grande in White Rock Canyon. This main stream channel is classified by the National Wetlands Inventory as an ephemeral riverine system, but field checks of the area indicate that the soil does not remain saturated long enough for the channel to qualify as a jurisdictional wetland. Flood-plain maps developed by McLin (1992, 0825) indicate that a flood plain does exist within Ancho Canyon. However, EC activities are not anticipated to adversely affect the Ancho Canyon flood plain or the ephemeral riverine system as long as personnel adhere to the work practices outlined in this EC.

At TA-39, all the stream channels carry ephemeral flow. Runoff, when it does occur in these alluvial channels, is produced by intense summer thunderstorms or snowmelt. Flash flooding does occur and can be severe, as was demonstrated in the summer of 1991, when roads and buildings at TA-39 were damaged.

Many of the hydrologic studies on the Pajarito Plateau have focused on the main aquifer because it serves as the water supply for Los Alamos County. The main aquifer is found in the Tesuque Formation and the overlying Puye Conglomerate at depths below the surface ranging from less than 300 ft in the canyon bottoms (towards the eastern end of the plateau) to more than 1000 ft on the mesa tops.

Twenty-nine archeological sites are located within the survey area. Because of their research potential, 27 of these are eligible for inclusion on the National Register of Historic Places. That eligibility will not be affected by the EC activities proposed at SWMU 39-002(a).

2.2. Summary of Previous Investigations

2.2.1 RCRA Field Investigation

Sampling activities were conducted in Area 1 of PRS 39-002(a) on September 27, 1993, as part of the Phase I RFI sampling at TA-39. Five surface soil samples were collected from two locations. Duplicate and replicate samples were collected as part of the quality assurance program sampling to evaluate variability associated with the sampling procedures. The samples were collected from the top 6 in. of soil near the northwest corner of TA-39-2 (Figure 2-1).

Following screening for gross alpha, beta and gamma activity, the samples were submitted to the LANL Sample Management Organization (SMO) for analysis of total metals including uranium, cesium-137 (^{137}Cs), semivolatile organic compounds (SVOC), HE, total petroleum hydrocarbons (TPH), and polychlorinated biphenyls (PCB). Analytical procedures followed EPA SW-846 gamma spectroscopy method SL 13018 for ^{137}Cs and U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) methodology for HE compounds. The results have undergone review and data verification as outlined in the Quality Assurance Project Plan, Annex II of the RFI Work Plan (LANL 1993, 1088).

2.2.2 Evaluation of Results

Analytical results for the RFI are presented in Annex 6.9. Twenty-nine analytes were detected in one or more of the surface soil samples. Based on the screening assessment process described in the

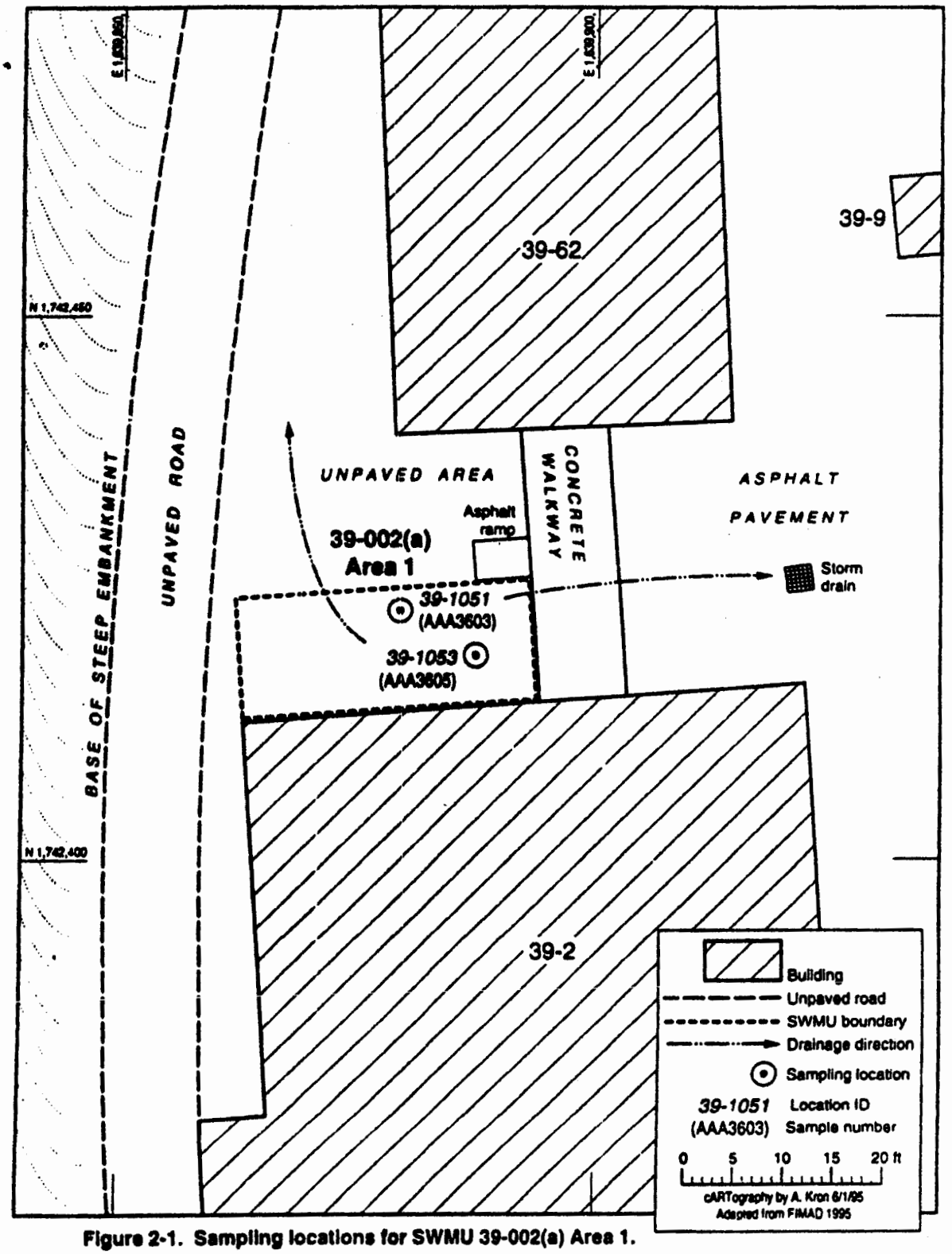


Figure 2-1. Sampling locations for SWMU 39-002(a) Area 1.

installation Work Plan, Appendix J (LANL 1993, 1017), which includes comparison of the concentrations detected with background levels and human health-based screening action levels (SAL). 12 analytes have been identified as COCs (LANL 1995)

Metals	copper; mercury; lead
SVOCs	benzo(a)pyrene; dibenzofuran; dibenzo(a,h)anthracene; 2-methylnaphthalene; phenanthrene
HE	2,4-dinitrotoluene; 1,3-dinitrobenzene; 1,3,5-trinitrobenzene
PCBs	

Of these COCs, the maximum measured concentrations exceeded the SALs for only lead, benzo(a)pyrene, dibenzo(a,h)antracene, and PCBs (Table 2-1). The remaining COCs were identified because of their cumulative effect as determined by a multiconstituent analysis. All of the COCs are present at concentrations above background levels.

TABLE 2-1
SWMU 39-002(a) PHASE 1 SAMPLING FOR COCs

Constituent	Location		SAL
	39-1051	39-1053	
Copper	750	990	3000
Mercury	2	3	24
Lead	4700	7000	400
Benzo(a)pyrene	29	19.5	0.1
Dibenzofuran	5.6	1.9	–
Dibenzo(a,h)anthracene	4	2.5	0.1
Phenathrene	79	53.5	–
PCBs	1.6	1.1	1
2,4-Dinitroluene	0.19	0.51	1
1,3-Dinitrobenzene	0.25	1.1	8
1,3,5-Trinitrobenzene	ND	0.95	4

All concentrations for sample locations and SALs reported in mg/kg. SAL: screening action level ND: Not detected

2.3. Types and Volumes of Waste Present

The soil at SWMU 39-002(a), Area 1 contains metals, SVOCs, HE, and PCBs. The lateral and vertical extent of contamination has not been defined. The surrounding topography and locations of structures indicate that contaminant migration via overland flow of runoff may not have extended more than approximately 40 ft to the west of the concrete walkway and approximately 25 ft to the north of TA-39-2 (Figure 2-1).

Analytical results document that contamination at the two locations sampled exists to a minimum depth of 6 in. Currently, an estimated volume 18.5 yd^3 of material will be removed.

The extent and volume of wastes at SWMU 39-002(a) will be further defined during the field-screening and confirmatory sampling to be conducted during the EC, as described in Sections 4.1 and 4.3 of this plan.

2.4 Potential Impacts on Public Health and the Environment

TA-39 is not known to support any threatened or endangered species habitats, and Ancho Canyon does not currently contain any jurisdictional wetlands (LANL 1993, 1088). Human exposure to contaminants from SWMU 39-002(a) soils may occur through incidental ingestion, inhalation, or dermal contact (Figure 2-2). Additionally animals may be exposed to site contaminants through soil contact.

2.4.1 Potential Pathways

2.4.1.1 SWMU - In Place

Contaminants present in the SWMU 39-002(a) Area 1 soils may leach/disperse through the vadose zone or be entrained by surface water and transported downgradient by runoff. Particulates may become airborne and migrate short distances through wind dispersion.

2.4.1.2 SWMU - Remediation

Remedial activities at SWMU 39-002(a) will consist of removing the contaminated surface soil, verification sampling, and backfilling the excavated area with clean fill. The same potential mechanisms for transport from the site will be present during remediation as for the SWMU in its current condition. The presence of loose soil material during the remediation could increase the potential for surface transport. Run-on and runoff controls will be used to mitigate this potential.

2.4.2 Future Land Use

SWMU 39-002(a) lies entirely on DOE-owned land within Ancho Canyon. The areas is removed from any public access roads. In the foreseeable future, the land is expected to be used for Laboratory industrial operations.

2.4.3 Cleanup Levels

Preliminary remedial goals (PRG) have been calculated for the two primary site contaminants, lead and benzo(a)pyrene, based on the expected industrial land use at this site. Lead is identified as a COC because of its toxicity, and benzo(a)pyrene because of its carcinogenicity. Because their effects are not combined, the cleanup levels for these two contaminants can be addressed independently. The methodology presented in Annex 6.6 results in a maximum cleanup level for benzo(a)pyrene of 32 mg/kg.

The proposed cleanup level for lead is 3,000 mg/kg. This level was derived for an adult under an industrial exposure scenario using the methodology described in Annex 6.10 and is considered conservative. The soil lead cleanup level was calculated using a computer spreadsheet algorithm for estimating blood lead concentrations in adults based on a multipathway analysis developed by the California Department of Toxic Substances Control (DTSC). The DTSC algorithm is similar to the EPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) for children. However, unlike the IEUBK mode, which addresses children only, the DTSC computer spreadsheet can calculate blood lead levels for an adult.

A blood lead concentration of 10 µg/dl is the target blood lead level for exposure to lead in the environment, regardless of the source. Sources include drinking water, grocery store food products, soil (incidental soil ingestion and dermal contact), and the air. The soil lead cleanup level therefore includes the contribution to blood lead levels from non-site sources as well as on-site soil contact, soil ingestion, and inhalation pathways and was calculated not to exceed the target level of 10 µg/dl at the 95th

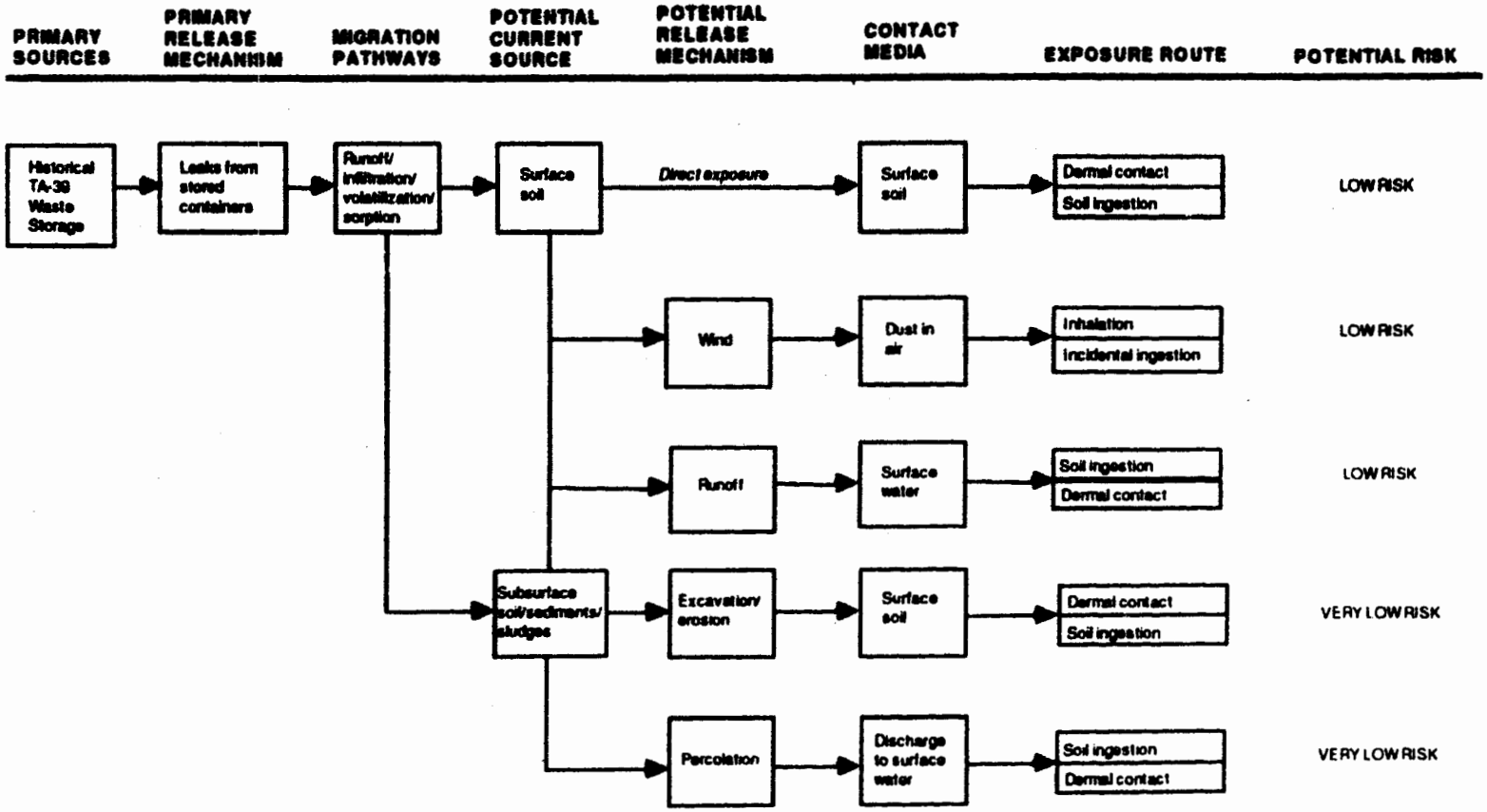


Figure 2-2. Conceptual exposure model for SWMU 39-002(a)

percentile concentration. The contact rate for soil ingestion was set at 0.05 g soil/day to reflect the on-site industrial pathways are default values and represent background lead levels that may be encountered in tap water and grocery store food products. All other exposure input parameters are default values based on a residential exposure scenario.

PCBs are also identified as a contaminant of concern, but at concentrations close to the SAL. A cleanup goal of 10 ppm has been proposed for PCBs when other contaminants are present (McCann 1995).

.0 EXPEDITED CLEANUP

3.1. Overview and Rationale

The EC will remove contaminated surface soils from Area 1 of SWMU 39-002(a) and backfill the excavation with clean fill. This approach will minimize exposure to workers, remove soil that may be a source of contaminant migration to the surrounding area, and provide some containment of deeper soils from contact with surface water runoff.

Field screening will establish the horizontal extent of contamination within the target 25-ft by 40-ft area. This will be done by dividing the area into rectangular grid cells measuring approximately 10 ft by 10 ft and performing screening at the center of each cell. Those cells showing contamination above target field-screening levels will be excavated to a depth of 6 in., and the screening repeated. The target field-screening level will be set at 75% of the cleanup goal to provide reasonable assurance that the cleanup goal will be met. Verification samples will be collected from the base of the excavation and analyzed for all COCs. Results of screening in the bottom of the excavation will determine whether additional excavation is necessary. Soils within contaminated cells will be excavated in 6-in. increments until the field-screening goals are met for all cells. The excavated soil will be characterized and shipped offsite for treatment and/or disposal at a licensed facility.

3.2 Permitting, Approval, and Notification Requirements

3.2.1 Regulatory Notification/Permit Modifications

SWMU 39-002(a) is included in Table A of the Hazardous and Solid Waste Amendments module of the Laboratory's RCRA permit. Implementation of this EC will require a Class III modification the Laboratory's RCRA permit. EPA and the New Mexico Environment Department have been notified of this project, and a request for a permit modification has been submitted. Implementation of this EC Plan will proceed upon receipt of EPA approval.

3.2.2 DOE Approval

IF the laboratory intends to implement this EC prior to receiving EPA approval, DOE approval must be documented through receipt of the sign Field Work Approval Form (Annex 6.7).

3.3 Cleanup Activities

All EC field activities will be performed in accordance with a SSHASP, which will be prepared following approval of this plan and before the start of any site preparation efforts. The SSHASP will include description of the training and medical surveillance requirements, work zones, physical and chemical hazards, personnel and equipment decontamination procedures, monitoring and personal protective equipment requirements, and emergency response procedures.

3.3.1 Field Screening Methods

As described in Section 2.4.3, only two COCs were measured at concentrations significantly above the proposed cleanup level, and PCBs were measured at concentrations in the range of the proposed cleanup levels. These three COCs will be used as indicators to assess the effectiveness of cleanup during field activities. The physical extent of soil requiring removal will be established using the following field-screening methods:

- Analysis for lead using a portable x-ray fluorescence (XRF) instrument configured to detect lead in soils at levels below 100 ppm

- Analysis for PCBs using an immunoassay field test kit capable of detecting PCBs in soils at levels to a sensitivity of 0.5 ppm
- Analysis of total polycyclic aromatic hydrocarbons (PAH) in soils using an immunoassay field test kit capable of detecting total PAHs in soils at levels to 0.6 ppm sensitivity in soils

The immunoassay field test kits (D TECH with DTECHTOR meter or equivalent) correlate well to laboratory analyses of environmental samples by EPA SW-846 methodology. The immunoassay field test kits also provide comparable sensitivity and adequate specificity for the field determinations. Proposal of the three field-screening tests listed above is based on the following factors:

- Detection of lead, PCBs, and two PAHs above the SALs in Phase I soil samples
- Differences in the relative mobilities of the COCs and the uncertainties in the types and exact locations of wastes stored within Area 1
- Availability of field test procedures with sensitivity near or below the SALs

3.3.2 Excavation

The vertical extent of excavation (0 to 24 in.) within a grid cell will be based on the following field-screening objectives:

Indicator	Field-screening Objective	Basis
Lead	300 ppm	75% of remediation goal
PCBs	7.5 ppm	75% of remediation goal
Total PAHs	0.6 ppm	Lower limit of assay range

To maximize cost efficiency, each location will be analyzed for lead using XRF analysis, followed by immunoassay tests for organics if necessary. A decision to excavate within certain grid cells may be based on the XRF results alone, eliminating the need to conduct the immunoassay tests. When the lead concentration reported through XRF analysis meets the field-screening objective, immunoassay tests will be conducted to test for the presence of organic indicators. If levels of organic indicators are above the screening objectives, excavation will proceed, followed by additional immunoassay screening. Excavation in 6-in. increments will be performed within each grid cell until the results for all indicator parameters meet the field-screening objectives.

Initial screening samples will be collected and analyzed before the excavation begins. The 25-ft by 40-ft area will be divided into grid cells approximately 8 ft on a side. Soil samples to a depth of 6 in. will be taken from the center of each grid cell and analyzed for lead by XRF in a field laboratory at the site; analyses for organic indicators using immunoassay test kits will be performed if lead results do not provide a basis for excavation. A run-on control berm will be constructed around the area to be excavated. The berm will be constructed of clean fill to a minimum height of 6 in. The field-screening process is further described in Section 4.3.

If, during the initial field screening, any concentration in an exterior grid cell exceeds the screening assessment criteria, the boundary of the initial field screening will be extended in that direction.

A 6-in. layer of soil will be excavated from within the grid cells as indicated by the initial and subsequent field-screening results either manually or by using a front-end loader, backhoe, or bobcat. The excavated material will be stockpiled in a roll-off box and stored at a designated waste storage area until characterization is completed.

The excavation will start in the grid cells nearest the concrete walkway connecting TA-39-2 and TA-39-62, and proceed west away from the walkway. Following excavation of the initial 6-in. increment, field screening will be performed to determine if additional excavation is necessary (see Section 4.3). After excavation of contaminated soils is completed, confirmatory samples will be collected and analyzed. The extent of excavation will be documented and the site will be backfilled with clean fill in accordance with site restoration procedures (Section 3.6)

3.4 Waste Management Issues

3.4.1 Characterization of Materials for Disposal

Results from the Phase I sampling indicate lead concentrations that prohibit land disposal before treatment. Therefore, a representative sample of the excavated soil will be collected and submitted to SMO for determination of waste characteristics. Results of these analyses will be sent to the disposal facility, along with the waste samples required for the facility's waste profiling.

3.4.2 Treatment, Storage, and Disposal Plans

Wastes generated during the EC will generally be limited to surface soils. Because these wastes are from a single source area, the materials will be consolidated into one wastestream. Characterization of the wastestream prior to its consolidation may be necessary to ensure timely and economical disposal. Therefore, a sample of these residuals will be obtained during the initial field activities. This sample will be analyzed for COCs as requested by the permitted transportation and disposal facilities.

Based on 1994 sample results, the projected classification of the consolidated wastestream will be as listed hazardous waste. Contractors, such as vacuum truck operators, and permitted disposal facilities can be readily obtained to handle listed waste. Transportation of the wastes to the permitted disposal facility by the selected subcontractor will be handled under appropriate manifests. Once at the disposal facility, the liquid waste may require treatment, such as stabilization.

3.5 Verification Plan

Following excavation, confirmatory samples will be collected from within each excavated grid cell. Sample collection will follow LANL-ER-SOP-6.09, Spade and Scoop Method for Collection of Soil Samples. Analytical procedures and methods will be in accordance with EPA SW-846 and USATHAMA protocols.

The data will be reviewed against the quality control criteria to identify any quality issues. Soil concentrations, as reported by the analytical laboratory, will enable verification of the field-screening results or, alternatively, may identify areas within the excavation that have not met the cleanup goals. Decisions on additional excavation will consider the extent, depth, and levels of any residual contamination.

3.6 Site Restoration Plan

The excavated area will be backfilled to grade with clean soil fill. Depending on the anticipated turnaround for confirmatory sample results, the excavation either will be backfilled immediately upon confirmatory sample collection or will remain open pending review of the analytical results. If backfilling will be performed before confirmatory results are received, a plastic liner will be placed in the excavation to mark the vertical extent before the fill is put in place; the liner will minimize the effort required to continue excavation if necessary. If the excavation is to remain open, the integrity of berms and access barriers will be regularly inspected until such time as the excavation is backfilled.

3.7 Acceptance Inspection

The Laboratory proposes an Acceptance Inspection as the mechanism for DOE and EPA to assess that the Laboratory has implemented this EC Plan effectively. A minimum of 10 days' notification will be provided to the agencies before the start of field activities. At this time, a tentative date for the inspection will be agreed upon.

An Acceptance Inspection Checklist will be used to document the scope of the inspection and will become part of the EC Final Report. The checklist will contain specific agreed-upon inspection items, criteria, and requirements that will constitute acceptance of remediation activities.

The Acceptance Inspection will be conducted by an independent professional skilled in the appropriate technical discipline. During the Acceptance Inspection, written resolution and an anticipated schedule for completion will be identified for any outstanding items and documented on the inspection checklist. The Laboratory Field Project Leader (FPL) or designee will be responsible for completing outstanding inspection items and documenting their resolution in the EC Final Report.

Upon completion of remediation activities, the Laboratory will submit a written certification to EPA Region 6, stating that the remedy has been completed in accordance with the EC Plan and Acceptance Inspection Checklist. The certification will be signed by the Laboratory and by the independent professional conducting the inspection. The certification will accompany the EC Final Report.

3.8 Final Report

Following the completion of all field activities, a final report will be prepared. A proposed outline for this report is presented as Annex 6.8.

.0 PROJECT MANAGEMENT

4.1 Staffing Requirements

Implementation of this EC will be managed by Gene Gould, the FPL. John Ronquillo of ICF Kaiser Engineers will serve as the Field Team Leader An outside contractor(s) will transport, treat, and dispose of the stabilized waste.

4.2 Resource Requirements

The cost of this EC has been estimated at $132,500. The estimate is based on excavating approximately 18 yd^3 of soil and having a total of 13 samples (confirmatory plus waste characterization) analyzed in the laboratory. Field equipment and labor costs assume single-stage stabilization; waste disposal costs are based on approximately 42 yd^3 of stabilized material that is not subject to radioactive material disposal restrictions.

Planning and Preparatory Activities	
Preparation of Expedited Cleanup Plan	$2,500
Preparation of SSHASP	2,000
Preparation of Waste Management Checklist	500
Subcontractor scheduling/site preparation	1,000
Sample Analysis Plan	500
Subtotal	$6,500
Field Activities	
Mobilize to site	$1,000
Excavate contaminated soil	20,000
Clay barrier and backfill w/clean fill	3,000
Equipment decontamination	3,000
Waste management and disposal	57,000
Demobilize from site/site restoration	1,000
Subtotal	$85,000
Laboratory analytical costs	
Verification sampling - 6 samples x $2,000	$12,000
Waste characterization - 7 samples	14,000
Subtotal	$26,000
Post-Field Activities	
Acceptance Inspection	$1,000
Expedited Cleanup Final Report	2,000
Subtotal	$3,000
Contingency @ 10%	12,000
Total Estimated Cost	**$132,500**

4.3 Schedule

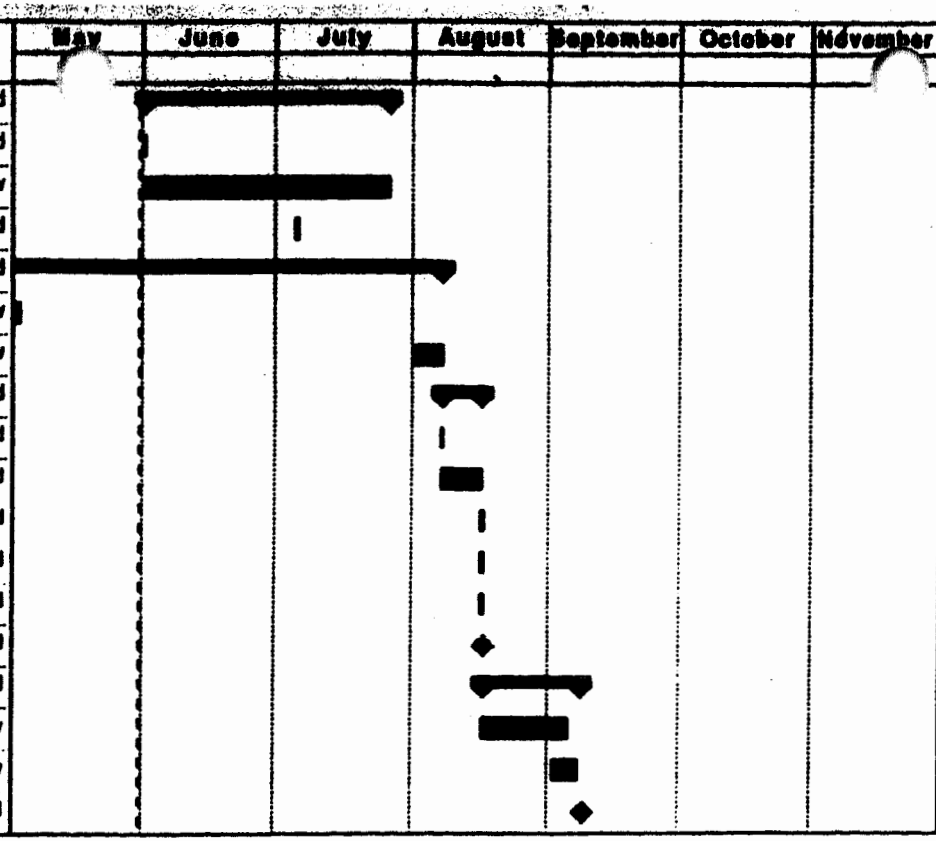
The proposed schedule for this EC is presented in Table 4-1. Initial planning, including preparation of this plan, was performed in April and May 1995. Submission of this plan as part of the requested permit modification will initiate a 60-day public comment period. Field work will begin within 45 days of the completion of this comment period, and cleanup activities will be completed by the end of September 1995. A final report, containing analytical results from verification sampling, will be issued by December 1995.

4.4 Stakeholder Notifications

Stakeholder notifications are an integral part of the procedure for conducting ECs. The ER Project office will notify state and local governments, external and internal stakeholders, and individuals on the ER Project mailing list of the availability of the EC Plan. The EC Plan will be available to the stakeholder at the UNM Community Reading Room in Los Alamos; at the document repositories in the Los Alamos, Espanola, and Santa Fe public libraries, and at the San Ildefonso Pueblo Governor's Office.

The submission of this EC Plan to EPA will trigger publication of a public notice indicating the start of the 60-day public comment period.

ID	Name	Duration
1	1 PUBLIC ACCEPTANCE	55.38ed
2	1.1 SUBMIT EC PLAN TO EPA	1d
3	1.2 PUBLIC COMMENTS	8w
4	1.3 PUBLIC MEETINGS	1d
5	2 PLANNING	109.38ed
6	2.1 PREPARE HEALTH/SAFETY PLAN	2w
7	2.2 FIELD WORK PLANNING	1w
8	3 IMPLEMENT EXPEDITED CLEANUP	9.38ed
9	3.1 MOBILIZATION	1d
10	3.2 PERFORM CLEAN UP	8d
11	3.3 SITE RESTORATION	1d
12	3.4 INSPECTION & SUPERVISION	0.38ed
13	3.5 DEMOBILIZATION	1d
14	3.6 COMPLETE EC	0d
15	4 ANALYSIS AND REPORT PREPARTION	23ed
16	4.1 SAMPLE ANALYSIS	3w
17	4.2 PREPARE FINAL REPORT	1w
18	4.3 SUBMIT REPORT	0d



Project: SWMU 36-003(a) schedul
Date: 5/31/95

Critical
Noncritical
Progress
Milestone
Summary

ICF KAISER ENGINEERS, INC.

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McCann, J., February 6, 1995. "Guidance for Evaluation and Cleanup of PCBs in Soil for the Los Alamos National Laboratory Environmental Restoration Project," Final Draft. (McCann 1995).

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.0 ANNEXES

6.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

6.2 Quality Assurance Plan

See Quality Program Plan And Quality Assurance Project Plan For Environmental Restoration, last revision January 1993, May 1991, Los Alamos National Laboratory, New Mexico.

6.3 Health and Safety Plan

See Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Project Health and Safety Plan (HASP) (LANL, February 11, 1995).

6.4 Records Management Plan

See Installation Work Plan For Environmental Restoration, Revision 4, Chapter IV, Records Management Program Plan.

6.5 Public Involvement Plan

See Installation Work Plan For Environmental Restoration, Revision 4, Chapter V, Public Involvement Program Plan.

6.6 Methodology for Development of Preliminary Remedial Goals to Demonstrate Clean Closure

6.7 Field Work Approval

6.8 Proposed Outline for Expedited Cleanup Final Report

6.9 RFI Analytical Data

6.10 Methodology for Establishing Cleanup Levels for Lead in Soil

ANNEX 6.6

METHODOLOGIES FOR DEVELOPING SITE-SPECIFIC PRELIMINARY REMEDIAL GOALS TO DEMONSTRATE CLEAN CLOSURE

1.0 APPROACH

A-based cleanup levels will be calculated for those constituents failing the screening assessment (comparison to SALs and background concentrations, including the analysis of multiple constituents) as documented in the RFI Report for this SWMU. Those contaminants failing the screening assessment phase will be called contaminants of concern (COCs) for the EC.

For those constituents that fail the screening assessment, cleanup levels will be calculated using EPA equations and default input parameters modified for site-specific information. Due to the location of this SWMU, cleanup levels will be based on a reasonable maximum exposed individual (a health working adult) under a continued laboratory operations land use scenario.

Under the EPA default industrial land use scenario, risk due to exposure to contaminants in soil is assumed to be due to direct ingestion, inhalation of volatiles from the soil, inhalation of particulates from the soil, and dermal exposure. For intrusive work (e.g., soil excavation), it is also assumed that there is a greater potential for the use of heavy equipment and thus a greater potential for soils to be disturbed and produce particulate and volatile emissions than in most residential and recreational land use scenarios. EPA default parameters are based on the type of industrial exposure activities expected after cleanup, and the physical properties of the COCs. One set of circumstances includes parameters such as exposure frequency and exposure duration, which are adjusted to reflect a maintenance worker versus a construction worker (or surface versus subsurface contamination scenarios), depending on the type of continued laboratory operations activity expected (i.e., non-intrusive or intrusive, respectively). The most conservative calculated cleanup goal (i.e., intrusive or non-intrusive) for a particular analyte will be used as the target cleanup level. Negotiation and agreement on the site-specific cleanup level parameters will have to be reached by appropriate Stakeholders per implementation of the EC and Permit Modification processes.

PRG EQUATIONS

Calculations of PRGs are consistent with Risk Assessment Guidance for Superfund (RAGS) Part B (EPA 1991) but also consider updates to the RAGS Part B equations (EPA 1994). The PRGs will use the most current sources of EPA-approved toxicity criteria such as the Integrated Risk Information System (IRIS), the Health Effects Assessment Summary Table (HEAST), and the Environmental Criteria and Assessment Office (ECAO). Should no toxicity criteria be available from the primary source of information (i.e., IRIS) for a specific route of exposure (i.e., inhalation or oral), the other two sources (HEAST and ECAO) will be consulted. Should toxicity criteria be available for only one route of exposure (i.e., either inhalation or oral), the missing toxicity criteria will be derived from the available route-specific toxicity criteria for that constituent. Equations 1 and 2 are used to calculate PRGs for carcinogenic and noncarcinogenic contaminants, respectively. The methodology backcalculates a soil concentration for carcinogens from a target cancer risk value of 10^{-4} (i.e., 1 in 10,000) and for non-carcinogens from a target hazard quotient of 1. The equations for soil combine across pathways for direct exposure (i.e., ingestion, skin contact, and inhalation).

To calculate soil PRGs, the cancer slope factor and reference dose (RfD) for dermal exposure is calculated in Equations 3 and 4, respectively. For volatile chemicals in soil, a chemical-specific volatilization factor is calculated in Equation 5.

Should COCs for this EC contain radionuclides, cleanup levels based on an acceptable level of dose to the worker (i.e., 100 mrem/year) will be calculated using the RESRAD code. The exposure parameters described in this document, and other inputs as required to successfully run the model for the final exposure scenario will be incorporated.

Equation 1: Direct Exposures to Carcinogenic Constituents in Industrial Soil

$$C(mg/kg) = \frac{TR \times BW_a \times AT_c \times 365 d/y}{EF_o \times ED_o \left[\frac{IRS_o \times CSF_o}{10^6\ mg/kg} + \frac{SA_a \times CSF_d \times AF \times ABS}{10^6\ mg/kg} + IRA_a \times CSF_i \times \left(\frac{1}{VF_s} + \frac{1}{PEF} \right) \right]}$$

Where:

$C(mg/kg)$ = Preliminary remedial goal for soil based on exposure to carcinogenic constituents (mg/kg)

TR = Target cancer risk (unitless)
Considered to be 1×10^{-4}

BW_a = Body weight, adult (kg)
Considered to be 70 kg (EPA 1991a)

AT_c = Averaging Time - cancer (years)
Considered to be 70 years (EPA 1991a)

EF_o = Exposure Frequency - occupational (d/y)
NONINTRUSIVE
Considered to be 200 d/y
Based on 250 d/y (EPA 1991a) minus 50 workdays when soil is wet or covered with snow
INTRUSIVE
Considered to be 90 d/y (LANL, 1993)

ED_o = Exposure duration - occupational (years)
NONINTRUSIVE
Considered to be 25 years (EPA 1991a)
INTRUSIVE
Considered to be 1 year (LANL 1993)

IRS_o = Soil ingestion - occupational (mg/day)
NONINTRUSIVE
Considered to be 50 mg/day (EPA 1991a)
INTRUSIVE
Considered to be 480 mg/day (LANL 1993)

CSF_o = Cancer slope factor-oral $(mg/kg\text{-}d)^{-1}$ (IRIS, HEAST, or ECAO)

SA_a = Surface area, adult (cm^2)
NONINTRUSIVE
Considered to be 5000 cm^2 (EPA 1992)
INTRUSIVE
Considered to be 3200 cm^2

CSF_d = Cancer slope factor-dermal $(mg/kg\text{-}d)^{-1}$
(See Equation 3)

AF = Adherence factor (mg/cm^2)
Considered to be 0.2 mg/cm^2 (EPA 1992)

ABS = Skin absorption
Considered to be 0.1 for organics (EPA 1994)
Considered to be 0.01 for inorganics (EPA 1994)

IRA_a = Inhalation rate - adult (m^3/day)
Considered to be 20 m^3/day (EPA 1991a)

CSF_i = Cancer slope factor-inhalation $(mg/kg\text{-}d)^{-1}$ (IRIS, HEAST, or ECAO)

VF_s = Volatilization factor for soil (m^3/kg)
(See Equation 5)

PEF = Particulate emission factor (m^3/kg)
Considered to be $1.32 \times 10^{+9}$ m^3/kg (EPA 1994)

Equation 2: Direct Exposures to Noncarcinogenic Constituents in Industrial Soil

$$C(mg/kg) = \frac{THQ \times BW_a \times ED_o \times 365\ d/y}{EF_o \times ED_o \left[\frac{1}{RfD_o} \times \frac{IRS_o}{10^6 mg/kg} + \frac{1}{RfD_d} \times \frac{SA_a \times AF \times ABS}{10^6 mg/kg} + \frac{1}{RfD_i} \times \left(\frac{IRA_a}{VF_s} + \frac{IRA_a}{PEF} \right) \right]}$$

Where:

$C(mg/kg)$ = Preliminary remedial goal for soil based on exposure to noncarcinogenic constituents (mg/kg)

THQ = Target hazard quotient (unitless)
Considered to be 1

BW_a = Body weight, adult (kg)
Considered to be 70 kg (EPA 1991a)

ED_o = Exposure duration - occupational (years)
NONINTRUSIVE
Considered to be 25 years (EPA 1991a)
INTRUSIVE
Considered to be 1 year (LANL 1993)

EF_o = Exposure frequency - occupational (d/y)
NONINTRUSIVE
Considered to be 200 d/y
Based on 250 d/y (EPA 1991a) minus 50 workdays when soil is wet or covered with snow
INTRUSIVE
Considered to be 90 d/y (LANL, 1993)

RfD_o = Reference dose-oral (mg/kg-d) (IRIS, HEAST, or ECAO)

IRS_o = Soil ingestion - occupational (mg/day)
NONINTRUSIVE
Considered to be 50 mg/day (EPA 1991a)
INTRUSIVE
Considered to be 480 mg/day (LANL 1993)

RfD_d = Reference dose-dermal (mg/kg-d) (IRIS, HEAST, or ECAO)
(See Equation 4)

SA_a = Surface area, adult (cm^2)
NONINTRUSIVE
Considered to be 5000 cm^2 (EPA 1992)
INTRUSIVE
Considered to be 3200 cm^2

AF = Adherence factor (mg/cm^2)
Considered to be 0.2 mg/cm^2 (EPA 1992)

ABS = Skin absorption
Considered to be 0.1 for organics (EPA 1994)
Considered to be 0.01 for inorganics (EPA 1994)

RfD_i = Reference dose inhalation (mg/kg-d) (IRIS, HEAST, or ECAO)

IRA_a = Inhalation rate - adult (m^3/day)
Considered to be 20 m^3/day (EPA 1991a)

VF_s = Volatilization factor for soil (m^3/kg)
(See Equation 5)

PEF = Particulate emission factor (m^3/kg)
Considered to be 1.32×10^{-9} m^3/kg (EPA 1994)

Equation 3: Dermal Cancer-Slope Factor (CSFd) Based Upon Absorbed Dose

Cancer slope factors based upon administered doses will be adjusted for absorption to obtain estimates of potential dermal cancer-slope factors (1992). Where absorption factors and oral cancer slope factors are available, dermal cancer-slope factors will be calculated using the following equation:

$$CSF_{absorbed} = \frac{CSF_{administered}}{A_{bs}}$$

Where:

$CSF_{absorbed}$ = cancer-slope factor based on absorbed dose
$CSF_{administered}$ = oral cancer-slope factor
A_{bs} = oral absorption factor

Equation 4: Dermal Reference Dose (RfDd) Based Upon Absorbed Dose

Reference doses based upon administered doses will be adjusted for absorption to obtain estimates of potential dermal reference doses (1992). Where absorption factors and oral reference doses are available, dermal reference doses will be calculated using the following equation:

$$RfD_{absorbed} = RfD_{administered} \times A_{bs}$$

Where:

$RfD_{absorbed}$ = reference dose based on absorbed dose
$RfD_{administered}$ = oral reference dose
A_{bs} = oral absorption factor

'ation 5: Derivation of the Volatilization Factor

$$VF(m^3/kg) = \frac{LS \times V \times DH}{A} \times \frac{(\pi \times \alpha \times T)^{1/2}}{2 \times D_{ei} \times P_a \times K_{as} \times 10^{-3}\ kg/g}$$

Where:

$$\alpha = \frac{D_{ei} \times P_a}{P_a + \frac{(\rho_s)(1-P_a)}{K_{as}}}$$

VF = Volatization factor (m^3/kg)

LS = Length of side of contaminated area (m) Considered to be 45 m

V = Windspeed in mixing zone (m/s) Considered to be default of 2.25 m/s

DH = Diffusion height (m) Considered to be default of 2 m

A = Area of contamination (cm^2) Considered to be 20,000,000 cm^2

D_{ei} = Effective diffusivity (cm^2/s) Considered to equal to $D_i(P_a^{3.33}/P_i^2)$

P_a = Air-filled soil porosity (unitless) Considered to be equal to P_i-θθ

P_i = Total soil porosity (unitless) Considered to be equal to 1-(θ/P_s)

θ = Soil moisture content (cm^3-water/g-soil) Considered to be default of 0.1 cm^3-water/g-soil

θ = Soil bulk density (g/cm^3) Considered to be default of 1.5 g/cm^3

ρ_s = True soil density or particle density (g/cm^3) Considered to be default of 2.65 g/cm^3

K_{as} = Soil-air partition coefficient (g-soil/cm^3-air) Considered to be equivalent to (H/K_s) x 41 (41 is a conversion factor)

T = Exposure interval (s) Considered to be 28,800 s (8 hr)

D_i = Diffusivity in air (cm^2/s) Chemical-specific

H = Henry's Law constant (atm-m^3/mol) Chemical-specific

K_s = Soil-water partition coefficient (cm^3/g) K_{oc}xOC

OC Organic carbon content of soil (fraction) Considered to be default of 0.02

3.0 References

EPA (U.S. Environmental Protection Agency), December 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A), Interim Final Report, EPA/540/1-89/002, Office of Emergency and Remedial Response, Washington, D.C., 1989. (EPA 1989)

EPA (U.S. Environmental Protection Agency), July 27, 1990. "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," proposed rule, 40 CFR Parts 264, 265, 270, and 271, Federal Register, Vol. 55, No. 145, pp. 30798-30884, July 27, 1990. (EPA 1990)

EPA (U.S. Environmental Protection Agency), March 25, 1991. 'Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance,' "Standard Default Exposure Factors," Interim Final, OSWER Directive 9285.6-03, Office of Solid Waste and Emergency Response, Toxics Integration Branch, Washington, D.C., 1991 (EPA 1991a)

EPA (U.S. Environmental Protection Agency), 1991. "Risk Assessment Guidance for Superfund, Volume I--Human Health Evaluation Manual (Part B: Development of Risk-Based Preliminary Remediation Goals)," Interim, EPA/540/1-89/002, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1991)

EPA (U.S. Environmental Protection Agency), January 1992. "Dermal Exposure Assessment: Principles and Applications," Interim Report, EPA/600/8-91/011B, Office of Research and Development, Washington D.C., 1992 (EPA 1992)

EPA (U.S. Environmental Protection Agency Region IX), August 1994. Region IX Preliminary Remediation Goals (PRGs), Second Half 1994. Memo from Standford J. Smucker, Ph.D., Regional Toxicologist (H-9-3), Technical Support Section to PRG Table Mailing List. (EPA 1994)

LAC 1991: Los Alamos County Community Development Department, "Los Alamos Development Code," Chapter 17.42, Site Development Requirements, 1991.

LANL 1993: Los Alamos National Laboratory, November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993)

ANNEX 6.7
FIELD WORK APPROVAL FORM

This form must be completed prior to starting remediation field work for Expedited Cleanups that do not have an EPA-approved plan.

I, _____, DOE-LAAO, **APPROVE** the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU 39-002(a), TA-39.

I, _____, DOE-AL, **DO NOT APPROVE** the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU 39-002(a), TA-39.

The following reasons reflect the decision for disapproval:

Signed: _____ Date: _____

ANNEX 6.8
PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORTS

1.0 Summary of Expedited Cleanup

1.1 Overview
1.2 Expedited Cleanup

2.0 Site Restoration

3.0 Modifications to the EC Plan

4.0 Quantities and Types of Waste Generated

5.0 Outstanding Items from the Acceptance Inspection

6.0 Problems Encountered and Lessons Learned

APPENDICES

A Analytical Data
B Acceptance Inspection Checklist
C Equipment Inventory
D Photographs
E Certification of Completion

ANNEX 6.9

RFI Analytical Data

MEASURED CON TRATIONS OF COPCs IN S 39-002(a)

(Maximum concentrations for PRS shown in boldface)
(Shaded values at or above background UTL)

Potential Release Site	Sample Number and Site ID #	Sample Type and Depth	Units	Metals	Polychlorinated Biphenyls	Radionuclides	Semivolatile Organic Compounds	Volatile Organic Compounds	High Explosives	Total Petroleum Hydrocarbon	Screening Action Level	Contract Required Quant. Limits	Background
39-002(a)	AAA3602	Soil	mg/kg	**66 Barium**				No Analysis			5600	40	1140 (a)
Storage	(39-1051)	(0-6")	mg/kg	0.48 Beryllium							NC	1	3.31
Building			mg/kg	<0.4 Cadmium							80	1	2.7
39-2			mg/kg	5.5 Chromium							400	2	34.2
			mg/kg	3.4 Cobalt							~	10	51.1
(5 samples)			mg/kg	31 Copper							3000	5	15.7
			mg/kg	32 Lead*							400	0.6	39
			mg/kg	1 Mercury							24	0.04	0.1
			mg/kg	5.3 Nickel							1600	8	26.7
			mg/kg	59 Zinc							24000	4	101
			mg/kg		<1.0 PCB*						1.0	0.033	~
			pci/g			0.28 Cs-137					4	~	1.0
			mg/kg			2.7 U (total)					160	NA	2.09
			mg/kg				0.44 Anthracene				24000	0.33	4.0
			mg/kg				1.1 Benzo[a]anthracene*				1	0.33	11.9
			mg/kg				1.8 Benzo[a]pyrene*				0.1	0.33	11.4
			mg/kg				2 Benzo[b]fluoranthene*				1	0.33	12.1
			mg/kg				1.4 Benzo[g,h,i]perylene				~	0.33	5.9
			mg/kg				0.62 Benzo[k]fluoranthene				1	0.33	18.2
			mg/kg				1.5 Chrysene				96	0.33	18.3
			mg/kg				2.4 Fluoranthene				3200	0.33	30.9
			mg/kg				1.2 Indeno[1,2,3-cd]pyrene*				1	0.33	6.0
			mg/kg				2.5 Phenanthrene				~	0.33	22.7
			mg/kg				3.2 Pyrene			16.5	2400	0.33	12.5

(J) = Indicates estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable, ~ = Not Avail
* = at or above SAL

a - Site-wide background UTL from Ryti 1995
b - Range in urban backgrounds for PAHS from Bradley et al

MEASURED CONCENTRATIONS OF COPCs IN SWMU 39-002(a)

(Maximum concentrations for PRS shown in boldface)
(Shaded values at or above background UTL)

Potential Release Site	Sample Number and Site ID #	Sample Type and Depth	Units	Metals	Polychlorinated Biphenyls	Radionuclides	Semivolatile Organic Compounds	Volatile Organic Compounds	High Explosives	Total Petroleum Hydrocarbon	Screening Action Level	Contract Required Quant. Limits	Background
39-002(a)	AAA3603	Soil	mg/kg	58 Barium				No Analysis			5600	40	1140 (a)
Storage	(39-1051)	(0-6")	mg/kg	0.44 Beryllium							NC	1	3.31
Building			mg/kg	4.1 Cadmium							80	1	2.7
39-2			mg/kg	14 Chromium							400	2	34.2
			mg/kg	9.1 Cobalt							~	10	51.1
			mg/kg	750 Copper							3000	5	15.7
			mg/kg	4700 Lead*							400	0.6	39
			mg/kg	2 Mercury							24	0.04	0.1
			mg/kg	9 Nickel							1600	8	26.7
			mg/kg	290 Zinc							24000	4	101
			mg/kg		1.6 PCB*						1.0	0.033	~
			pci/g			0.35 Cs-137					4	~	1.0
			mg/kg			12.2 U (total)					160	NA	2.09
			mg/kg				10 Acenaphthene				4800	0.33	3.4
			mg/kg				0.93 Acenaphthylene (J)				~	0.33	1.1
			mg/kg				16 Anthracene				24000	0.33	4.0
			mg/kg				32 Benzo[a]anthracene*				1	0.33	11.9
			mg/kg				29 Benzo[a]pyrene*				0.1	0.33	11.4
			mg/kg				38 Benzo[b]fluoranthene*				1	0.33	12.1
			mg/kg				4.5 Benzo[g,h,i]perylene				~	0.33	5.9
			mg/kg				11 Benzo[k]fluoranthene*				1	0.33	18.2
			mg/kg				33 Chrysene				96	0.33	18.3
			mg/kg				13 Di-n-butylphthalate				8000	0.33	~
			mg/kg				4 Dibenzo[a,h,]anthracene*				0.1	0.33	2.9
			mg/kg				5.6 Dibenzofuran				~	0.33	~
			mg/kg				81 Fluoranthene				3200	0.33	30.9
			mg/kg				10 Fluorene				3200	0.33	3.3
			mg/kg				15 Indeno[1,2,3-cd]pyrene*				1	0.33	6.0
			mg/kg				2.4 2-Methylnaphthalene (J)				~	0.33	0.64
			mg/kg				8.4 Naphthalene				3200	0.33	0.66
			mg/kg				78 Phenanthrene				~	0.33	22.7
			mg/kg				73 Pyrene				2400	0.33	12.5
			mg/kg						0.25 1,3-dinitrobenzene		8	~	~
			mg/kg						0.19 2,4-dinitrotoluene (J)		1	0.33	~
			mg/kg						1.89 o-nitrotoluene		800	~	~
			mg/kg						3.22 p-nitrotoluene		800	~	~
			mg/kg						1.98 Tetryl(methyl-2,4,6-trinitrophenylnitramine) (J)		800	~	~
			mg/kg							110 TPH	~	~	~

(J) = Indicates estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable; ~ = Not Avail
* = at or above SAL

a - Site-wide background UTL from Ryti 1995
b - Range in urban backgrounds for PAHS from Bradley et al

MEASURED CON[illegible]TRATIONS OF COPCs IN S[illegible]39-002(a)

(Maximum concentrations for PRS shown in boldface)
(Shaded values at or above background UTL)

Potential Release Site	Sample Number and Site ID #	Sample Type and Depth	Units	Metals	Polychlorinated Biphenyls	Radionuclides	Semivolatile Organic Compounds	Volatile Organic Compounds	High Explosives	Total Petroleum Hydrocarbon	Screening Action Level	Contract Required Quant. Limits	Background
39-002(a)	AAA3605	Soil	mg/kg	53 Barium				No Analysis			5600	40	1140
(continued)	(39-1053)	(0-6")	mg/kg	**0.96 Beryllium**							NC	1	3.31
			mg/kg	5.3 Cadmium							80	1	2.7
			mg/kg	**18 Chromium**							400	2	34.2
			mg/kg	5.2 Cobalt							~	10	51.1
			mg/kg	**880 Copper**							3000	5	15.7
			mg/kg	**7006 Lead***							400	0.6	39
			mg/kg	**3 Mercury**							24	0.04	0.1
			mg/kg	10 Nickel							1600	8	26.7
			mg/kg	810 Zinc							24000	4	101
			mg/kg		1.1 PCB*						1.0	0.033	~
			pci/g			0.33 Cs-137					4	~	1.0
			pci/g			**0.16 Co-60**					0.9	~	~
			mg/kg			15 U (total)					160	NA	2.09
			mg/kg				6 Acenaphthene				4800	0.33	3.4
			mg/kg				0.26 Acenaphthylene (J)					0.33	1.1
			mg/kg				10.1 Anthracene				24000	0.33	4.0
			mg/kg				20.9 Benzo[a]anthracene*				1	0.33	11.9
			mg/kg				19.5 Benzo[a]pyrene*				0.1	0.33	11.4
			mg/kg				22.2 Benzo[b]fluoranthene*				1	0.33	12.1
			mg/kg				8.8 Benzo[g,h,i]perylene				~	0.33	5.9
			mg/kg				2.8 Benzo[k]fluoranthene*				1	0.33	18.2
			mg/kg				**0.38 Bis(2-ethylhexyl)phthalate**				50	0.33	~
			mg/kg				22.4 Chrysene				96	0.33	18.3
			mg/kg				12.6 Di-n-butylphthalate				8000	0.33	~
			mg/kg				2.5 Dibenzo[a,h,]anthracene*				0.1	0.33	2.9
			mg/kg				1.9 Dibenzofuran				~	0.33	~
			mg/kg				0.063 2,4 Dimethylphenol (J)				1600	0.33	~
			mg/kg				55.3 Fluoranthene				3200	0.33	30.9
			mg/kg				6.3 Fluorene				3200	0.33	3.3
			mg/kg				16.8 Indeno[1,2,3-cd]pyrene*				1	0.33	6.0
			mg/kg				0.1 4-Methylphenol (J)				400	0.33	~
			mg/kg				5.1 Naphthalene				3200	0.33	0.66
			mg/kg				53.5 Phenanthrene				~	0.33	22.7
			mg/kg				0.057 Phenol (J)				48000	0.33	~
			mg/kg				44.7 Pyrene				2400	0.33	12.5
			mg/kg						1.10 1,3-dinitrobenzene		8	~	~
			mg/kg						0.51 2,4-dinitrotoluene (J)		1	0.33	~
			mg/kg						1.62 o-nitrotoluene		800	~	~
			mg/kg						**0.95 1,3,5-trinitrobenzene (J)**		4	~	~
			mg/kg							96.5 TPH	~	~	~

(J) = Indicates estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable, ~ = Not Avail
* = at or above SAL

a - Site-wide background UTL from Ryti 1995
b - Range in urban backgrounds for PAHS from Bradley et al

MEASURED CONCENTRATIONS OF COPCs IN SWMU 39-002(a)

(Maximum concentrations for PRS shown in boldface)
(Shaded values at or above background UTL)

Potential Release Site	Sample Number and Site ID #	Sample Type and Depth	Units	Metals	Polychlorinated Biphenyls	Radionuclides	Semivolatile Organic Compounds	Volatile Organic Compounds	High Explosives	Total Petroleum Hydrocarbon	Screening Action Level	Contract Required Quant. Limits	Background
39-002(a)	AAA3606	Soil	mg/kg	57 Barium				No Analysis			5600	40	1140 (a)
Storage	(39-1053)	(0-6")	mg/kg	0.67 Beryllium							NC	1	3.31
Building			mg/kg	4.1 Cadmium							80	1	2.7
39-2			mg/kg	10 Chromium							400	2	34.2
			mg/kg	6 Cobalt							~	10	51.1
			mg/kg	880 Copper							3000	5	15.7
			mg/kg	2700 Lead*							400	0.6	39
			mg/kg	1 Mercury							24	0.04	0.1
			mg/kg	11 Nickel							1600	8	26.7
			mg/kg	440 Zinc							24000	4	101
			mg/kg		1.2 PCB*						1.0	0.033	~
			pci/g			0.28 Cs-137					4	~	1.0
			mg/kg			40 U (total)					160	NA	2.09
			mg/kg				6.1 Acenaphthene				4800	0.33	3.4
			mg/kg				9.2 Anthracene				24000	0.33	4.0
			mg/kg				21 Benzo[a]anthracene*				1	0.33	11.9
			mg/kg				19.9 Benzo[a]pyrene*				0.1	0.33	11.4
			mg/kg				22 Benzo[b]fluoranthene*				1	0.33	12.1
			mg/kg				9.6 Benzo[g,h,i]perylene				~	0.33	5.9
			mg/kg				8.8 Benzo[k]fluoranthene*				1	0.33	18.2
			mg/kg				23 Chrysene				96	0.33	18.3
			mg/kg				5.4 Di-n-butylphthalate				8000	0.33	~
			mg/kg				3.9 Dibenzo[a,h]anthracene*				0.1	0.33	2.9
			mg/kg				2.4 Dibenzofuran				~	0.33	~
			mg/kg				50.1 Fluoranthene				3200	0.33	30.9
			mg/kg				6.6 Fluorene				3200	0.33	3.3
			mg/kg				16.1 Indeno[1,2,3-cd]pyrene*				1	0.33	6.0
			mg/kg				1.1 2-Methylnaphthalene (J)				~	0.33	0.64
			mg/kg				4.9 Naphthalene				3200	0.33	0.66
			mg/kg				53.5 Phenanthrene				~	0.33	22.7
			mg/kg				45.5 Pyrene				2400	0.33	12.5
			mg/kg						0.55 2-amino-4,6-dinitrotoluene		~	~	~
			mg/kg						1.19 1,3-dinitrobenzene		8	~	~
			mg/kg						0.90 2,4-dinitrotoluene (J)		1	0.33	~
			mg/kg						5.43 p-nitrotoluene		800	~	~
			mg/kg						0.96 2,6-dinitrotoluene		1	~	~
			mg/kg						4.76 m-nitrotoluene		~	~	~
			mg/kg						0.31 1,3,5-trinitrotoluene		4	~	~
			mg/kg							100 TPH	~	~	~

(J) = Indicates estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable, ~ = Not Avail
* = at or above SAL

a - Site-wide background UTL from Ryti 1995
b - Range in urban backgrounds for PAHS from Bradley et al

MEASURED CONC RATIONS OF COPCs IN SV 9-002(a)

(Maximum concentrations for PRS shown in boldface)
(Shaded values at or above background UTL)

Potential Release Site	Sample Number and Site ID #	Sample Type and Depth	Units	Metals	Polychlorinated Biphenyls	Radionuclides	Semivolatile Organic Compounds	Volatile Organic Compounds	High Explosives	Total Petroleum Hydrocarbon	Screening Action Level	Contract Required Quant. Limits	Background
39-002(a)	AAA3607	Soil	mg/kg	50 Barium				No Analysis			5600	40	1140 (a)
Storage	(39-1053)	(0-6")	mg/kg	0.54 Beryllium							NC	1	3.31
Building			mg/kg	3.1 Cadmium							80	1	2.7
39-2			mg/kg	9.4 Chromium							400	2	34.2
			mg/kg	6.9 Cobalt							~	10	51.1
			mg/kg	370 Copper							3000	5	15.7
			mg/kg	1600 Lead*							400	0.6	39
			mg/kg	1 Mercury							24	0.04	0.1
			mg/kg	23 Nickel							1600	8	26.7
			mg/kg	210 Zinc							24000	4	101
			mg/kg		1.0 PCB*						1.0	0.033	~
			pci/g			0.24 Cs-137					4	~	1.0
			mg/kg			14 U (total)					160	NA	2.09
			mg/kg				4.1 Acenaphthene				4800	0.33	3.4
			mg/kg				6.9 Anthracene				24000	0.33	4.0
			mg/kg				14.7 Benzo[a]anthracene*				1	0.33	11.9
			mg/kg				14.2 Benzo[a]pyrene*				0.1	0.33	11.4
			mg/kg				15.5 Benzo[b]fluoranthene*				1	0.33	12.1
			mg/kg				6 Benzo[g,h,i]perylene				~	0.33	5.9
			mg/kg				2.6 Benzo[k]fluoranthene*				1	0.33	18.2
			mg/kg				16.8 Chrysene				96	0.33	18.3
			mg/kg				12.1 Di-n-butylphthalate				8000	0.33	~
			mg/kg				2.7 Dibenzo[a,h,]anthracene*				0.1	0.33	2.9
			mg/kg				2 Dibenzofuran				~	0.33	~
			mg/kg				37.7 Fluoranthene				3200	0.33	30.9
			mg/kg				4.3 Fluorene				3200	0.33	3.3
			mg/kg				11.3 Indeno[1,2,3-cd]pyrene*				1	0.33	6.0
			mg/kg				0.86 2-Methylnaphthalene (J)				~	0.33	0.64
			mg/kg				4 Naphthalene				3200	0.33	0.66
			mg/kg				39.1 Phenanthrene				~	0.33	22.7
			mg/kg				33.3 Pyrene				2400	0.33	12.5
			mg/kg						0.45 4-amino-2,6-dinitrotoluene		~	~	~
			mg/kg						1.61 1,3-dinitrobenzene		8	~	~
			mg/kg						0.64 2,4-dinitrotoluene (J)		1	0.33	~
			mg/kg						0.43 2-amino-4,6-dinitrotoluene		~	~	~
			mg/kg						8.0 1,3,5-trinitrotoluene		4	~	~
			mg/kg							134 TPH	~	~	~

(J) = Indicates estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable; ~ = Not Avail
* = at or above SAL

a - Site-wide background UTL from Ryti 1995
b - Range in urban backgrounds for PAHS from Bradley et al

ANNEX 6.10

Methodology for Establishing Cleanup Levels for Lead in Soil

Methodology for Establishing Cleanup Levels for Lead in Soil

LEAD EXPOSURES

EPA has not derived CSFs or RfDs for evaluating the toxicity of lead or lead compounds. Previously, EPA had considered the concentration range of 500 to 1,000 mg/kg lead in soil to be acceptable as an interim cleanup level for residential Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites (EPA 1992). This interim cleanup level was proposed in a Centers for Disease Control document (CDC 1985) on lead poisoning in children, as children and fetuses are considered the most sensitive receptors for lead's toxic end points. Even more current EPA (1994) guidance has suggested a lead concentration in soil of 400 mg/kg as the threshold level. However, more recently for residential CERCLA and RCRA sites, EPA has recommended replacing the 500 to 1,000 mg/kg cleanup range and the 400 mg/kg threshold level with levels derived by its Integrated Exposure Uptake Biokinetic (IEUBK) model (Hensel 0.99d).

Because of the anticipated future use of the Laboratory site for industrial/commercial purposes, the residential exposures are not considered relevant for the site. The California Environmental Protection Agency (Cal/EPA) has developed its own model (1993) to predict blood lead (PbB) levels in adults as well as children. The Cal/EPA model was employed in this assessment to evaluate potential adverse health effects to adults from lead in soil at the Laboratory site (see attached table).

Cal/EPA Lead Model

Similar to the EPA IEUBK model, the Cal/EPA model is used to estimate blood lead concentrations resulting from exposures via several pathways (inhalation of particulates, ingestion of food, dust, soil, water, and plant uptake). The contribution from the pathways are added to derive an estimate median PbB concentration resulting from multipathway exposure. In addition, the model calculates the 90th, 95th, and 99th percentile concentrations by assuming a lognormal distribution with a standard deviation of 1.45 mg/dl.

A PbB concentration of 10 mg/dl is the target PbB level for exposure to lead in the environment, regardless of the source. Sources include drinking water, grocery story food products, soil (incidental soil ingestion and dermal contact), and the air. Therefore, the calculation of a soil lead cleanup level for an industrial exposure scenario includes the contribution to blood lead levels from non-site sources.

The soil lead cleanup level includes the contribution to PbB levels from non-site sources as well as on-site soil contact, soil ingestion, and inhalation pathways and was calculated not to exceed the target level of 10 mg/dl at the 95 percentile concentration. The contact rate for soil ingestion was changed from 0.03 g soil/day to 0.02 g soil/day to reflect the on-site industrial exposure pathway. The lead concentrations used in the water and food ingestion pathways are default values and represent background lead levels that may be encountered in tap water and grocery store food products. All other exposure input parameters are default values based on a residential exposure scenario.

REFERENCES

Cal/EPA (California Environmental Protection Agency, Department of Toxic Substance Control). 1993. "Cal-Tox, a Multimedia Total Exposure Model for Hazardous Waste Sites. Office of Science Affairs, Department of Toxic Substances Control. (Cal/EPA 1993)

EPA (U.S. Environmental Protection Agency). 1992. "Revised Guidance on Establishing Soil Lead Cleanup Levels at CERCLA/RCRA Sites." OSWER Directive 9355. 4-08. (EPA 1992)

EPA (U.S. Environmental Protection Agency), July 14, 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive No. 9355.4-12. (EPA 1994).

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

INPUT		OUTPUT					
MEDIUM	LEVEL		percentiles				
			50th	90th	95th	98th	99th
LEAD IN AIR (ug/m^3)	0.01						
LEAD IN SOIL (ug/g)	3385	BLOOD Pb, ADULT (ug/dl)	5.7	8.9	10.0	11.6	12.8
LEAD IN WATER (ug/l)	15						
PLANT UPTAKE? 1=YES 0=NO	0						
AIRBORNE DUST (ug/m^3)	50						

EQUATIONS, ADULTS

Pathway	Blood Pb ug/dl		Route-specific constant		concentration in medium		contact rate		percent of total
SOIL CONTACT:	0.66	=	1E-04 (ug/dl)/(ug/day)	*	3385 ug/g	*	1.85 g soil/day (5 g/m^2 * 0.37 m^2)		12%
SOIL INGESTION:	2.98	=	0.018 (ug/dl)/(ug/day)	*	3385 ug/g	*	0.05 g soil/day		53%
INHALATION:	0.29	=	1.64 (ug/dl)/(ug/m^3)	*	0.18 ug/m^3				5%
WATER INGESTION:	0.84	=	0.04 (ug/dl)/(ug/day)	*	15 ug/l	*	1.4 l water/day		15%
FOOD INGESTION:	0.88	=	0.04 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	2.2 kg diet/day		16%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (ug/kg) = 10.0 ug/kg

LEAD IN PRODUCE = 10 ug/kg or 0.00045 * soil lead = 10.0 ug/kg

Los Alamos National Laboratory

Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 18-003(e)

June 1995
Revision 0

Environmental
Restoration

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ACRONYMS

AOC	area of concern
AP	Administrative Procedure
CEARP	Comprehensive Environmental Assessment Response Program
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CST	Chemical Science and Technology (Division)
CST-3	Analytical Services (Group)
DOE	U.S. Department of Energy
EC	expedited cleanup
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FPL	Field Project Leader
FTL	Field Team Leader
HSWA	Hazardous and Solid Waste Amendments
LANL, the Laboratory	Los Alamos National Laboratory
PCOC	potential contaminant of concern
PPE	personal protective equipment
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
VOC	volatile organic compound

1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan is for Solid Waste Management Unit (SWMU) 18-003(e) at TA-18, Los Alamos National Laboratory (the Laboratory), Los Alamos, New Mexico (Figure 1-1). This EC Plan is being proposed as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) described in the RFI Work Plan for Operable Unit 1093 (LANL 1993, 1085).

SWMU 18-003(e) is included in Table A of the original Hazardous Solid Waste Amendments (HSWA) module of the Laboratory's RCRA permit.

SWMU 18-003(e) consists of a deactivated septic tank that was filled with sand. Results from the RFI indicate the contents of the septic tank are hazardous waste and straightforward to remediate. The drainfield associated with SWMU 18-003(e) does not pose a potential risk to human health or the environment.

EC activities proposed by the plan include removing the tank contents, cleaning its interior, stabilizing the tank by filling it with concrete, and leaving it in place.

This EC Plan identifies the level of effort required from initial transmittal of the plan to the U.S. Environmental Protection Agency (EPA) for review, through implementation, to the completion of the final project report. In the development of this EC Plan, the following assumptions are made:

- Land use at the location of this SWMU will be for industrial purposes.
- Minimal delays in EC operations will result from inclement weather and site access delays. Delays that could result from the acquisition and scheduling of heavy equipment and from accepting waste at permitted disposal facilities cannot be anticipated and therefore are not considered within this plan.
- The site-specific health and safety plan (SSHASP) will be developed specifically to address chemicals of concern (COC) identified in this EC Plan. Deviations from these anticipated COC concentrations concern may necessitate adjustments to that plan.
- Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC Plan.

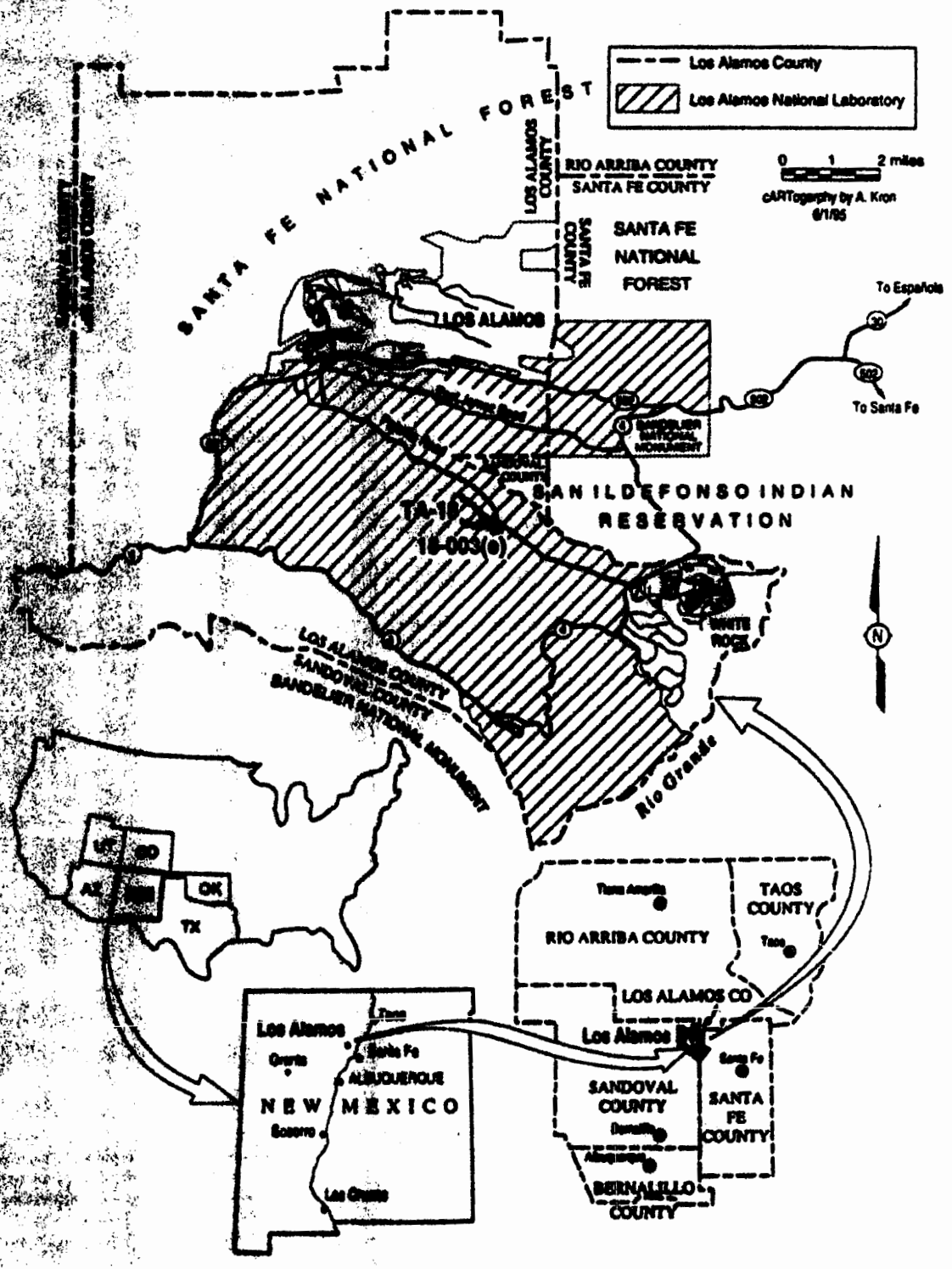


Figure 1-1. Regional location map.

0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Description of Septic Tank 18-40, SWMU 18-003(e)

SWMU 18-003(e) is a 500-gal. cylindrical concrete septic tank 6 ft in diameter and 6 ft, 2 in. high. Two inlet lines are located at right angles along the northern end of the tank, while a single outlet is situated along the southeastern section of the unit. A 2-ft diameter cast-iron manhole lid allows access to the tank. It is filled with sand to the upper concrete cover, preventing personnel entry. Vertical reinforced-concrete baffles, 6 in. high, are located in front of the inlet and outlet pipes, forming three sides of a square.

2.1.1 Operational History

SWMU 18-003(e), in service from 1951 until 1969, served Buildings TA-18-28, TA-18-31, TA-18-37, TA-18-129, and perhaps Septic Tanks TA-18-43 and TA-18-152. The SWMU primarily received sanitary waste, although it also received water from a sink in a small machine shop added to TA-18-28 in 1964.

2.1.2 Physical Setting

The tank is located south of TA-18-37 within the TA-18 outer security fence in the grassy area north of Kiva 3 (Figure 2-1). SWMU 18-003(e) lies entirely on U. S. Department of Energy (DOE)-owned land in Pajarito Canyon.

The prevalent soil type in the canyon bottom is the well-drained, alluvial-derived Totavi series. Alluvial channel-fill deposits are approximately 35 ft thick in the eastern portion of TA-18, where the SWMU is located. Pleistocene ash flows of the Bandelier Tuff directly underlie the soil and alluvial deposits.

Stream flow in the eastern section of Pajarito Canyon is ephemeral. A significant volume of surface flow in the form of stream and surface-water runoff recharges an unconfined, perched groundwater body in the channel-fill alluvium. The shallow groundwater is confined to the canyon alluvium extending from the top of the Bandelier Tuff to near ground surface. Thickness of the saturated zone varies seasonally, as does the depth to groundwater, which ranges from approximately 8 to 15 ft. The perched aquifer is believed to not be hydraulically connected with the regional groundwater system. The main aquifer is located approximately 300 ft below the perched alluvial groundwater.

2.2 Summary of Investigations

This septic tank and its drainfield were sampled in 1994 as part of the RFI Phase I characterization at TA-18.

2.2.1 Investigations Prior to RFI

No information is available regarding any sampling investigations in Septic Tank TA-18-40 being done prior to the RFI. However, the location and possible contaminants of the septic tank were noted in both the 1987 Comprehensive Environmental Assessment and Response Program (CEARP) report (DOE 1987, 0264) and the 1990 Solid Waste Management Units Report (LANL 1990, 0145).

2.2.2 RCRA Facility Investigation

During July 1994, multimedia samples were collected from the septic tank and associated drainfield to determine the potential effect of the inactive septic system on public health and the environment.

Septic Tank. Two samples of the tank's sand fill were obtained and analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), RCRA metals, isotopic plutonium and total uranium. Two boreholes were installed adjacent to the tank walls and sampled to determine the integrity of the structure.

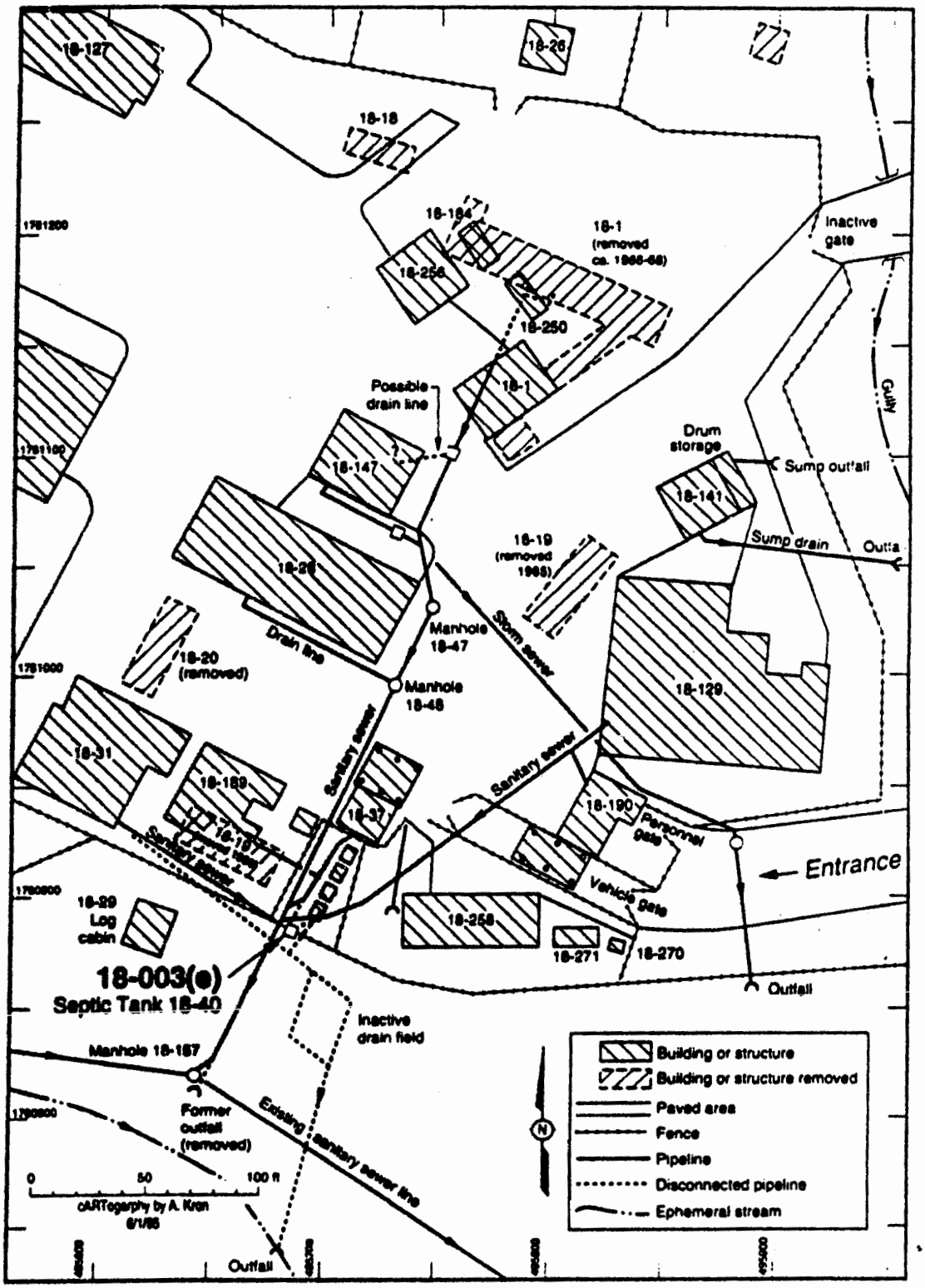


Figure 2-1. SWMU 18-003(e) location map.

ainfield. Approximately 24 soil samples were collected in the drainfield and next to the septic tank and analyzed for VOCs, SVOCs, metals, isotopic plutonium and total uranium. Subsurface soil samples were collected at discrete intervals from several boreholes drilled throughout the leachfield.

Two boreholes encountered shallow groundwater. Shallow groundwater samples were collected from these locations. These water samples were also analyzed for chlorides and nitrates so that, based on comparisons with background soil and groundwater concentrations, the proximity of the sample locations to drainfield leach zones could be ascertained.

2.2.3 Evaluation of the Results

Appendix A presents a summary of the analytical data for samples collected from septic tank and drainfield. An evaluation of the results provided the following findings:

Septic Tank

- No radionuclides were detected at concentrations above background.
- Levels of detected metals were significantly below SALs.
- No identifiable compounds were detected in the SVOC analysis.
- The VOC analysis revealed slightly elevated concentrations. The maximum reported constituent concentrations (in mg/kg) were acetone (270); 2-butanone (24); 1,2 dichloroethane (1,2 DCA) (7); cis-1,2-dichloroethylene (cis 1,2 DCE) (660); and trichloroethene (TCE) (200). Concentrations were reported in liquid units (µg/l) because of the watery nature of the sand fill. However, for evaluation of risk, the material should be appropriately treated as a solid material. The measured concentrations are all below screening action levels (SAL) for soil.

Drainfield

Total uranium and isotopic plutonium levels are below SALs and below or in the range of background.

- Levels of metals were significantly below SALs.
- SVOC analytes were below detection limits. The one exception, diethylphthalate (6.3 mg/kg), is several orders of magnitude below the corresponding SAL.
- VOC analytes in all soil and groundwater samples were below detection limit. The only exceptions were low levels of acetone (a probable laboratory contaminant) and TCE (20 µg/kg). These values are below SALs.

2.2.4 Conclusions

Based on analytical results, the contents of the septic tank are considered hazardous waste because of the presence of the following slightly elevated VOC constituents: 1,2 DCA; cis 1,2 DCE; and 1,1,1-trichloroethane (TCA). Concentrations of COCs remaining in the tank are all below SALs.

Analytical results from the associated drainfield reveals COCs significantly below SALs or below laboratory detection limits. TCE was detected at a low concentration at one sample location; however, the reported value is estimated because of laboratory uncertainty. The comparison of background nitrate levels with those observed at sample locations confirm samples were collected within soils affected by sanitary waste disposal.

2.3 Types and Volumes of Waste

The types and volume of the wastes expected to be generated by the proposed cleanup are presented in Table 2-1. Waste handling/disposal options for mixed waste versus hazardous waste are significantly

different. Therefore, EC field activities will not be implemented until analytical results for radioactive constituents have been received and reviewed.

TABLE 2-1
ANTICIPATED WASTE VOLUMES

Item	Type	Volume
Sand waste from tank	hazardous	5.5 yd^3
Decontaminated water	aqueous - potential hazardous	4 drums
PPE/Sampling Waste	solid - potential hazardous / noncontaminated	1gal.

This EC Plan proposes that the drainfield area be decommissioned in place. The tank contents contain slightly elevated levels of TCE, which is classified as a RCRA F-listed hazardous waste (40 CFR 261, Subpart D). In addition to the existing material in the tank, potentially contaminated water will be generated when the tank interior is washed following the removal of its existing contents. This EC Plan proposes consolidation of this wastewater with the removed tank residuals. As described in Section 3.3, the contents of the tank and the washwater will be pumped into containers, which will be handled by an approved off-site waste disposal facility. Treatment or stabilization of the residuals before its disposal may be necessary. The specific nature of this stabilization will be determined by the disposal facility.

Additional waste generated by this activity will be limited to decontamination water, disposable sampling equipment, and personal protective equipment (PPE). These materials will be handled in accordance with the waste management checklist (Annex 6.6) and treated as potentially mixed waste pending field screening and/or analytical results.

2.4 Potential Impacts on Public Health and the Environment

Potential exposure routes of receptors (animal and human) include

- inhalation (especially when the facility is disturbed);
- ingestion (in particular, receptors living onsite could be exposed by eating plants growing in soil contaminated by tank contents); or
- skin contact with contaminated soils or sediments.

Direct human contact with the soil surrounding the septic tank or in the drainfield would occur only through significant disturbance of the soil (Figure 2-2).

2.4.1 Potential Pathways

2.4.1.1 SWMU - In Place

Sources from which potential contaminants may migrate are the septic tank, associated piping and drainfield, and contaminated soils and gravels. Contaminants may reside in soils and sediments underlying and adjacent to the septic system components, in the air, and/or in plants. Transport mechanisms include surface water, subsurface water, wind, and plant uptake. Subsurface transport of potential contaminants is more critical where underground systems, such as septic systems, are in place.

2.4.1.2 SWMU - Remediation

EC activities will remove the tank's overburden and clean the septic tank interior. This could present additional temporary potential pathways for contaminant migration as a result of the increased surface exposure of contaminated materials. The primary pathways associated with these activities are wind dispersion and surface-water runoff.

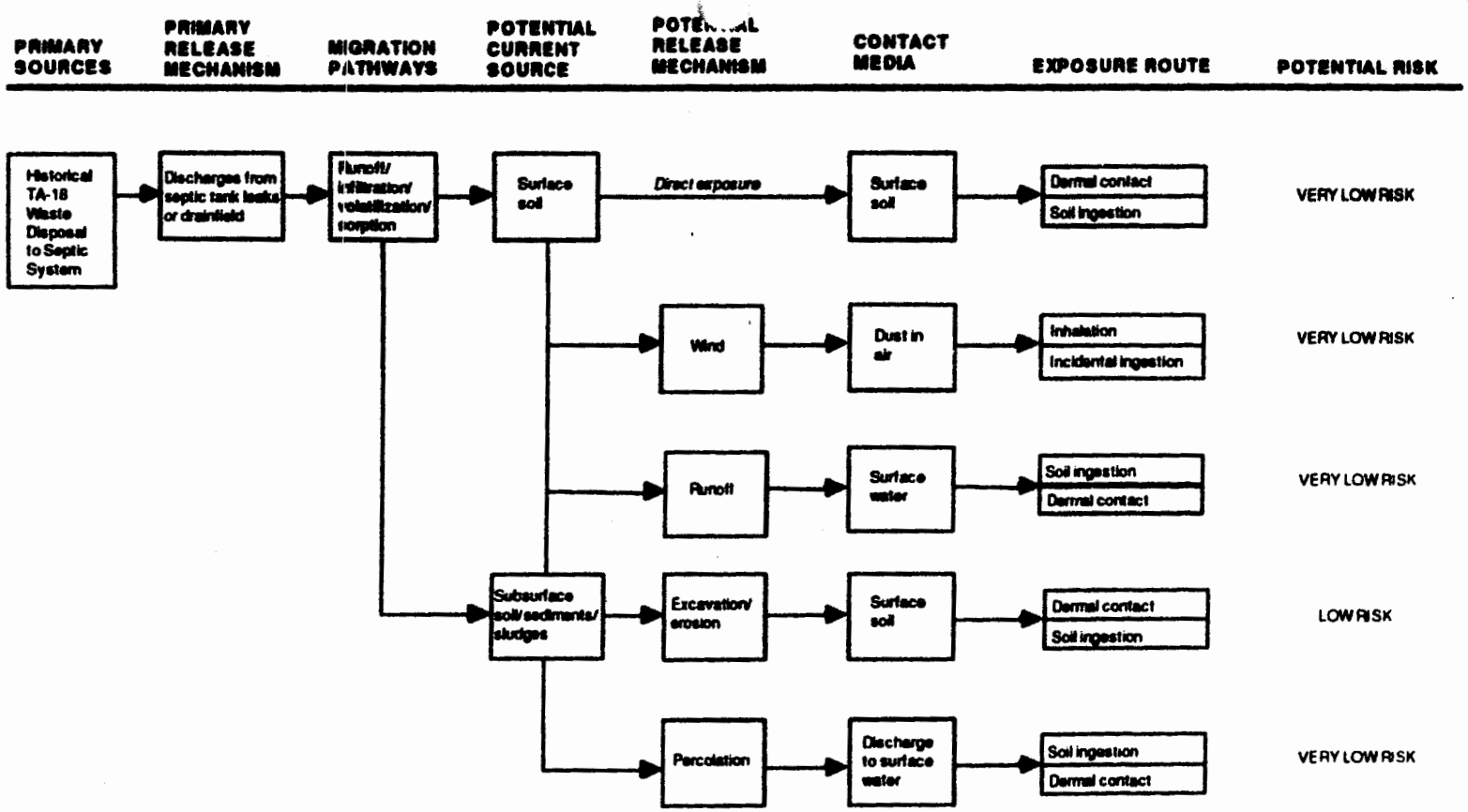


Figure 2-2. Conceptual exposure model for SWMU 18-003(e)

To minimize potential particulate dispersion, disturbed areas will be monitored both visually and mechanically for dust. Dust suppression techniques, such as the application of water or plastic sheeting over disturbed surfaces, may be implemented. Similarly, disturbed areas will be monitored for potential contaminant migration via surface-water runoff. Plastic sheeting, berms, or other temporary structural barriers may be implemented as necessary to minimize this risk.

Previous analytical results indicate the levels of VOCs present at the inactive septic system will be low enough that any potential contaminant migration by volatilization will not pose an unacceptable human or environmental risk. Soil and sand fill will be monitored using field instruments so that measures can be taken to protect human health and the environment if unanticipated levels of contaminant vapors are encountered.

During field activities, decontamination water, disposable PPE, and sampling equipment will be monitored for hazardous vapors and radioactive constituents. These materials will be placed in containers and disposed of according to an approved task-specific waste management checklist.

2.4.2 Future Land Use

This former septic system lies entirely on DOE-owned land; the residential community of White Rock lies to the east of TA-16. In the foreseeable future, land in the area of this SWMU is anticipated to be used exclusively for laboratory operations or other industrial purposes (LANL 1994, 1171).

2.4.3 Cleanup Levels

SALs are risk-based, media-specific action levels with which the maximum concentrations of an analyte are compared to determine whether further evaluation of potential contamination is warranted (LANL 1993, 1055). SALs are based on regulatory limits (e.g., maximum contaminant levels) or are calculated using a standard methodology described in the proposed RCRA Subpart S, Corrective Action for Solid Waste Management Units (EPA 1990, 0432). An additional conservative modification of the Subpart S methodology was introduced to account for exposure to VOCs volatilizing from water or soil. Calculation of the air-to-water volatilization factor was based on an EPA equation and on chemical-specific parameters (LANL 1993, 1055).

SALs are calculated using the most current chemical, route-specific toxicity values and default exposure parameters. They are based on average daily exposures that will not result in exceeded target risks or hazard values (i.e., a cancer risk of 1 in a million for all Class A and B carcinogens, a cancer risk of 1 in 100,000 for all Class C carcinogens, and a hazard index of 1 for noncarcinogens).

The additive effects of multiple constituents is similarly evaluated by adding the ratios of the SAL comparison values (maximum concentrations/SAL) for each constituent with a similar toxic end point (e.g., cancer, kidney effects, liver effects). If the total value is less than 1, the additive effects of multiple constituents are not considered to present a human health risk. If multiple constituents are detected and the sum of the SAL comparison ratios (maximum concentrations/SAL) is less than 1 (LANL 1993, 1171), then the cleanup standard will be met.

As mentioned previously, measured concentrations of COCs in the drainfield and in soil next to the tank are below SALs; therefore, no cleanup of those soils is proposed. The tank contents, which are considered to be hazardous waste, will be removed for proper disposal. Low quantities of residual waste could remain in the tank following pressure rinsing. However, because COC concentrations are below SALs, this residual material does not pose an unacceptable risk.

.0 EXPEDITED CLEANUP

3.1 Overview and Rationale

Analytical data, as discussed in Section 2.2, indicate that the septic tank contains hazardous waste. Sample results from boreholes adjacent to the septic tank walls indicate the tank is intact; no contaminants in these samples were detected at or above background levels. However, fractures in the tank or joint failures between the tank and inflow or outflow lines could develop, resulting in contamination to the surrounding soil material. Therefore, residual waste will be removed from the tank. The inside of the tank will be decontaminated. The waste removed from the tank and all decontamination fluids will be sampled and managed appropriately.

Analytical data for samples collected from drainfield soils and from underlying shallow groundwater indicate significant releases have not occurred. Therefore, the drainfield will be decommissioned in place without removal of any soil.

3.2 Permitting, Approval, and Notification Requirements

The Laboratory will be prepare and submit an excavation permit for execution of this plan.

Documentation will be prepared in accordance with Laboratory ER Administrative Procedure LANL-ER-AP-05.1, Readiness Review for Environmental Restoration Program Field Activities. Key documents to be prepared for this review include a SSHASP and a waste management checklist. The SSHASP will specify training requirements; all site workers must complete training prior to the implementation of this EC Plan.

3.2.1 Regulatory Notification/Permit Modifications

SWMU 18-003(e) is included in Table A of the Hazardous and Solid Waste Amendments module of the aboratory's RCRA permit. Implementation of this EC will require a Class III modification to the Laboratory's RCRA permit. EPA and the New Mexico Environment Department have been notified of this project, and a request for a permit modification has been submitted. Implementation of this EC Plan will proceed upon receipt of EPA approval.

3.2.2 DOE Approval

If the Laboratory intends to implement this EC prior to receiving EPA approval, DOE approval must be documented through receipt of the signed Field Work Approval Form (Annex 6.7).

3.3 Cleanup Activities

SWMU 18-003(e) is located within a secured area at TA-18; therefore, site preparation will be limited to scheduling for site access and establishing work zones. Initially, the overburden from the tank will be removed to expose the tank's central portal. The tank contents will be vacuum pumped from the central portal, if possible; otherwise, the activities will proceed to the removal of the tank's concrete lid and subsequent content removal. The contents have been adequately characterized during the RFI effort; however, pending requirements by the permitted disposal facility, a sample of the tank's contents will be collected and analyzed to establish the current waste characterization profile.

Once the tank's contents have been removed and contained, the tank interior will be washed using a pressure wash. The wash liquid will then be pumped from the tank and placed in containers. Air exhausted from the vacuum unit will be filtered in a manner consistent with health and safety requirements. The consolidated solid waste and the wash liquid will be disposed of in accordance with the waste management checklist. The septic tank will then be filled with concrete. After allowing the concrete to dry, the lid of the tank will be replaced and overburden reapplied to its original location.

3.4 Waste Management Issues

As indicated in Section 2.3, wastes in the septic tank should be classified as hazardous wastes. Waste generated during this EC Plan will be handled in accordance with the waste management checklist

3.4.1 Characterization of Materials for Disposal

Field screening of samples for radioactivity and organic vapors will be used to identify gross contamination. Previous analyses of the tank contents will be used to characterize the contents and associated wastewater, except as noted below. Characterization of PPE and other sampling wastes will be based on environmental sample analyses.

3.4.2 Treatment, Storage, and Disposal Plans

Wastes generated during the EC will generally be limited to liquids and sand (i.e., decontamination water, residual sand within the tank, and liquid waste from the tank cleaning). Because these wastes are from a single source area, the materials will be consolidated into one wastestream. Characterization of the wastestream prior to its consolidation may be necessary to ensure timely and economical disposal. Therefore, as concentrations of COCs are likely highest in the sand, a sample of these residuals will be obtained during the initial field activities. This sample will be analyzed for COCs as requested by the permitted transportation and disposal facilities.

Based on 1994 sample results, the projected classification of the consolidated wastestream will be as listed hazardous waste. Contractors, such as vacuum truck operators, and permitted disposal facilities can be readily obtained to handle listed waste. Transportation of the wastes to the permitted disposal facility by the selected subcontractor will be handled under appropriate manifests. Once at the disposal facility, the liquid waste may require treatment, such as stabilization.

3.5 Verification Plan

RFI sample results indicate the tank contents are hazardous waste. Samples collected from the periphery of the tank indicate the tank structure is intact and the surrounding soils pose no significant risk to human health or the environment. Analytical results from the drainfield reveal collection locations were within the septic leachfield and were significantly below SALs and/or background levels for all analytes. Therefore, as the contamination is limited to the tank's contents (which will be removed), no verification sampling is proposed.

3.6 Site Restoration Plan

Every attempt will be made to return the area to its preinvestigation condition. Excavated overburden will be compacted and the ground surface returned to its original condition.

3.7 Acceptance Inspection

The Laboratory proposes an Acceptance Inspection as the mechanism for DOE and EPA to assess that the Laboratory has implemented this EC Plan effectively. A minimum of 10 days' notification will be provided to the agencies before the start of field activities. At this time, a tentative date for the inspection will be agreed upon.

Field activities associated with this EC are not anticipated to generate waste other than construction debris and incidental administrative debris. If potentially contaminated waste is generated, it will be stored in a designated storage area pending laboratory analysis and/or field screening results and appropriately treated, stored, or disposed of.

An Acceptance Inspection Checklist will be used to document the scope of the inspection and will become part of the EC Final Report. The checklist and the timing of the inspection will be developed by the Laboratory and agreed to by the other agencies This inspection checklist will contain specific items, criteria, and requirements to be inspected that will constitute acceptance of remediation activities.

The Acceptance Inspection will be conducted by an independent professional skilled in the appropriate technical discipline. During the Acceptance Inspection, written resolution and an anticipated schedule for completion will be identified for any outstanding items and documented on the inspection checklist. The Laboratory Field Project Leader (FPL) or designee will be responsible for completing outstanding inspection items and documenting their resolution in the EC Final Report.

Upon completion of remediation activities, the Laboratory will submit a written certification to EPA Region 6, stating that the remedy has been completed in accordance with the EC Plan and Acceptance Inspection Checklist. The certification will be signed by the Laboratory and by the independent professional conducting the inspection. The certification will accompany the EC Final Report.

3.8 Final Report

Following the completion of all field activities, a final report will be prepared. A proposed outline for this report is presented as Annex 6.8.

4.0 PROJECT MANAGEMENT

Overall implementation of this expedited cleanup will be managed by Gene Gould, the FPL, supported by the ICF Kaiser Field Team Leader (FTL), a Field Technician, and a Site Safety Officer (SSO).

4.1 Staffing and Resource Requirements

Total anticipated costs for the EC is $56,560, as detailed below:

Prefield Activities		
Preparation of Waste Management Plan		$1,500
Preparation of Site Health and Safety Plan		5,600
Site Preparation/Subcontractor Scheduling/Preparation of Field Plan		8,400
Subtotal		$15,500
Field Activities		
Removal of tank's contents and pressure work		5,800
Disposal of tanks residuals and wastewater		
Filling of tank with concrete		3,000
Site restoration/reseeding		1,000
Equipment to be rented includes:		
Backhoe		500
Subtotal		$10,300
Personnel Costs		
ICF Kaiser FTL	$70/hr x 5 days	5,600
Site Health and Safety Officer	$70/hr x 5 days	5,600
LANL Field Supervisor	$70/hr x 5 days	5,600
Backhoe Operator	$60/hr x 2 days	960
		$17,760
Analytical Costs		
Equipment Rinsate/Waste Disposal Characterization (3 samples)		12,000
Subtotal		$12,000
Post-Field Activities		
Acceptance Inspection		500
Final report		500
Subtotal		$1,000
Total Estimated Cost		**$56,560**

'.2 Schedule

The proposed EC schedule is shown in Table 4-1. The submittal of this EC Plan to EPA in June 1995 will initiate the 60-day public review/comment period No sooner than 15 days after the start of this period, a public meeting will be held. Pre-field work activities and development of implementation plans will be conducted concurrent to the public review period. Should this proposed EC Plan be approved by the agencies and the public, implementation of the remaining EC activities will be initiated in August. Completion of field work and the Acceptance Inspection should be completed in July, and the final EC Report will be submitted by December, 1995

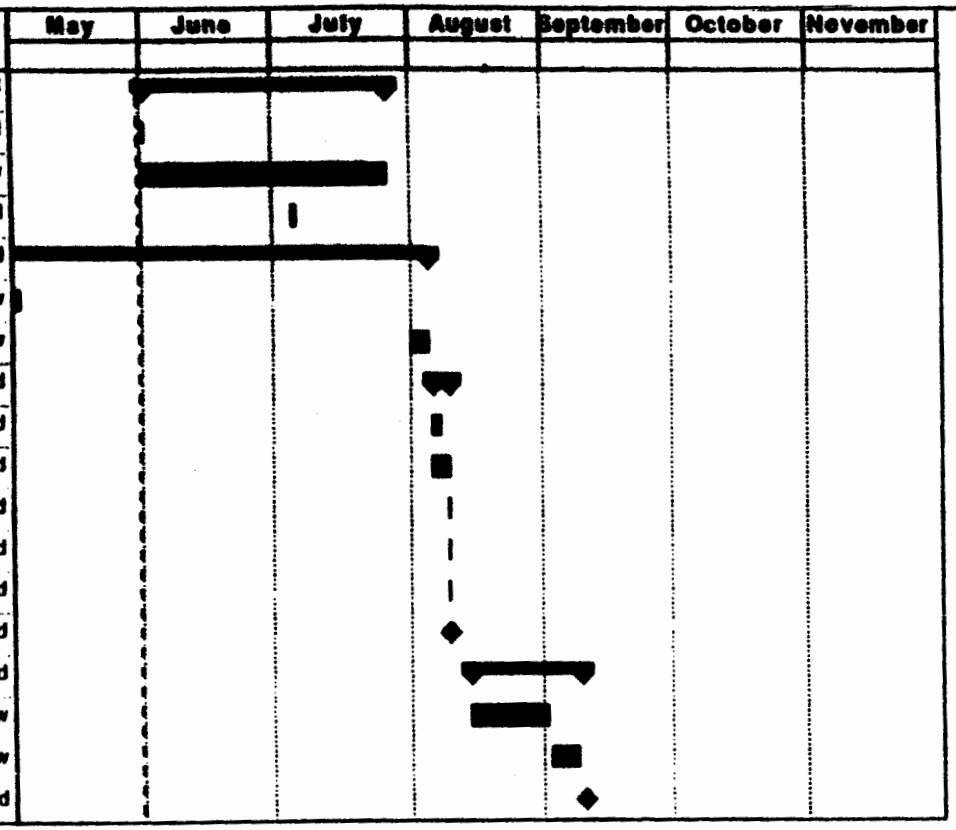
4.3 Stakeholder Notifications

Stakeholder notifications are an integral part of the procedure for conducting ECs. The ER Project office will notify state and local governments, external and internal stakeholders, and individuals on the ER Project mailing list of the availability of the EC Plan. The EC plan will be available to the stakeholders at the LANL Community Reading Room in Los Alamos; at the document repositories at the Los Alamos, Española, and Santa Fe public libraries; and at the San Ildefonso Pueblo Office of the Governor.

The submission of this EC Plan to EPA will trigger publication of a public notice indicating the start of the 60-day public comment period.

TABLE 4-1 PROPOSED SCHEDULE FOR SWMU 18-003(e)

ID	Name	Duration
1	1 PUBLIC ACCEPTANCE	55.38ed
2	1.1 SUBMIT EC PLAN TO EPA	1d
3	1.2 PUBLIC COMMENTS	8w
4	1.3 PUBLIC MEETINGS	1d
5	2 PLANNING	106.38ed
6	2.1 PREPARE HEALTH/SAFETY PLAN	2w
7	2.2 FIELD WORK PLANNING	1w
8	3 IMPLEMENT EXPEDITED CLEANUP	4.38ed
9	3.1 MOBILIZATION	1d
10	3.2 PERFORM CLEAN UP	3d
11	3.3 SITE RESTORATION	1d
12	3.4 INSPECTION & SUPERVISION	1d
13	3.5 DEMOBILIZATION	1d
14	3.6 COMPLETE EC	0d
15	4 ANALYSIS AND REPORT PREPARTION	26.38ed
16	4.1 SAMPLE ANALYSIS	3w
17	4.2 PREPARE FINAL REPORT	1w
18	4.3 SUBMIT REPORT	0d



Project: SWMU 36-003(a) schedul
Date: 5/31/95

Critical
Noncritical
Progress
Milestone
Summary

ICF KAISER ENGINEERS, INC.

5.0 REFERENCES

DOE (U.S. Department of Energy). 0264. October 1987. "Phase I: Installation Assessment, Los Alamos National Laboratory," Volumes 1 and 2. (draft). Comprehensive Environmental Assessment and Response Program, Albuquerque Operations Office. Albuquerque. New Mexico. (DOE 1987. 0264) (Title for Volume 2 not included).

EPA (US Environmental Protection Agency). July 27. 1990. "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," proposed rule. Title 40 Parts 264. 265. 270. and 271. Federal Register. Vol. 55.. pp. 30798-30884 (EPA 1990. 0432).

LANL (Los Alamos National Laboratory). November 1990. "Solid Waste Management Units Reports," Volumes I – IV. Los Alamos National Laboratory Report LA-UR-90-3400. prepared by International Technology Corporation under Contract Number 9-XS8-006R-2. Los Alamos. New Mexico (LANL 1990 0145).

LANL (Los Alamos National Laboratory). May 1993. "RFI Work Plan for Operable Unit 1093," Los Alamos National Laboratory Report LA-UR-93-422. Los Alamos. New Mexico (LANL 1993. 1085).

LANL (Los Alamos National Laboratory). November 1993. "Installation Work Plan for Environmental Restoration," Revision 3. Los Alamos National Laboratory Report LA-UR-93-3987. Los Alamos. New Mexico (LANL 1993. 1017).

LANL (Los Alamos National Laboratory) 1994. "Site Development Plan. Annual Update 1994," Los Alamos National Laboratory Publication LALP-94-21. Los Alamos. New Mexico. (LANL 1994. 1171)

LANL (Los Alamos National Laboratory) February 1995. "Installation on Work Plan for Environmental Restoration," Revision 4. Los Alamos National Laboratory Report LA-UR-95-740. Los Alamos. New Mexico. (LANL 1995. 1164).

6.0 ANNEXES

6.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

6.2 Quality Assurance Plan

See Quality Program Plan And Quality Assurance Project Plan For Environmental Restoration, last revision January 1993, Los Alamos National Laboratory, Los Alamos, New Mexico.

6.3 Health and Safety Plan

See Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Project Health and Safety Plan (HASP) (LANL, February 11, 1995).

6.4 Records Management Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter IV, Records Management Program Plan.

6.5 Public Involvement Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter V, Public Involvement Program Plan.

6.6 Field Work Approval Form

6.7 Proposed Outline for Expedited Cleanup Final Report

6.8 RFI Analytical Reports

IEX 6.6

FIELD WORK APPROVAL FORM

This form must be completed prior to starting site remediation field work in Expedited Cleanups that do not have an EPA-approved work plan.

I, _____, DOE-LAAO, **APPROVE** the field work as proposed in the accompanying Expedited Cleanup Plan (TA-18) for the decommissioning of SWMU 18-003(e) the inactive sewer line and drainfield.

I, _____, DOE-AL, **DO NOT APPROVE** the field work as proposed for SWMU 18-003(e) (TA-18) as described in the accompanying Expedited Cleanup Plan for the decommissioning of the inactive sewer line and drainfield.

The following reasons reflect the decision for disapproval:

Signed: _____ Date: _____

ANNEX 6.7

PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORTS

1.0 Summary of Expedited Cleanup

- 1.1 Overview
- 1.2 Expedited Cleanup

2.0 Site Restoration

3.0 Modifications to the EC Plan

4.0 Quantities and Types of Waste Generated

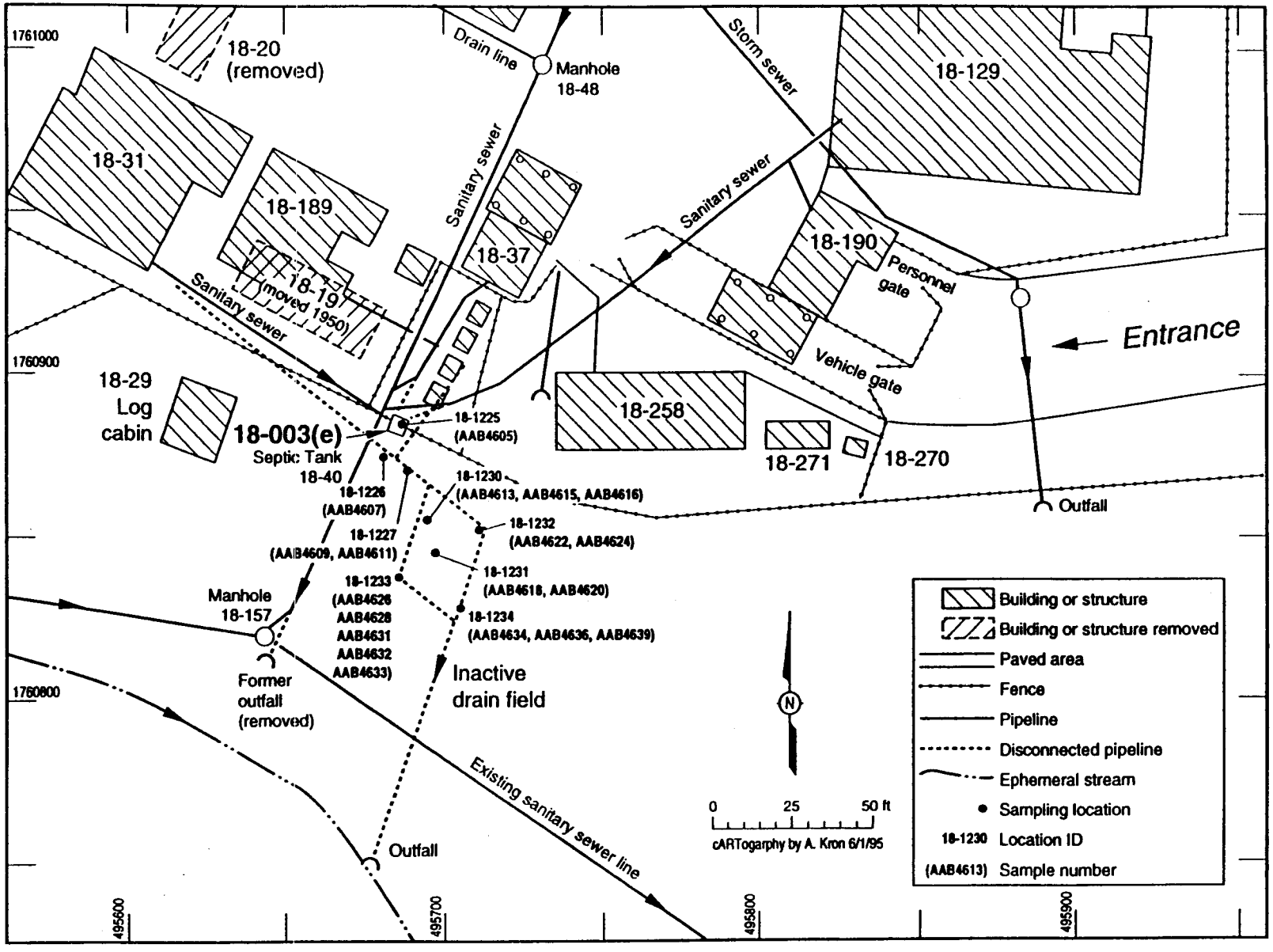
5.0 Outstanding Items from the Acceptance Inspection

6.0 Problems Encountered and Lessons Learned

APPENDIXES

- A Analytical Data
- B Acceptance Inspection Checklist
- C Wheelstream Inventory
- D Photographs
- E Certification of Completion

ANNEX 6.8
ANALYTICAL DATA FROM RFI AT SWMU 18-003(e)



Sampling locations for SWMU 18-003(e).

MEASURED CONCENTRATIONS OF COPCs FOR OU 1093

PRS	Sample Number	Location ID	Sample Type	Units	Metals	Nitrates/ Chlorides	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
Septic Tank	AAB4605	18-1225	Soil	mg/kg	1140 Aluminum (J)	None Detected		None Detected		~	40	58900
			2-4 ft	mg/kg	72.1 Barium					5600	40	1140
				mg/kg	9140 Calcium					~	1000	54400
				mg/kg	4.2 Chromium					400	10	34.2
				mg/kg	5840 Iron					~	20	35600
				mg/kg	2.1 Lead					400	0.6	39
				mg/kg	622 Magnesium					~	1000	16100
				mg/kg	107 Manganese					11000	3	1030
				mg/kg	13.2 Vanadium					560	10	66
				mg/kg	8.7 Zinc					24000	4	101
				mg/kg					.270 Acetone	8000	0.01	~
				mg/kg					.024 2-Butanone	4000	0.01	~
				mg/kg					.007 1,2-Dichloroethane	0.2	0.01	~
				mg/kg					.660 Cis1,2 -Dichloroethylene	~	0.01	~
				mg/kg					.200 Trichloroethene	1000	0.01	~
				pci/g			0.003 PU-239/240 TPU			18	~	0.052
				pci/g			0.006 PU-238 TPU			20	~	0.014
				ug/g			0.249 U (Total)			160	NA	2.09
Septic Tank	AAB4607	18-1226	Soil	mg/kg	3670 Aluminum(J)			None Detected	None Detected	~	40	58900
			0-5 ft	mg/kg	73.3 Barium					5600	40	1140
				mg/kg	2190 Calcium					~	1000	54400
				mg/kg	4.6 Chromium					400	10	34.2
				mg/kg	8.9 Copper					3000	5	15.7
				mg/kg	7470 Iron					~	20	35600
				mg/kg	23.8 Lead					400	0.6	39
				mg/kg	376 Manganese					11000	3	1030
				mg/kg	1410 Potassium					~	1000	6180
				mg/kg	76.9 Zinc					24000	4	101
				ug/g		15.5 Nitrates						
				ug/g		24.9 Chlorides						
				pci/g			28.14 K-40			~	~	36.1
				ug/g			1.53 U (Total)			160	~	2.09

Boldface values at or above SALs
(J) = Indicates estimated value
NA = Not Applicable; ~ = Not Avail
* =

MEASURED CONCENTRATIONS OF COPCs FOR OU 1093

PRS	Sample Number	Location ID	Sample Type	Units	Metals	Nitrates/ Chlorides	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
Septic Tank	AAB4609	18-1227	Soil	mg/kg	9390 Aluminum(J)			None Detected	None Detected	~	40	58900
			5-10 ft	mg/kg	1.3 Arsenic					~	2	11.6
				mg/kg	68.4 Barium					5600	40	1140
				mg/kg	1110 Calcium					~	1000	54400
				mg/kg	9.1 Chromium					400	10	34.2
				mg/kg	5.3 Copper					3000	5	15.7
				mg/kg	11300 Iron					~	20	35600
				mg/kg	5.8 Lead					400	0.6	39
				mg/kg	690 Magnesium					~	1000	16100
				mg/kg	240 Manganese					11000	3	1030
				mg/kg	7.6 Nickel					1600	8	26.7
				mg/kg	669 Potassium					~	1000	6180
				mg/kg	17.3 Vanadium					560	10	66
				mg/kg	5.8 Zinc					24000	4	101
				ug/g		2.65 Chlorides						
				pci/g			0.01 PU-239/240			18	~	0.052
				pci/g			0.006 PU-238 TPU			20	~	0.014
				ug/g			0.598 U (Total)			160	NA	2.09
Septic Tank	AAB4611	18-1227	Soil	mg/kg	4800 Aluminum (J)			None Detected	None Detected	~	40	58900
			0-5 ft	mg/kg	68.0 Barium					5600	40	1140
				mg/kg	1670 Calcium					~	1000	54400
				mg/kg	5.9 Chromium					400	10	34.2
				mg/kg	10.0 Copper					3000	5	15.7
				mg/kg	8180 Iron					~	20	35600
				mg/kg	19.5 Lead					400	0.6	39
				mg/kg	972 Magnesium					~	1000	16100
				mg/kg	299 Manganese					11000	3	1030
				mg/kg	997 Potassium					~	1000	6180
				mg/kg	10.8 Vanadium					560	10	66
				mg/kg	65.9 Zinc					24000	4	101
				ug/g		2.2 Nitrates						
				ug/g		2.84 Chlorides						
				pci/g			0.001 PU-239/240 TPU			18	~	0.052
				pci/g			0.004 PU-238 TPU			20	~	0.014
				ug/g			0.020 U (Total)			160	~	2.09

Boldface values at or above SALs
(J) = Indicates estimated value
NA = Not Applicable. ~ = Not Avail.
* =

MEASURED CONCENTRATIONS OF COPCs FOR OU 1093

PRS	Sample Number	Location ID	Sample Type	Units	Metals	Nitrates/ Chlorides	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
Drainfield	AAB4613	18-1230	Soil	mg/kg	2150 Aluminum(J)	None Detected		None Detected	None Detected	~	40	58900
			0-5 ft	mg/kg	1.5 Arsenic					~	2	11.6
				mg/kg	44.7 Barium					5600	40	1140
				mg/kg	851 Calcium					~	1000	54400
				mg/kg	2.5 Chromium					400	10	34.2
				mg/kg	2.9 Copper					3000	5	15.7
				mg/kg	5230 Iron					~	20	35600
				mg/kg	26.7 Lead					400	0.6	39
				mg/kg	275 Mangenese					11000	3	1030
				mg/kg	5.8 Vanadium					560	10	66
				mg/kg	25.1 Zinc					24000	4	101
				pci/g			0.0019 PU-238			20	~	0.014
				pci/g			0.0004 PU-239			18	~	0.052
				ug/g			1.02 U (Total)			160	~	2.09
Drainfield	AAB4615	18-1230	Soil	mg/kg	3240 Aluminum(J)			None Detected	None Detected	~	40	58900
			5-10 ft	mg/kg	1.3 Arsenic					~	2	11.6
				mg/kg	57.6 Barium					5600	40	1140
				mg/kg	790 Calcium					~	1000	54400
				mg/kg	3.7 Chromium					400	10	34.2
				mg/kg	3.0 Copper					3000	5	15.7
				mg/kg	6020 Iron					~	20	35600
				mg/kg	6.9 Lead					400	0.6	39
				mg/kg	231 Manganese					11000	3	1030
				mg/kg	10.4 Vanadium					560	10	66
				mg/kg	21.3 Zinc					24000	4	101
				ug/g		2.72 Chlorides						
				pci/g			0.0019 PU-238			20	~	0.014
				pci/g			0.9771 RA-226			5	~	~
				ug/g			1.18 U (Total)			160	~	2.09
Drainfield	AAB4616	18-1230	Soil	mg/kg	3230 Aluminum (J)			None Detected		~	40	58900
			5-10 ft	mg/kg	41.3 Barium					5600	40	1140
				mg/kg	712 Calcium					~	1000	54000
				mg/kg	3.8 Chromium					400	10	34.2
				mg/kg	3.2 Copper					3000	5	15.7
				mg/kg	6400 Iron					~	20	35600
				mg/kg	3.7 Lead					400	0.6	39
				mg/kg	217 Manganese					11000	3	1030
				mg/kg	8.2 Vanadium					560	10	66
				mg/kg	27.4 Zinc					24000	4	101
				ug/g		2.78 Chlorides						
				pci/g			0.0003 PU-238			20	~	0.014
				pci/g			0.0005 PU-239			18	~	0.052
				ug/g			1.16 U (Total)			160	~	2.09
				mg/kg					.038 Acetone	8000	0.01	~

Boldface values at or above SALs
(J) = Indicates estimated value
NA = Not Applicable, ~ = Not Avail
* =

MEASURED CONCENTRATIONS OF COPCs FOR OU 1093

PRS	Sample Number	Location ID	Sample Type	Units	Metals	Nitrates/ Chlorides	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
Drainfield	AAB4618	18-1231	Soil	mg/kg	3240 Aluminum(J)			None Detected		~	40	58900
			0-5 ft	mg/kg	1.5 Arsenic					~	2	11.6
				mg/kg	63.8 Barium					5600	40	1140
				mg/kg	1360 Calcium					~	1000	54400
				mg/kg	3.8 Chromium					400	10	34.2
				mg/kg	16.7 Copper					3000	5	15.7
				mg/kg	10500 Iron					~	20	35600
				mg/kg	56.2 Lead					400	0.6	39
				mg/kg	586 Magnesium					~	1000	16100
				mg/kg	391 Manganese					11000	3	1030
				mg/kg	4.1 Nickel					1600	8	26.7
				mg/kg	684 Potassium					~	1000	6180
				mg/kg	8.6 Vanadium					560	10	66
				mg/kg	45 Zinc					24000	4	101
				ug/g		6.76 Chlorides						
				pci/g			0.0071 PU-238			20	~	0.014
				pci/g			0.0059 PU-239			18	~	0.052
				ug/g			2.09 U (Total)			160	~	2.09
				mg/kg					0.20 Trichloroethene (J)			
Drainfield	AAB4620	18-1231	Soil	mg/kg	2530 Aluminum(J)			None Detected		~	40	58900
			5-10 ft	mg/kg	1.3 Arsenic					~	2	11.6
				mg/kg	33.0 Barium					5600	40	1140
				mg/kg	762 Calcium					~	1000	54400
				mg/kg	4.0 Chromium					400	10	34.2
				mg/kg	2.6 Copper					3000	5	15.7
				mg/kg	5910 Iron					~	20	35600
				mg/kg	7.9 Lead					400	0.6	39
				mg/kg	206 Manganese					11000	3	1030
				mg/kg	7.3 Vanadium					560	10	66
				mg/kg	23.3 Zinc					24000	4	101
				ug/g		4.28 Chlorides						
				pci/g			0.0018 PU-238			20	~	0.014
				pci/g			0.001 PU-239			18	~	0.052
				ug/g			1.58 U (Total)			160	~	2.09
				mg/kg					.026 Acetone	8000	0.01	~

Boldface values at or above SALs
(J) = Indicates estimated value
NA = Not Applicable, ~ = Not Avail
* =

MEASURED CONCENTRATIONS OF COPCs FOR OU 1093

PRS	Sample Number	Location ID	Sample Type	Units	Metals	Nitrates/ Chlorides	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
Drainfield	AAB4622	18-1232	Soil	mg/kg	1990 Aluminum(J)			None Detected		~	40	58900
			0-5 ft	mg/kg	1.1 Arsenic					~	2	11.6
				mg/kg	59.0 Barium					5600	40	1140
				mg/kg	1170 Calcium					~	1000	54400
				mg/kg	2.2 Chromium					400	10	34.2
				mg/kg	104 Copper					3000	5	15.7
				mg/kg	4760 Iron					~	20	35600
				mg/kg	50.3 Lead					400	0.6	39
				mg/kg	545 Potassium					~	1000	6180
				mg/kg	7 Vanadium					560	10	66
				mg/kg	34.3 Zinc					24000	4	101
				ug/g		3.31 Nitrates						
				ug/g		16.4 Chlorides						
				pci/g			0.0013 PU-238			20	~	0.014
				pci/g			0.0023 PU-239			18	~	0.052
				ug/g			1.82 U (Total)			160	~	2.09
				mg/kg					.029 Acetone	8000	0.01	~
Drainfield	AAB4624	18-1232	Soil	mg/kg	5460 Aluminum(J)					~	40	58900
			5-10 ft	mg/kg	1.9 Arsenic					~	2	11.6
				mg/kg	52.3 Barium					5600	40	1140
				mg/kg	671 Calcium					~	1000	54400
				mg/kg	3.3 Chromium					400	10	34.2
				mg/kg	7770 Iron					~	20	35600
				mg/kg	9.4 Lead					400	0.6	39
				mg/kg	293 Manganese							
				mg/kg	10.6 Vanadium					560	10	66
				mg/kg	32 Zinc					24000	4	101
				ug/g		9.49 Chlorides						
				pci/g			0.0021 PU-238			20	~	0.014
				pci/g			0.0033 PU-239			18	~	0.052
				ug/g			1.18 U (Total)			160	~	2.09
				mg/kg				6.3 Diethylphthalate		64000	0.33	~
				mg/kg					.029 Acetone	8000	0.01	~
Drainfield	AAB4626	18-1233	Soil	pci/g	~	~	0.01 PU-238			20	~	0.014
			0-5 ft	pci/g								
Drainfield	AAB4628	18-1233	Soil	pci/g	~	~		~	None Detected	5600	40	1140
			5-10 ft	pci/g						4	~	1
				pci/g						~	~	~
				pci/g						~	~	~
				pci/g			0.03 PU-238			20	~	0.014
				pci/g			0.01 PU-239			18	~	0.052

Boldface values at or above SALs
(J) = Indicates estimated value
NA = Not Applicable, ~ = Not Avail
* =

MEASURED CONCENTRATIONS OF COPCs FOR OU 1093

PRS	Sample Number	Location ID	Sample Type	Units	Metals	Nitrates/ Chlorides	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
Drainfield	AAB4631	18-1233	Water	ug/L	4830 Aluminum(J)		None Detected	None Detected	None Detected	~	40	58900
				ug/L	18500 Calcium					~	1000	54400
				ug/L	3030 Iron					~	20	35600
				ug/L	6.9 Lead					400	0.6	39
				ug/L	5440 Magnesium					~	1000	16100
				ug/L	538 Manganese					11000	3	1030
				ug/L	6840 Potassium					~	1000	6180
				ug/L	23,600 Sodium					~	1000	1880
				ug/L	111 Zinc					24000	4	101
				ug/L		1280 Nitrates						
				ug/L		20.1 Chlorides						
Drainfield	AAB4632	18-1233	Water	ug/L	13.3 Lead	None Detected		~	~	400	0.6	39
				ug/L	44.2 Zinc					24000	1000	1880
				ug/L			0.0311 PU-238			20	~	0.014
Drainfield	AAB4633	18-1233	Water	ug/L	72.9 Zinc	None Detected		~	~	24000	0.6	39
				ug/L			0.145 PU-238			20	~	0.014
				ug/L			0.0961 PU-239			18	~	0.052
Drainfield	AAB4634	18-1234	Soil	mg/kg	2280 Aluminum(J)			~		~	40	58900
			0-5 ft	mg/kg	1.1 Arsenic					~	2	11.6
				mg/kg	48.4 Barium					5600	40	1140
				mg/kg	1210 Calcium					~	1000	54400
				mg/kg	4.2 Chromium					400	10	34.2
				mg/kg	19.1 Copper					3000	5	15.7
				mg/kg	6480 Iron					~	20	35600
				mg/kg	25.5 Lead					400	0.6	39
				mg/kg	275 Manganese					11000	3	1030
				mg/kg	599 Potassium					~	1000	6180
				mg/kg	7.1 Vanadium					560	10	66
				mg/kg	37 Zinc					24000	4	101
				ug/g		3.06 Chlorides						
				pci/g						~	~	36.1
				pci/g						~	~	~
				pci/g						~	~	~
				pci/g			0.0022 PU-239			18	~	0.052
				ug/g			2.43 U (Total)			160	~	2.09
				mg/kg					.031 Acetone	8000	0.01	~

Boldface values at or above SALs
(J) = Indicates estimated value
NA = Not Applicable, ~ = Not Avail
* =

MEASURED CONCENTRATIONS OF COPCs FOR OU 1093

PRS	Sample Number	Location ID	Sample Type	Units	Metals	Nitrates/ Chlorides	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
Drainfield	AAB4636	18-1234	Soil	mg/kg	2710 Aluminum(J)			None Detected		~	40	58900
			5-10 ft	mg/kg	1.2 Arsenic					~	2	11.6
				mg/kg	52.9 Barium					5600	40	1140
				mg/kg	968 Calcium					~	1000	54400
				mg/kg	16 Chromium					400	10	34.2
				mg/kg	9.4 Copper					3000	5	15.7
				mg/kg	6700 Iron					~	20	35600
				mg/kg	11 Lead					400	0.6	39
				mg/kg	294 Manganese					11000	3	1030
				mg/kg	5.4 Nickel					1600	8	26.7
				mg/kg	8.1 Vanadium					560	10	66
				mg/kg	27.3 Zinc					24000	4	101
				ug/g		5.16 Chlorides						
				pci/g						~	~	36.1
				pci/g						~	~	~
				pci/g						~	~	~
				pci/g			0.0023 PU-238			20	~	0.014
				pci/g			0.005 PU-239			18	~	0.052
				pci/g						~	~	~
				ug/g			2.15 U (Total)			160	~	2.09
				mg/kg					.041 Acetone	8000	0.01	~
Drainfield	AAB4639	18-1234	Water	ug/L	1590 Aluminum(J)			None Detected	None Detected	~	40	58900
				ug/L	2190 Calcium					~	1000	54400
				ug/L	1090 Iron					~	20	35600
				ug/L	4.1 Lead					400	0.6	39
				ug/L	5670 Magnesium					~	1000	16100
				ug/L	194 Manganese					11000	3	1030
				ug/L	20,500 Sodium					~	1000	1880
				ug/L	238 Zinc					24000	4	101
				ug/L		944 Nitrates						
				ug/L		28.2 Chlorides						
				pci/L			0.0917 PU-239			18	~	0.052
Background	AAB2435	18-1060	Soil	ug/g		<1.04 Cl						
Well BG1			2-4 ft	ug/g		2.38 N03						
Background	AAB2437	18-1060	Soil	ug/g		1.83 Cl						
Well BG1			7-9 ft	ug/g		<1.06 N02/N03						
Background	AAB2439	18-1060	Soil	ug/g		4.68 Cl						
Well BG1			12-14 ft	ug/g		<1.12 N02/N03						
Background	AAB2442	18-1060	Water	ug/L		15.5 mg/L Cl						
Well BG1				ug/L		99.7 ug/L N02/N03						

Boldface values at or above SALs
(J) = Indicates estimated value
NA = Not Applicable; ~ = Not Avail
* =

MEASURED CONCENTRATION[illegible] COPCs FOR OU 1093

PRS	Sample Number	Location ID	Sample Type	Units	Metals	Nitrates/ Chlorides	Radionuclides	SVOCs	VOCs	SALs	CRQLs	Background
Background	AAB2443	18-1063	Soil	ug/g		<2.59 Cl						
Well BG2			2-4 ft	ug/g		1.02 N03						
Background	AAB2445	18-1063	Soil	ug/g		19.8 Cl						
Well BG2			7-9 ft	ug/g		10.3 N03						
Background	AAB2447	18-1063	Soil	ug/g		16.8 Cl						
Well BG2			12-14 ft	ug/g		13.7 N03						
Background	AAB2450	18-1063	Water	ug/L		24.2 mg/L Cl						
Well BG2				ug/L		<5 ug/L N03						

Boldface values at or above SALs
(J) = Indicates estimated value
NA = Not Applicable · = Not Avail
* =

Los Alamos National Laboratory
Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 36-003(a)

June 1995
Revision 0

Environmental
Restoration

ACRONYMS

AOC	area of concern
AP	Administrative Procedure
CEARP	Comprehensive Environmental Assessment and Response Program
COC	chemical of concern
COPC	chemical of potential concern
CST	Chemical Science and Technology (Division)
CST-3	Analytical Services (Group)
DOE	U.S. Department of Energy
EC	expedited cleanup
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FPL	Field Project Leader
FTL	Field Team Leader
HSWA	Hazardous and Solid Waste Amendments
LANL, the Laboratory	Los Alamos National Laboratory
PPE	personal protective equipment
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
VOC	volatile organic compound

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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan is for Solid Waste Management Unit (SWMU) 36-003(a), located within the central portion of the Los Alamos National Laboratory (the Laboratory), Los Alamos, New Mexico (Figure 1-1). This EC Plan is being proposed as a part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in the RFI Work Plan for Operable Unit 1130 (LANL 1993, 1088).

SWMU 36-003(a) is included in Table A of the original Hazardous and Solid Waste Amendments (HSWA) module to the Laboratory's RCRA permit.

SWMU 36-003(a) consists of an inactive septic tank, a drainfield, and a seepage pit. The system was in use from 1949 to 1992. Photochemical wastes as well as sanitary wastes were routinely discharged to the system. Analytical results from the RFI sampling effort indicate the septic tank contains elevated levels of metals. Constituents detected within the associated drainfield and seepage pit are significantly below screening action levels (SAL). These data indicate that the contents of the tank should be classified as RCRA hazardous waste and should be removed from the tank for proper disposal. The drainfield will be decommissioned in place without further action.

Activities comprising this EC Plan include verification sampling outside the tank to ensure contamination is confined to the interior of the septic tank, removal of the septic tank contents, and cleaning of the interior of the tank. The contents of the tank will be disposed of at a permitted facility and the site restored to its previous condition.

This EC Plan identifies the level of effort required from initial transmittal of the plan to the U.S. Environmental Protection Agency (EPA) for review, through implementation, to the completion of the final project report. In the development of this EC Plan, the following assumptions are made:

- Land use at the location of this SWMU will continue to be for industrial purposes.
- There will be minimal delays in EC operations resulting from inclement weather, site access delays, and firing schedule delays. Delays that may result from the acquisition and scheduling of heavy equipment and from accepting waste at permitted disposal facilities cannot be anticipated and therefore are not considered within this plan.
- The site-specific health and safety plan (SSHASP) will be developed specifically to address chemicals of concern (COC) identified in this EC Plan. Deviations from these anticipated concentrations of COCs may necessitate adjustments to that plan.
- Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC Plan.

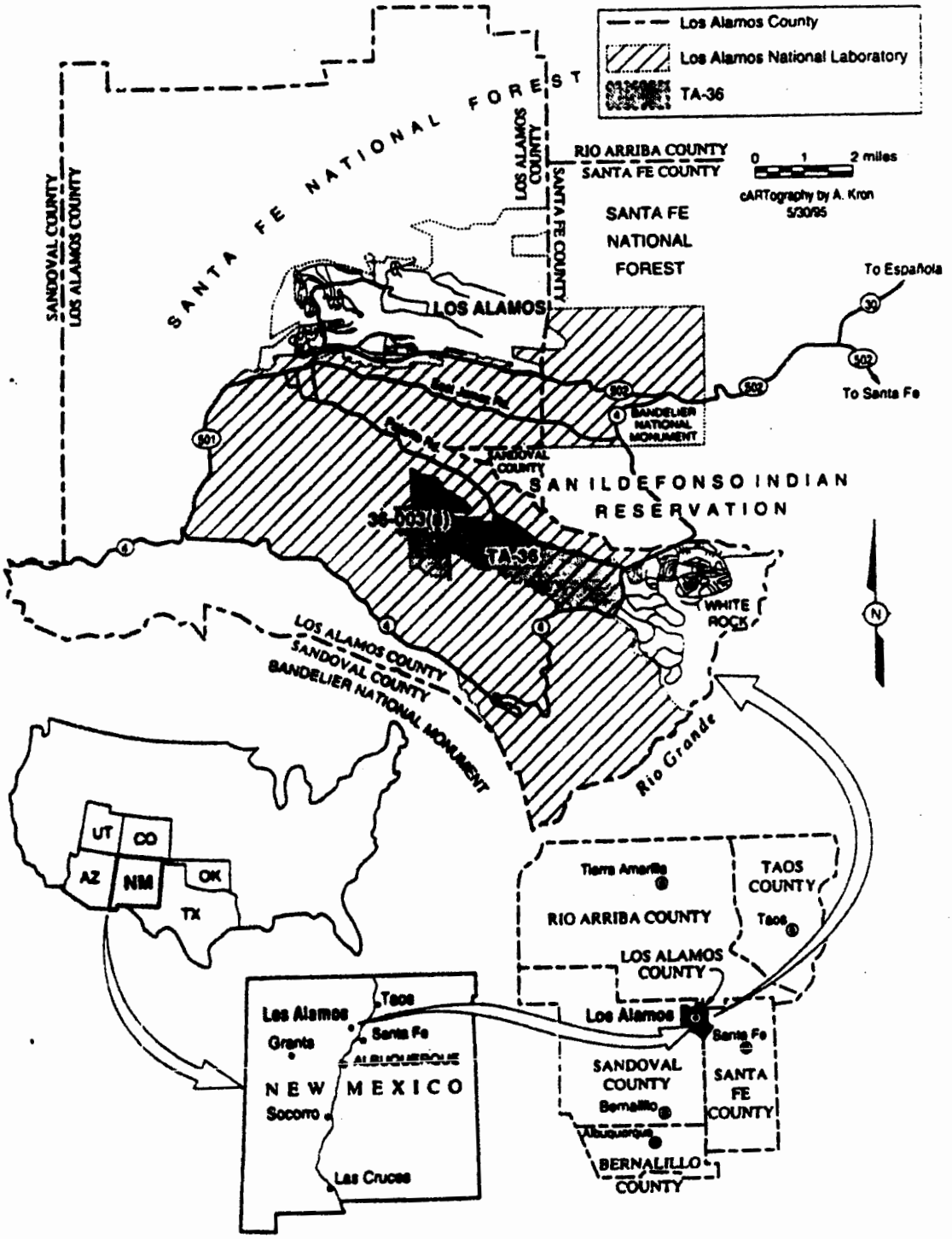


Figure 1-1. Regional location map.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Detailed Description of SWMU 36-003(a)

SWMU 36-003(a), a septic system, is located at TA-36 in the east-central part of the Laboratory (Figure 2-1). The septic system includes two manholes affiliated with the inlet line from TA-36-1 (Figure 2-2). The site is situated approximately 115 ft east of the northeast corner of TA-36-1. The septic tank, which is approximately 9 ft by 5.5 ft by 7 3 ft, and drainfield are located on a mesa an estimated 50 ft south of the southern rim of Threemile Canyon.

The system consists of a 1,160-gal. precast reinforced concrete tank, a distribution box, and a seepage pit. Two vent caps, each protruding 6 in. above the ground, mark the exact location of the tank. The septic tank is buried approximately 1.5 ft below ground surface. An entrance portal is centered between the vents approximately 1.5 ft below grade. A single inlet pipe is located on the western wall of the tank; the outlet pipe is located on the eastern wall. The outlet pipe leads to the concrete distribution box, which measures approximately 2 ft by 2 ft by 2 ft.

During 1973 and 1974, this line was abandoned and its effluent rerouted to an adjacent cylindrical seepage pit. This gravel-filled seepage pit is an estimated 50 ft deep and 4 ft in diameter. A 4-in. diameter drain line extends into and within 2 ft of the pit's base.

2.1.1 Operational History

SWMU 36-003(a) was in use from 1949 to 1992 and served the TA-36-1 offices/laboratory and the TA-36-22 main guard station. Until 1990 or 1991, the septic system received photochemical wastes and sanitary wastes; the system is presently inactive. In 1973 or early 1974, the drainfield was disconnected as a result of the increased use. In 1988, TA-36-22 was disconnected from this septic tank and connected to septic tank TA-36-100. In late 1992, the line from TA-36-1 was disconnected and rerouted to the Laboratory's sanitary waste line.

2.1.2 Physical Setting

SWMU 36-003(a) lies entirely on U.S. Department of Energy (DOE)-owned land on a mesa top south of Threemile Canyon. The area is removed from any public access roads.

The prevalent soil type on the mesa top is the moderately deep (20 to 40 in.) and well-drained Nyjack Loam. Pleistocene ash flows of the Bandelier Tuff directly underlie the soil. The tuff is moderately welded to nonwelded in the area of the septic system. Because the site is situated on a mesa, the existence of shallow aquifers in the area is unlikely. The depth to the main aquifer is estimated at 875 to 1,100 ft below ground surface.

Surface-water runoff from the site flows to ephemeral streams in the adjacent Threemile Canyon, which then discharges to an ephemeral stream in Pajarito Canyon.

2.2 Summary of Investigations

2.2.1 Investigations Prior to the RFI

No information is available regarding any sampling investigations of SWMU 36-003(a) prior to the RFI. The location and potential chemicals of potential concern (COPC) at this site were noted in

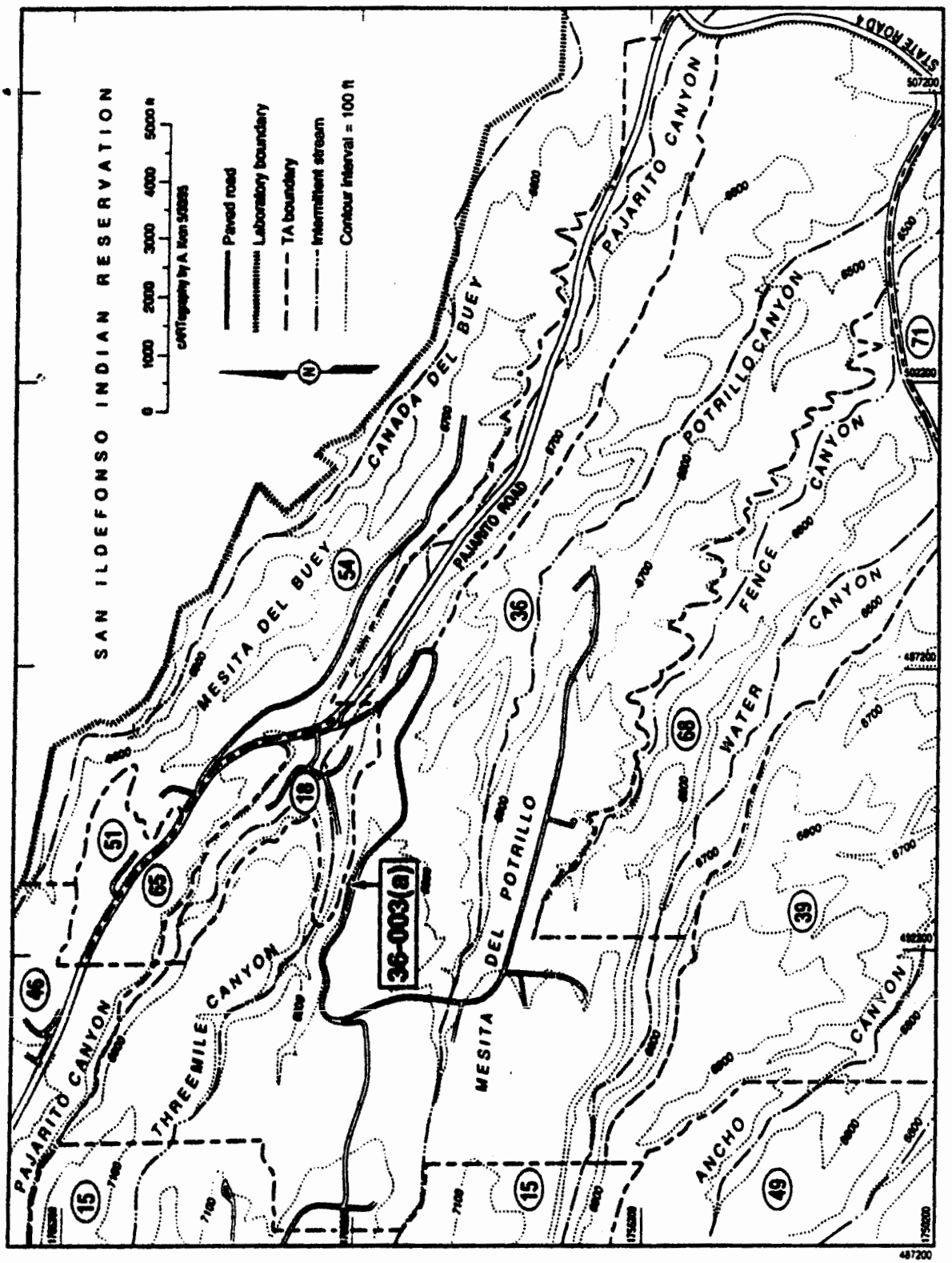


Figure 2-1. Location of SWMU 36-003(a).

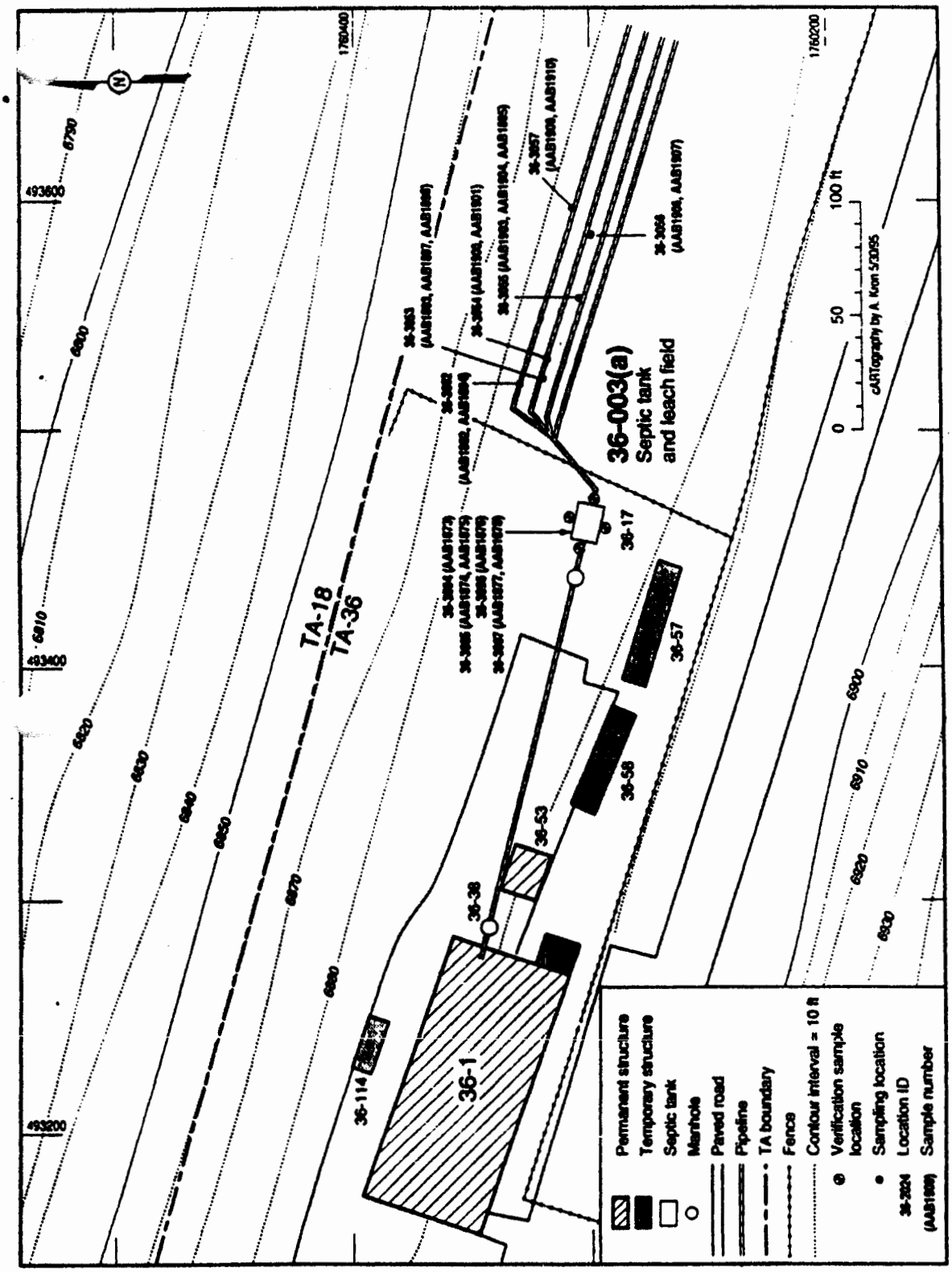


Figure 2-2. Septic system SWMU 36-003(a) site sketch.

the 1987 Comprehensive Environmental Assessment and Response Program (CEARP) Report (DOE 1987, 0264) and the 1990 Solid Waste Management Units Report (LANL 1990, 0145). A review of past operations in buildings served by the septic system led to the development of a list of COPCs. These COPCs, which are derived primarily from spent photochemicals from the x-ray developing process that operated in the served buildings, include thiosulfates, silver cyanides, and organic compounds.

2.2.2 RCRA Facility Investigation

During August 1994, multimedia samples were collected from the septic tank and associated drainfield to ascertain the potential effect of the inactive septic system on public health and the environment. The effort is summarized below.

Septic Tank. Six samples of the tank's contents were obtained. Both the liquid and sludge phases from within the septic tank were sampled and analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), RCRA metals (total), and cyanide. A gross alpha/beta/gamma screening was also performed. Results indicate the following:

- The tank contents contain elevated levels of metals. SALs (for either soils or water) were exceeded for barium, cadmium, lead, mercury, and silver. Maximum values for these metals of concern (in µg/L) are barium (3,350), cadmium (30), lead (290), mercury (66.4), and silver (18,300).

  The concentration of silver qualifies the liquid and sludge in the tank as a D-listed hazardous waste, in that this concentration indicates that it is highly likely the waste exceeds the Toxicity Characteristic and Leaching Procedure (TCLP) regulatory level (40 CFR 261.24).

- The VOC analysis revealed slightly elevated concentrations. These contaminant levels, which are significantly below SALs, do not pose an unacceptable risk to human health or the environment. The maximum values of these reported constituents (in µg/L) are 2-butanone (49), carbon disulfide (210), chlorobenzene(6), chloromethane (13), and p-dichlorobenzene (44).

  The presence of chlorobenzene and carbon disulfide qualify the tank contents as an F-listed hazardous waste.

- Detected SVOC results were all below background levels. Reported levels of cyanide are less than SALs.

Drainfield/Seepage Pit. Approximately 14 samples were collected from the septic drainfield. The seepage pit, used until 1972 (when the drainfield was put in place), was not sampled. If levels of COPCs had been detected above SALs in the drainfield, the seepage pit would have been sampled as part of a Phase II investigation. Samples were obtained from the base of the vitrified clay pipes. This location coincides with the contact between the soil and Bandelier Tuff. Additional subsurface soil samples were obtained from 2 ft within the tuff. The samples were analyzed for VOCs, SVOCs, RCRA metals, and cyanide. A gross alpha/beta/gamma screening was also performed. A preliminary review of the available data indicates the following:

- The drainfield constituents were below detection level for VOC analytes with the
- exception of methylene chloride, which is considered a laboratory contaminant.

- The SVOC analysis contain slightly elevated concentrations of di-n-butylphthalate and bis(2-ethylhexyl)phthalate. These compounds are considered common laboratory or plastic contaminants.

- Levels of cyanide were either below detection limits or significantly below SALs.

- Reported levels of metal constituents were below detection limits or below SALs.

2.2.3 Evaluation of the Results

Based on preliminary review of the data, the contents of the septic tank are classified as D-listed (toxic) waste because of the presence of silver. The contents also fall into the F-listed category (hazardous waste) because of the presence of carbon disulfide and chlorobenzene. In addition, concentrations of other metals in the waste at concentrations above SALs suggest a need to remediate the tank contents. However, reported concentrations of PCOCs in the drainfield were below SALs, so no remediation is proposed for this area.

2.3 Types and Volumes of Waste

The nature of the wastes expected to be generated by the proposed cleanup is presented in Table 2-1. As indicated above, constituents detected in the septic drainfield are significantly below SALs. This EC Plan proposes that the drainfield area be decommissioned in place; therefore, no waste generation will be associated with this area.

The tank liquid and sludge samples revealed elevated levels of metals. These concentrations are such that the material would fail TCLP criteria and thus be classified as EPA hazardous waste (40 CFR 261.24). In addition to the existing material in the tank, potentially contaminated water will be generated during the washing of the tank interior following the removal of the existing sludge. As described in Section 3.3, the tank contents and washwater will be pumped into containers to be handled by an approved waste facility. Treatment or stabilization of the residuals by the waste facility may be necessary before its disposal. The specific nature of this stabilization will be determined by the disposal facility.

Verification sampling will be performed as described in Section 3.5. Although soil cuttings will be segregated and returned to their respective boreholes, a small volume of solid and liquid wastes will be generated by the sampling activity. Waste associated with this effort include disposable sampling equipment and decontamination water. These materials will be handled in accordance with the task- specific waste management checklist and treated as potentially hazardous waste pending characterization.

TABLE 2-1
ANTICIPATED WASTE VOLUMES

Item	Type	Anticipated Volume
Sampling waste	solid - potential hazardous	5 gal.
Decontamination waste	water - potential hazardous	300 gal.
Tank contents	sludge/liquid - hazardous	500 gal.

2.4 Potential Impacts on Public Health and the Environment

Receptors of possible contaminants include animals and humans. Potential exposure routes of receptors include the following:

- Inhalation (especially when the facility is disturbed)
- Ingestion (in particular, receptors living onsite may be exposed by eating plants growing in soil contaminated by releases from the tank)
- Skin contact with contaminated soils or sediments

2.4.1 Potential Pathways

2.4.1.1 SWMU - In Place

The only source from which contaminants could migrate is the septic tank and its contents (Figure 2-3). Available analytical results from the drainfield indicate that soils from this area do not serve as a potential source area for contaminant migration. Therefore, the primary source area for COC migration is via residuals within the septic tank. Although a significant release of contaminants from the septic system was not detected during the RFI effort, possible future releases of the COCs to the environment via septic tank leaks or movement of residuals through the drain lines may occur if the contents remain in place.

Should releases occur, the primary mode for COC migration is via subsurface soils. Because the tuff is less permeable than the overlying soil, the interface serves as a preferential subsurface pathway. Thus, the most likely subsurface migration scenario has COCs moving along the soil/tuff interface toward the Threemile Canyon floor. Release to the surface could also occur along this pathway where the Bandelier Tuff is exposed along the steep canyon walls. Minor migration pathways through surface-water runoff and wind mechanisms could then develop.

2.4.1.2 SWMU - Remediation

IEC activities to be performed at SWMU 36-003(a) include removing the septic tank's contents and washing its interior, filling the excavated tank with concrete, and subsurface drilling associated with the verification sampling. These tasks may present additional temporary potential pathways for contaminant migration as a result of the increased surface exposure of contaminated soil, sludges, and liquids.

The primary pathways associated with these activities are wind dispersion and surface-water runoff. To minimize the potential for surface-water runoff, tank residuals will be pumped directly into drums, thus reducing the risk of spills to surrounding soils. The interior tank wash spray will be directed downward into the tank rather than up into the air and surrounding soils. Soil cuttings generated during the verification sampling will be field monitored for organic vapors and radioactive constituents. These cuttings will be returned to their respective boreholes. Should field screenings indicate potential contamination, the soil will be placed in containers and disposed of in accordance with the site-specific waste management checklist.

2.4.2 Future Land Use

SWMU 36-003(a) lies entirely on DOE-owned land on a mesa top north of Potrillo Canyon. The area is removed from any public access roads. In the foreseeable future, the land is anticipated to be used exclusively for Laboratory industrial operations.

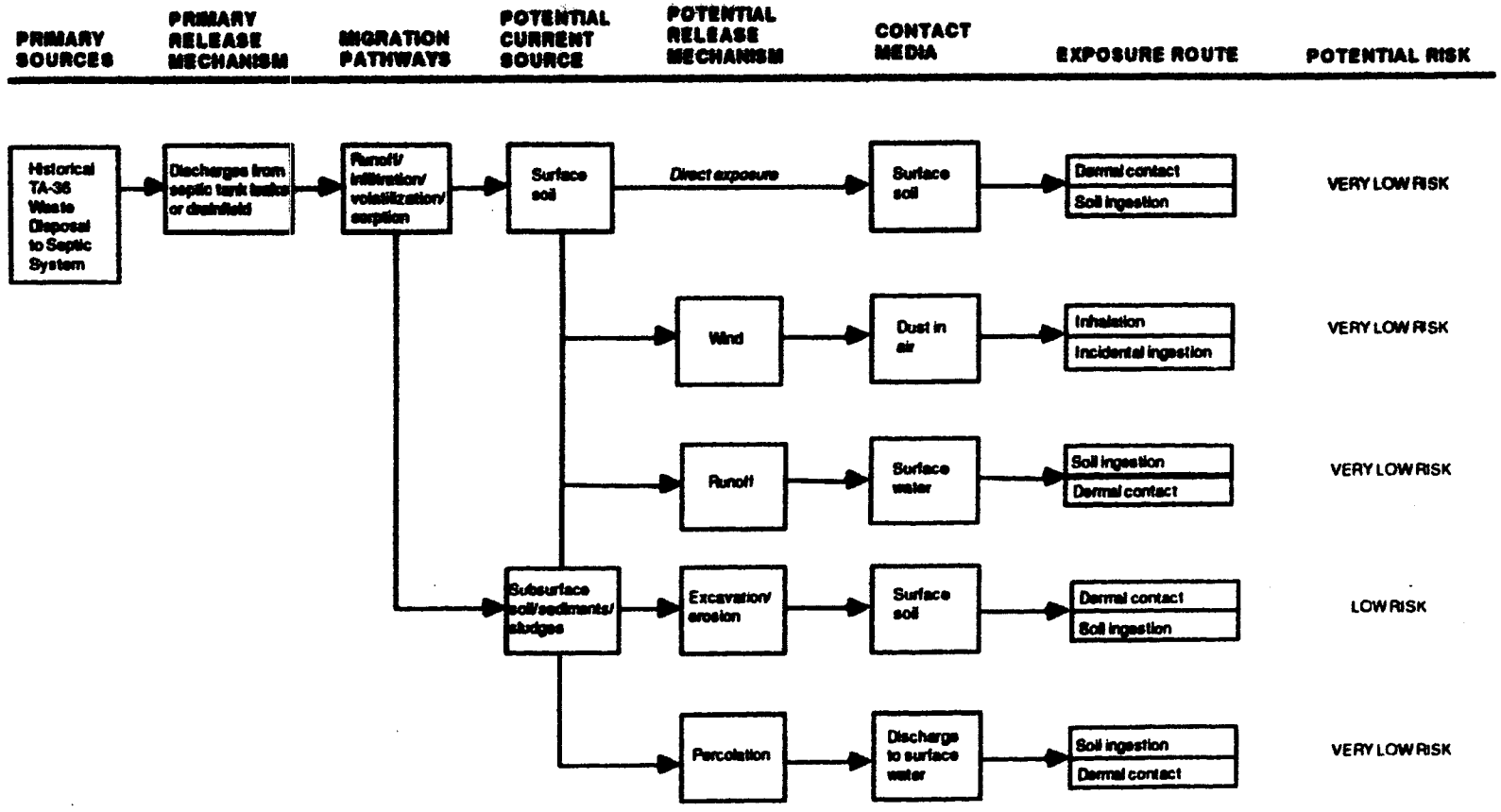


Figure 2-3. Conceptual exposure model for SWMU 36-003(a)

2.4.3 Cleanup Levels

The initial site assessment consisted of a comparison of measured concentrations with SALs. SALs are risk-based, media-specific action levels with which the maximum concentrations of an [illegible] compared to determine whether further evaluation of potential contamination is [illegible] (EPA, 1991, 1088). SALs are based on regulatory levels (e.g., maximum contaminant [illegible]) and calculated using a risk-based methodology described in the proposed RCRA [illegible] Corrective Action for Solid Waste Management Units (EPA 1990, 0432) assuming [illegible]. An additional conservative modification of the Subpart S methodology was [illegible] exposure to VOCs volatilizing from water or soil. Calculation of the [illegible] factor was based on an equation given by EPA and on chemical-[illegible] (EPA, 1993, 1088).

SALs are calculated using the most current route-specific chemical toxicity values and default [illegible]. They are based on average daily exposures that will not result in exceeded [illegible] hazard values (i.e., a cancer risk of 1 in a million for all Class A and B carcinogens, 1 in [illegible] Class C carcinogens, and a hazard index of 1 for noncarcinogens).

As [illegible] Section 2.1.2, the anticipated future use of this site is for industrial purposes. [illegible] industrial use are greater than SALs. Cleanup levels for the individual [illegible] using the methodology presented in Annex 6.6. These cleanup [illegible] adjacent to the septic tank, should verification sampling reveal the [illegible] VOCs. If more than one COC is detected, a multiconstituent analysis will be [illegible] cleanup levels for multiple constituents. The proposed cleanup level for [illegible] contaminant at this site, is 2,000 mg/kg.

3.0 EXPEDITED CLEANUP

3.1 Overview And Rationale

Preliminary analytical results indicate that the septic tank contents are hazardous waste. Using a conservative risk-based screening assessment, the contaminant concentrations in the drainfield soils do not pose a significant risk to human health or the environment. Therefore, the proposed EC (described in Section 3.3) will be performed to remove the potential risk of the remaining tank contents quickly and economically. Verification sampling will be performed to confirm the results of the RFI and the EC.

3.2 Permitting, Approval, and Notification Requirements

An excavation permit will be prepared and submitted for approval before execution of this plan.

Documentation will be prepared in accordance with Laboratory Environmental Restoration (ER) Administrative Procedure (AP) LANL-ER-AP-05.1, Rev. 0, Readiness Review for Environmental Restoration Program Field Activities (LANL 1993, 0951). Key documents to be prepared for this review include a site-specific health and safety plan (SSHASP) and a task-specific waste management checklist. Personnel training requirements will be specified and will require completion prior to implementation of this EC Plan. Site workers must have received all training for this project as specified in the SSHASP.

3.2.1 Regulatory Notification/Permit Modifications

SWMU 36-003(a) is included in Table A of the Hazardous and Solid Waste Amendments module of the Laboratory's RCRA permit. Implementation of this EC will require a Class III modification to the Laboratory's RCRA permit. EPA and the New Mexico Environment Department have been notified of this project, and a request for a permit modification has been submitted. Implementation of this EC Plan will proceed upon receipt of EPA approval.

3.2.2 DOE Approval

If the Laboratory intends to implement this EC prior to receiving EPA approval, DOE approval must be documented through receipt of the signed Field Work Approval Form (Annex 6.7).

3.3 Cleanup Activities

SWMU 36-003(a) is located within a secured area of TA-36; therefore, site preparation will be limited to scheduling site access and establishing work zones. Initially, the overburden from the tank will be removed to expose the tank's lid and central portal. The central portal will be opened, and a sample of the sludge may be collected to establish the current waste characterization profile for disposal purposes.

The tank will be vacuum-pumped from the central portal, if possible; otherwise, the activities will proceed to the removal of the tank's concrete lid and subsequent removal of the residuals. Once the tank's contents have been removed and placed in containers, the concrete lid will be removed and the interior of the tank rinsed using a pressure wash. The rinsing will be sufficient to remove all contamination from the interior of the tank. The wash liquid will then be pumped from the tank and placed in containers. Air exhausted from the vacuum unit will be filtered in a manner consistent with health and safety requirements. Both the solid waste and the wash liquid will be disposed of in accordance with the waste management checklist.

After the tank is rinsed, verification sampling will be performed as described in Section 3.5. If, as expected, the sampling indicates that no COCs are present above cleanup levels, no further cleanup will be performed. The inlet/outlet pipes of the tank will be plugged with concrete and monitored to ensure a proper seal has been achieved. The lid of the tank will be then be replaced and the overburden reapplied to its original location.

In the event that field screening indicates that COCs are present adjacent to the tank at concentrations above cleanup levels, the tank will be removed from the ground. Soil material will then be removed from the perimeter of the excavation until field screening indicates that cleanup levels have been obtained. This screening will use a field-portable x-ray fluorescence (XRF) instrument to detect metals (primarily silver) that may exceed cleanup levels.

3.4 Waste Management Issues

As indicated in Section 2.3, wastes in the septic tank should be classified as RCRA hazardous wastes. Any wastes generated by this EC that are temporarily stored onsite will be placed in a designated less-than-90-day storage facility. In the event that the tank must be removed to allow for excavation of contaminated soil (as a result of detecting COCs above cleanup levels adjacent to the tank), the tank will be disposed of as non-contaminated construction debris. All soil removed from the excavation will be temporarily stored as potentially hazardous waste awaiting characterization.

3.4.1 Characterization of Materials for Disposal

Field screening of samples for radioactivity and organic vapors will be used to identify gross contamination. Previous analyses of the tank contents will be used to characterize the contents and associated wastewater, except as noted below. Characterization of personal protective equipment and other sampling wastes will be based on environmental sample analyses.

3.4.2 Treatment, Storage, and Disposal Plans

Wastes generated during the EC are expected to be limited to liquids and sludge (i.e., decontamination water, residual sludges within the tank, and liquid waste from the tank cleaning). Because these wastes are from a single source area, the liquids will be consolidated into one wastestream. Characterization of the wastestream prior to its consolidation may be necessary to ensure timely and economical disposal. Therefore, as concentrations of COCs are likely highest in the sludge, a sample of these residuals will be obtained during the initial field activities. This sample will be analyzed for constituents as requested by the permitted transportation and disposal facilities. A composite sample will be obtained of any excavated soil to characterize the material for disposal.

Based on [illegible] sample results, the consolidated wastestream will be designated a RCRA hazardous waste. Contractors, such as the vacuum truck operators, and permitted disposal facilities to handle D-listed waste are readily available. Transportation of the wastes to the permitted disposal facility by the selected subcontractor will be handled under appropriate manifests. Once at the disposal facility, the liquid waste may require treatment, such as stabilization.

3.5 Verification Plan

Sample results obtained during the RFI indicate the tank contents are hazardous, while reported levels of contaminants in the drainfield samples show the surrounding soils are significantly below SALs. RFI field observation revealed the septic tank contained liquids and sanitary residuals after

being abandoned for 2 years. These observations indicate that significant fractures or breeches within the structure are unlikely.

Excavation of the septic tank will not be performed. However, to confirm that there has been no release of COCs from the tank, four boreholes will be installed adjacent to the tank and soil samples collected for laboratory analysis (Table 3-1). The four boreholes will be installed in accordance with LANL -ER-SOP-04.01, R0, Drilling Methods and Drill Site Management (LANL 1993, 0951). Boreholes will be located at the western wall, adjacent to the inlet port; at the eastern wall, adjacent to the outlet port; and at midpoints of the north and south walls (Figure 2-2).

For each boring, core material will be field-screened for COCs using the following methods:

- Portable XRF configured to detect silver and other metals at concentrations below 100 mg/kg
- An immunoassay field test kit capable of detecting total polycyclic aromatic hydrocarbons in soils with a detection level of 0.6 mg/kg.

The field screening will be used to identify the depth intervals evidencing the highest concentrations of COCs, and these intervals will be sampled. If screening is inconclusive, a sample will be collected from each borehole at the soil-tuff interface. Subsurface soil samples will be collected following LANL-ER-SOP-06.24, R0, Sample Collection From Split-Spoon Samplers and Shelby Tube Samplers (LANL 1993, 0951). A duplicate soil sample and rinsate blank of any reusable sampling equipment will be collected in accordance with LANL-ER-SOP-01.05, R0, Field Quality Control Samples (LANL 1993, 0951).

3.6 Site Restoration Plan

3.6.1 Return of Materials to Site

Every attempt will be made to return the excavation and its adjacent area to the preinvestigation condition. Excavated soils and unused samples will be replaced and compacted in the excavation and the ground surface returned to its original condition. Soil cuttings derived during the verification sampling will be returned to their respective boreholes.

3.6.2 Expedited Cleanup Waste

Waste storage and handling procedures to be used depend upon the type of waste generated. If contamination is suspected and the return of soil materials to the site is determined to pose a potential for increased exposure, the EC waste will be stored in a designated less-than-90-day storage area until the laboratory analysis is completed and/or the material is sent to an appropriate treatment, storage, or disposal facility. The septic tank residuals, washwater and decontamination water will be placed in containers, characterized and disposed of in accordance with waste management checklist.

3.7 Acceptance Inspection

The Laboratory proposes an Acceptance Inspection as the mechanism for DOE and EPA to assess that the Laboratory has implemented this EC Plan effectively. A minimum of 10 days' notification will be provided to the agencies before the start of field activities. At this time, a tentative date for the inspection will be agreed upon.

TABLE 3-1
SUMMARY OF VERIFICATION SAMPLES AND ANALYSES FOR 36-003(a)

Description	Samples						Field Screening				Laboratory Analyses			
	Structure		Surface		Subsurface									
	primary	duplicate	primary	duplicate	primary	duplicate	Beta-gamma	Alpha	Organic Vapor	Radiological Smear and Swipe Techniques	Metals (SW 6010/7000)*	Mercury	VOCs (SW 8260)*	SVOCs (SW 8270)*
Borehole Soil Samples					4	1	x	x	x		x	x	x	x
Disposable Equipment	x						x	x	x	x				
Equipment Rinsate	1						x	x	x		x	x	x	x
Decontamination Water(1)	1						x	x	x		x	x	x	x
Current Tank Profile(1)	1						x	x	x		x	x	x	x

x : All samples
Note: Additional samples may be taken based on field surveys and observations.
*: Applicable EPA SW-846 methods.

An Acceptance Inspection Checklist will be used to document the scope of the inspection and will become part of the EC Final Report. The checklist and the timing of the inspection will be developed by the Laboratory and agreed to by the other agencies. This inspection checklist will contain specific items, components, and requirements agreed upon by all parties to be inspected that will constitute acceptance of remediation activities

The Acceptance Inspection will be conducted by an independent professional skilled in the appropriate technical discipline. During the final inspection, written resolution and anticipated schedule for completion will be identified for any outstanding items and documented on the inspection checklist. The Laboratory Field Project Leader (FPL) or designee will be responsible for addressing outstanding inspection items and documenting their resolution in the EC Final Report.

Upon completion of remediation activities, the Laboratory will submit a written certification to EPA Region 6, stating that the remedy has been completed in accordance with the EC Plan and Acceptance Inspection Checklist. The certification will be signed by the Laboratory and by the independent professional conducting the inspection. The certification will accompany the final EC Report.

3.8 Final Report

Following the return of analytical data from the verification sampling and completion of all field activities, a final report will be prepared. A proposed outline for this report is presented as Annex 6.8.

4.0 PROJECT MANAGEMENT

Overall implementation of this expedited cleanup will be managed by Gene Gould, FPL. Catherine Goetz of ICF Kaiser Engineers will serve as Field Team Leader (FTL) for the EC activities.

4.1 Staff and Resource Requirements

Total anticipated costs for the EC is $54,120, as detailed below.

Prefield Activities		
Preparation of SSHASP		2,800
Site Preparation/Subcontractor Scheduling/Preparation of Field Plan		2,800
Subtotal		$5,600
Field Activities		
Removal of tank's contents and pressure work		$5,800
Disposal of tanks residuals and wastewater		3,600
Site restoration/reseeding		1,000
Equipment to be rented:		
Backhoe @ $500/week		$500
LANL drill rig		0
Subtotal		$10,900
Personnel Costs		
ICF Kaiser FTL	$70/hr x 6 days	$3,360
Site Health and Safety Officer	$70/hr x 6 days	3,360
Sample Technicians (2)	$120/hr x 4 days	3,840
Backhoe Operator	$60/hr x 2 days	960
Subtotal		$11,470
Analytical Costs		
Verification sampling 6 samples x $2,500		$15,000
Waste disposal characterization (2 samples)		5,000
Subtotal		$20,000
Post-Field Activities		
Acceptance inspection		500
Final Report		5,600
Subtotal		$6,100
TOTAL ESTIMATED COST		**$54,120**

4.2 Schedule

The proposed EC schedule is shown in Table 4-1 The submittal of this EC Plan to EPA in June 1995 will initiate the 60-day public review/comment period. No sooner than 15 days after the start of this period, a public meeting will be held. Preparation of field work and development of implementation plans will be conducted concurrent to the public review period. Should this proposed EC Plan be approved by the agencies and the public, implementation of the remaining EC activities will be initiated in July. Completion of field work and the Acceptance Inspection should be completed in August, and the EC Final Report will be submitted by the end of September 1995.

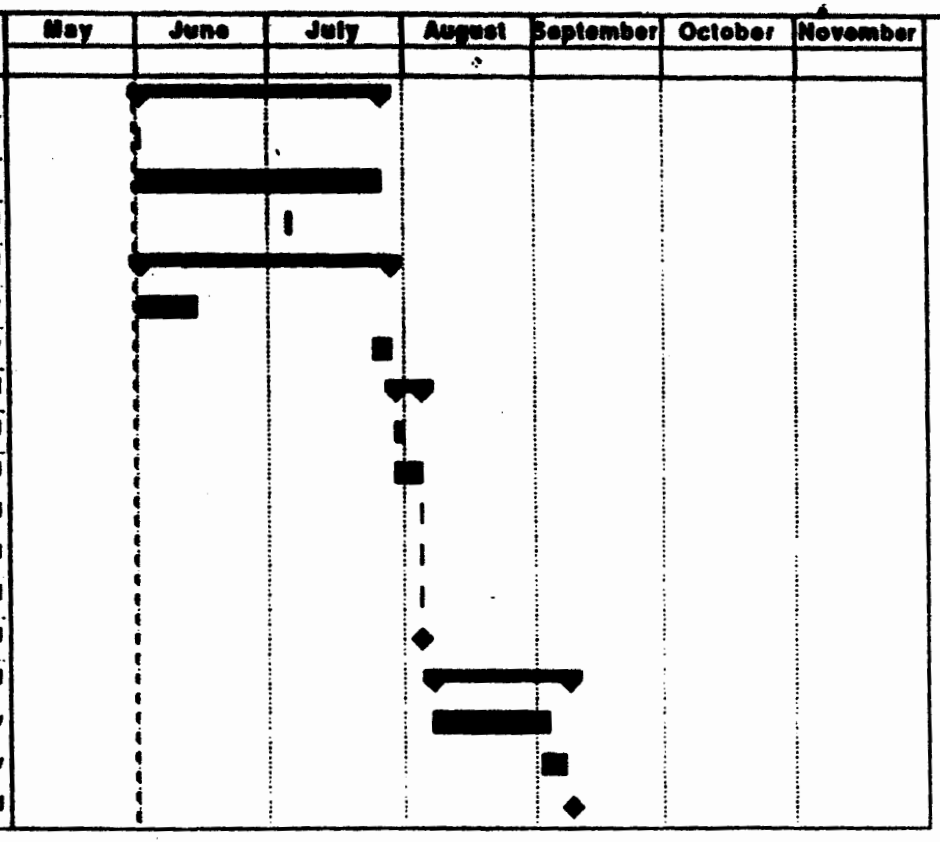
4.3 Stakeholder Notifications

Stakeholder notifications are an integral part of the procedure for conducting ECs. The ER Project will notify state and local governments, external and internal stakeholders, and individuals on the ER Project mailing list of the availability of the EC Plan. The EC Plan will be available to the stakeholders at the LANL Community Reading Room in Los Alamos, at the document repositories at the Los Alamos, Española, and Santa Fe public libraries, and at the Governor's Office at San Ildefonso Pueblo.

The submission of this EC Plan to EPA will trigger publication of a public notice indicating the start of the 60-day public comment period.

TABLE 4-1 PROPOSED SCHEDULE FOR SWMU 36-003(a)

ID	Name	Duration
1	1 PUBLIC ACCEPTANCE	55.38ed
2	1.1 SUBMIT EC PLAN TO EPA	1d
3	1.2 PUBLIC COMMENTS	8w
4	1.3 PUBLIC MEETINGS	1d
5	2 PLANNING	57.38ed
6	2.1 PREPARE HEALTH/SAFETY PLAN	2w
7	2.2 FIELD WORK PLANNING	1w
8	3 IMPLEMENT EXPEDITED CLEANUP	6.38ed
9	3.1 MOBILIZATION	1d
10	3.2 PERFORM CLEAN UP	5d
11	3.3 SITE RESTORATION	1d
12	3.4 INSPECTION & SUPERVISION	1d
13	3.5 DEMOBILIZATION	1d
14	3.6 COMPLETE EC	0d
15	4 ANALYSIS AND REPORT PREPARTION	32.38ed
16	4.1 SAMPLE ANALYSIS	4w
17	4.2 PREPARE FINAL REPORT	1w
18	4.3 SUBMIT REPORT	0d



Project: SWMU 36-003(a) schedul
Date: 5/31/95

Critical
Noncritical
Progress
Milestone
Summary

ICF KAISER ENGINEERS, INC.

5.0 REFERENCES

DOE (U.S. Department of Energy), October 1987. "Phase I: Installation Assessment, Los Alamos National Laboratory," Volumes 1 and 2, (draft), Comprehensive Environmental Assessment and Response Program, Albuquerque Operations Office, Albuquerque, New Mexico. (DOE 1987, 0264) (Title for Volume 2 not included)

EPA (US Environmental Protection Agency), July 27, 1990. "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," proposed rule, Title 40 Parts 264, 265, 270, and 271, Federal Register, Vol. 55., pp. 30798-30884 (EPA 1990, 0432).

LANL (Los Alamos National Laboratory) April 1993. "Administrative and Quality Procedures for Environmental Restoration," Los Alamos National Laboratory Report, Los Alamos, New Mexico. (LANL 1993, 0951).

LANL (Los Alamos National Laboratory), January 1993. "Los Alamos National Laboratory Environmental Restoration Program Standard Operating Procedures," Los Alamos National Laboratory Report, Los Alamos, New Mexico. (LANL 1993, 0875).

LANL (Los Alamos National Laboratory), June 1993. "RFI Work Plan for Operable Unit 1130," Los Alamos National Laboratory Report LA-UR-93-1152, Los Alamos, New Mexico. (LANL 1993, 1088).

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico. (LANL 1990, 0145).

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017).

LANL (Los Alamos National Laboratory), February 1995. "Installation Work Plan for Environmental Restoration," Revision 4, Los Alamos National Laboratory Report LA-UR-95-740, Los Alamos, New Mexico. (LANL 1995, 1164).

6.0 ANNEXES

6.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

6.2 Quality Assurance Plan

See Quality Program Plan And Quality Assurance Project Plan For Environmental Restoration, last revision January 1993, May 1991, Los Alamos National Laboratory, Los Alamos, New Mexico.

6.3 Health and Safety Plan

See Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Project Health and Safety Plan (HASP) (LANL, February 11, 1995).

6.4 Records Management Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter IV, Records Management Program Plan.

6.5 Public Involvement Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter V, Public Involvement Program Plan.

6.6 Methodology for Development of Preliminary Remedial Goals to Demonstrate Clean Closure

6.7 Field Work Approval Form

6.8 Proposed Outline for Expedited Cleanup Final Report

6.9 RFI Analytical Reports

1-1-4-7-2-5-7-1-7-7

ANNEX 6.6

METHODOLOGIES FOR DEVELOPING SITE-SPECIFIC PRELIMINARY REMEDIAL GOALS TO DEMONSTRATE CLEAN CLOSURE

1.0 APPROACH

Risk-based cleanup levels will be calculated for those constituents failing the screening assessment (comparison to SALs and background concentrations, including the analysis of multiple constituents) as documented in the RFI Report for this SWMU. Those contaminants failing the screening assessment phase will be called contaminants of concern (COCs) for the EC.

For those constituents that fail the screening assessment, cleanup levels will be calculated using EPA equations and default input parameters modified for site-specific information. Due to the location of this SWMU, cleanup levels will be based on a reasonable maximum exposed individual (a health working adult) under a continued laboratory operations land use scenario.

Under the EPA default industrial land use scenario, risk due to exposure to contaminants in soil is assumed to be due to direct ingestion, inhalation of volatiles from the soil, inhalation of particulates from the soil, and dermal exposure. For intrusive work (e.g., soil excavation), it is also assumed that there is a greater potential for the use of heavy equipment and thus a greater potential for soils to be disturbed and produce particulate and volatile emissions than in most residential and recreational land use scenarios. EPA default parameters are based on the type of industrial exposure activities expected and the physical properties of the COCs. One set of circumstances includes parameters such as exposure frequency and exposure duration, which are adjusted to reflect a maintenance worker versus a construction worker (or surface versus subsurface contamination scenarios), depending on the type of continued laboratory operations activity expected (i.e., non-intrusive or intrusive, respectively). The most conservative calculated cleanup goal (i.e., intrusive or non-intrusive) for a constituent will be used as the target cleanup level. Negotiation and agreement on the site-specific exposure level parameters will have to be reached by appropriate Stakeholders per implementation of the EC and Permit Modification processes.

2.0 PRG EQUATIONS

Calculations of PRGs are consistent with Risk Assessment Guidance for Superfund (RAGS) Part B (EPA 1991) but also consider updates to the RAGS Part B equations (EPA 1994). The PRGs will use the most current sources of EPA-approved toxicity criteria such as the Integrated Risk Information System (IRIS), the Health Effects Assessment Summary Table (HEAST), and the Environmental Criteria and Assessment Office (ECAO). Should no toxicity criteria be available from the primary source of information (i.e., IRIS) for a specific route of exposure (i.e., inhalation or oral), the other two sources (HEAST and ECAO) will be consulted. Should toxicity criteria be available for only one route of exposure (i.e., either inhalation or oral), the missing toxicity criteria will be derived from the available route-specific toxicity criteria for that constituent. Equations 1 and 2 are used to calculate PRGs for carcinogenic and noncarcinogenic contaminants, respectively. The methodology backcalculates a soil concentration for carcinogens from a target cancer risk value of 10^{-4} (i.e., 1 in 10,000) and for non-carcinogens from a target hazard quotient of 1. The equations for soil combine across pathways for direct exposure (i.e., ingestion, skin contact, and inhalation).

To calculate soil PRGs, the cancer slope factor and reference dose (RfD) for dermal exposure is calculated in Equations 3 and 4, respectively. For volatile chemicals in soil, a chemical-specific volatilization factor is calculated in Equation 5.

Should COCs for this EC contain radionuclides, cleanup levels based on an acceptable level of dose to the worker (i.e., 100 mrem/year) will be calculated using the RESRAD code. The exposure parameters described in this document, and other inputs as required to successfully run the model for the final exposure scenario will be incorporated.

Equation 1: Direct Exposures to Carcinogenic Constituents in Industrial Soil

$$C(mg/kg) = \frac{TR \times BW_a \times AT_c \times 365 d/y}{EF_o \times ED_o \left[\frac{IRS_o \times CSF_o}{10^6\ mg/kg} + \frac{SA_a \times CSF_d \times AF \times ABS}{10^6\ mg/kg} + IRA_a \times CSF_i \times \left(\frac{1}{VF_s} + \frac{1}{PEF} \right) \right]}$$

Where:

C(mg/kg) = Preliminary remedial goal for soil based on exposure to carcinogenic constituents (mg/kg)

TR = Target cancer risk (unitless)
Considered to be 1×10^{-4}

BW_a = Body weight, adult (kg)
Considered to be 70 kg (EPA 1991a)

AT_c = Averaging Time - cancer (years)
Considered to be 70 years (EPA 1991a)

EF_o = Exposure Frequency - occupational (d/y)
NONINTRUSIVE
Considered to be 200 d/y
Based on 250 d/y (EPA 1991a) minus 50 workdays when soil is wet or covered with snow
INTRUSIVE
Considered to be 90 d/y (LANL, 1993)

ED_o = Exposure duration - occupational (years)
NONINTRUSIVE
Considered to be 25 years (EPA 1991a)
INTRUSIVE
Considered to be 1 year (LANL 1993)

IRS_o = Soil ingestion - occupational (mg/day)
NONINTRUSIVE
Considered to be 50 mg/day (EPA 1991a)
INTRUSIVE
Considered to be 480 mg/day (LANL 1993)

CSF_o = Cancer slope factor-oral $(mg/kg\text{-}d)^{-1}$ (IRIS, HEAST, or ECAO)

SA_a = Surface area, adult (cm^2)
NONINTRUSIVE
Considered to be 5000 cm^2 (EPA 1992)
INTRUSIVE
Considered to be 3200 cm^2

CSF_d = Cancer slope factor-dermal $(mg/kg\text{-}d)^{-1}$
(See Equation 3)

AF = Adherence factor (mg/cm^2)
Considered to be 0.2 mg/cm^2 (EPA 1992)

ABS = Skin absorption
Considered to be 0.1 for organics (EPA 1994)
Considered to be 0.01 for inorganics (EPA 1994)

IRA_a = Inhalation rate - adult (m^3/day)
Considered to be 20 m^3/day (EPA 1991a)

CSF_i = Cancer slope factor-inhalation $(mg/kg\text{-}d)^{-1}$ (IRIS, HEAST, or ECAO)

VF_s = Volatilization factor for soil (m^3/kg)
(See Equation 5)

PEF = Particulate emission factor (m^3/kg)
Considered to be $1.32 \times 10^{+9}$ m^3/kg (EPA 1994)

Equation 2: Direct Exposures to Noncarcinogenic Constituents in Industrial Soil

$$C(mg/kg) = \frac{THQ \times BW_a \times ED_o \times 365\ d/y}{EF_o \times ED_o \left[\frac{1}{RfD_o} \times \frac{IRS_o}{10^6 mg/kg} + \frac{1}{RfD_d} \times \frac{SA_a \times AF \times ABS}{10^6 mg/kg} + \frac{1}{RfD_i} \times \left(\frac{IRA_a}{VF_s} + \frac{IRA_a}{PEF} \right) \right]}$$

Where:

C(mg/kg) = Preliminary remedial goal for soil based on exposure to noncarcinogenic constituents (mg/kg)

THQ = Target hazard quotient (unitless)
Considered to be 1

BW_a = Body weight, adult (kg)
Considered to be 70 kg (EPA 1991a)

ED_o = Exposure duration - occupational (years)
NONINTRUSIVE
Considered to be 25 years (EPA 1991a)
INTRUSIVE
Considered to be 1 year (LANL 1993)

EF_o = Exposure Frequency - occupational (d/y)
NONINTRUSIVE
Considered to be 200 d/y
Based on 250 d/y (EPA 1991a) minus 50 workdays when soil is wet or covered with snow
INTRUSIVE
Considered to be 90 d/y (LANL, 1993)

RfD_o = Reference dose-oral (mg/kg-d) (IRIS, HEAST, or ECAO)

IRS_o = Soil ingestion - occupational (mg/day)
NONINTRUSIVE
Considered to be 50 mg/day (EPA 1991a)
INTRUSIVE
Considered to be 480 mg/day (LANL 1993)

RfD_d = Reference dose-dermal (mg/kg-d) (IRIS, HEAST, or ECAO)
(See Equation 4)

SA_a = Surface area, adult (cm^2)
NONINTRUSIVE
Considered to be 5000 cm^2 (EPA 1992)
INTRUSIVE
Considered to be 3200 cm^2

AF = Adherence factor (mg/cm^2)
Considered to be 0.2 mg/cm^2 (EPA 1992)

ABS = Skin absorption
Considered to be 0.1 for organics (EPA 1994)
Considered to be 0.01 for inorganics (EPA 1994)

RfD_i = Reference dose inhalation (mg/kg-d) (IRIS, HEAST, or ECAO)

IRA_a = Inhalation rate - adult (m^3/day)
Considered to be 20 m^3/day (EPA 1991a)

VF_s = Volatilization factor for soil (m^3/kg)
(See Equation 5)

PEF = Particulate emission factor (m^3/kg)
Considered to be $1.32 \times 10^{+9}$ m^3/kg (EPA 1994)

Equation 3: Dermal Cancer-Slope Factor (CSFd) Based Upon Absorbed Dose

Cancer slope factors based upon administered doses will be adjusted for absorption to obtain estimates of potential dermal cancer-slope factors (1992). Where absorption factors and oral cancer slope factors are available, dermal cancer-slope factors will be calculated using the following equation:

$$CSF_{absorbed} = \frac{CSF_{administered}}{A_{bs}}$$

Where:

$CSF_{absorbed}$ = cancer-slope factor based on absorbed dose
$CSF_{administered}$ = oral cancer-slope factor
A_{bs} = oral absorption factor

Equation 4: Dermal Reference Dose (RfDd) Based Upon Absorbed Dose

Reference doses based upon administered doses will be adjusted for absorption to obtain estimates of potential dermal reference doses (1992). Where absorption factors and oral reference doses are available, dermal reference doses will be calculated using the following equation:

$$RfD_{absorbed} = RfD_{administered} \times A_{bs}$$

Where:

$RfD_{absorbed}$ = reference dose based on absorbed dose
$RfD_{administered}$ = oral reference dose
A_{bs} = oral absorption factor

Equation 5: Derivation of the Volatilization Factor

$$VF(m^3/kg) = \frac{LS \times V \times DH}{A} \times \frac{(\pi \times \alpha \times T)^{1/2}}{2 \times D_{ai} \times P_a \times K_{as} \times 10^{-3}\ kg/g}$$

Where:

$$\alpha = \frac{D_{ai} \times P_a}{P_a + \frac{(\rho_s)(1-P_a)}{K_{as}}}$$

VF = Volatilization factor (m^3/kg)

LS = Length of side of contaminated area (m) Considered to be 45 m

V = Windspeed in mixing zone (m/s) Considered to be default of 2.25 m/s

DH = Diffusion height (m) Considered to be default of 2 m

A = Area of contamination (cm^2) Considered to be 20,000,000 cm^2

D_{ai} = Effective diffusivity (cm^2/s) Considered to equal to $D_i(P_a^{3.33}/P_t^2)$

P_a = Air-filled soil porosity (unitless) Considered to be equal to P_t-$\theta\delta$

P_t = Total soil porosity (unitless) Considered to be equal to 1-(δ/P_s)

θ = Soil moisture content (cm^3-water/g-soil) Considered to be default of 0.1 cm^3-water/g-soil

δ = Soil bulk density (g/cm^3) Considered to be default of 1.5 g/cm^3

P_s = True soil density or particle density (g/cm^3) Considered to be default of 2.65 g/cm^3

K_{as} = Soil-air partition coefficient (g-soil/cm^3-air) Considered to be equivalent to (H/K_s) x 41 (41 is a conversion factor)

T = Exposure interval (s) Considered to be 28,800 s (8 hr)

D_i = Diffusivity in air (cm^2/s) Chemical-specific

H = Henry's Law constant (atm-m^3/mol) Chemical-specific

K_s = Soil-water partition coefficient (cm^3/g) K_{oc}xOC

OC = Organic carbon content of soil (fraction) Considered to be default of 0.02

3.0 References

EPA (U.S. Environmental Protection Agency), December 1989. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A), Interim Final Report, EPA/540/1-89/002, Office of Emergency and Remedial Response, Washington, D.C., 1989. (EPA 1989)

EPA (U.S. Environmental Protection Agency), July 27, 1990. "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," proposed rule, 40 CFR Parts 264, 265, 270, and 271, Federal Register, Vol. 55, No. 145, pp. 30798-30884, July 27, 1990. (EPA 1990)

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EPA (U.S. Environmental Protection Agency Region IX), August 1994. Region IX Preliminary Remediation Goals (PRGs), Second Half 1994. Memo from Standford J. Smucker, Ph.D., Regional Toxicologist (H-9-3), Technical Support Section to PRG Table Mailing List. (EPA 1994)

LAC 1991: Los Alamos County Community Development Department, "Los Alamos Development Code," Chapter 17.42, Site Development Requirements, 1991.

LANL 1993: Los Alamos National Laboratory, November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993)

ANNEX 6.7
FIELD WORK APPROVAL FORM

This form must be completed prior to starting site remediation field work for Expedited Cleanups that do not have an EPA-approved work plan.

I, _____, DOE-LAAO, **APPROVE** the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU 36-003(a), TA-36, for the decommissioning of the inactive septic tank and drainfield.

I, _____, DOE-AL, **DO NOT APPROVE** the field work as proposed for SWMU 36-003(a),TA-36, as described in the accompanying Expedited Cleanup Plan for the decommissioning of the inactive septic tank and drainfield.

The following reasons reflect the decision for disapproval:

Signed: _____ Date: _____

ANNEX 6.8
PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORTS

1.0 Summary of Expedited Cleanup

1.1 Overview
1.2 Expedited Cleanup

2.0 Site Restoration

3.0 Modifications to the EC Plan

4.0 Quantities and Types of Waste Generated

5.0 Outstanding Items from the Acceptance Inspection

6.0 Problems Encountered and Lessons Learned

APPENDICES

A Analytical Data
B Acceptance Inspection Checklist
C Wastestream Inventory
D Photographs
E Certification of Completion

ANNEX 6.9
RFI ANALYTICAL REPORTS

MEASURED CONCENTRATIONS OF COPCs FOR OU 1130

Location	Sample # and Location ID	Sample Type	Units	Metals	Cyanide	SVOCs	VOCs	SALs mg/kg	CRQLs mg/kg	Background mg/kg
Septic Tank	AAB1873	Sludge	ug/L	35,000 Calcium (J)	None Detected	None Detected	None Detected	~	1000	54400
East Bldg-1	36-3094	(Watery)	ug/L	15.6 Chromium				400	2	34.2
TA-36			ug/L	264 Iron (J)				~	20	35600
			ug/L	16,900 Potassium (J)				~	1000	6180
			ug/L	5010 Magnesium (J)				~	1000	16100
			ug/L	18,000 Sodium (J)				~	1000	1880
			ug/L	5.3 Lead (J)				400	0.6	39
Septic Tank	AAB1874	Sludge	ug/L	11.3 Silver	None Detected	None Detected	None Detected	400	2	~
East Bldg-1	36-3095	(Watery)	ug/L	27,600 Calcium (J)				~	1000	54400
TA-36			ug/L	22.9 Chromium				400	2	34.2
			ug/L	349 Iron (J)				~	20	35600
			ug/L	13,000 Potassium (J)				~	1000	6180
			ug/L	14,300 Sodium (J)				~	1000	1880
			ug/L	3.7 Lead (J)				400	0.6	39
Septic Tank	AAB1875	Sludge	ug/L	14 Silver	None Detected	None Detected	None Detected	400	2	~
East Bldg-1	36-3095	(Watery)	ug/L	40,500 Calcium (J)				~	1000	54400
TA-36			ug/L	252 Iron (J)				~	20	35600
			ug/L	19,600 Potassium (J)				~	1000	6180
			ug/L	5820 Magnesium (J)				~	1000	16100
			ug/L	20,700 Sodium (J)				~	1000	1880
			ug/L	8.8 Lead (J)				400	0.6	39
Septic Tank	AAB1876	Septic	ug/L	**10,800 Silver**				400	2	~
East Bldg-1	36-3096	Water	ug/L	29,100 Aluminum (J)				~	40	58900
TA-36			ug/L	2300 Barium (J)				5600	40	1140
			ug/L	259,000 Calcium (J)				~	1000	54400
			ug/L	21 Cadmium (J)				80	1	2.7
			ug/L	**451 Chromium**				400	2	34.2
			ug/L	73,900 Iron (J)				~	20	35600
			ug/L	**66.4 Mercury**				24	0.04	0.1
			ug/L	28,300 Potassium (J)				~	1000	6180
			ug/L	18,300 Magnesium (J)				~	1000	16100
			ug/L	1,000 Manganese (J)				11000	3	1030
			ug/L	24,000 Sodium (J)				~	1000	1880
			ug/L	102 Nickel (J)				1600	8	26.7
			ug/L	290 Lead (J)				400	0.6	39
			ug/L	24.2 Selenium				400	1	1.7
			ug/L	392 Vanadium (J)				560	10	66
			ug/L		61.4 Cyanide			1600	2	~
			ug/L			.044 1,4 p-Dichlorobenzene		29	0.33	~
			ug/L				.049 2 Butanone	4000	0.01	~
			ug/L				.210 Carbon Disulfide	7.4	0.01	~
			ug/L				.014 1,4 p-Dichlorobenzene	29	0.33	~

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MEASURED CONCENTRATIONS OF COPCs FOR OU 1130

Location	Sample # and Location ID	Sample Type	Units	Metals	Cyanide	SVOCs	VOCs	SALs mg/kg	CRQLs mg/kg	Background mg/kg
Septic Tank	AAB1877	Septic	ug/L	**17,900 Silver**	None Detected	None Detected		400	2	~
East of Bldg	36-3097	Water	ug/L	42,000 Aluminum (J)				~	400	58900
TA-36			ug/L	3350 Barium (J)				5600	40	1140
			ug/L	178,000 Calcium (J)				~	1000	54400
			ug/L	30 Cadmium (J)				80	1	2.7
			ug/L	**780 Chromium**				400	2	34.2
			ug/L	109,000 Iron (J)				~	20	35600
			ug/L	11.5 Mercury				24	0.04	0.1
			ug/L	28,700 Potassium (J)				~	1000	6180
			ug/L	17,400 Magnesium (J)				~	1000	16100
			ug/L	855 Manganese (J)				11000	3	1030
			ug/L	25,600 Sodium (J)				~	1000	1880
			ug/L	128 Nickel (J)				1600	8	26.7
			ug/L	270 Lead (J)				400	0.6	39
			ug/L	**659 Vanadium (J)**				560	10	66
			ug/L							
			ug/L				.028 Carbon Disulfide	7.4	0.01	~
			ug/L				.034 1,4 p-Dichlorobenzene	29	0.33	~
Septic Tank	AAB1878	Septic	ug/L	**18,300 Silver**	None Detected			400	2	~
East of Bldg	36-3097	Water	ug/L	20,600 Aluminum (J)				~	400	58900
TA-36			ug/L	16.7 Arsenic				~	2	11.6
			ug/L	1670 Barium (J)				5600	40	1140
			ug/L	107,000 Calcium (J)				~	1000	54400
			ug/L	15.4 Cadmium (J)				80	1	2.7
			ug/L	**402 Chromium**				400	2	34.2
			ug/L	47,400 Iron (J)				~	20	35600
			ug/L	3.79 Mercury				24	0.04	0.1
			ug/L	25,100 Potassium (J)				~	1000	6180
			ug/L	11,600 Magnesium (J)				~	1000	16100
			ug/L	395 Manganese (J)				11000	3	1030
			ug/L	23,400 Sodium (J)				~	1000	1880
			ug/L	60.7 Nickel (J)				1600	8	26.7
			ug/L	142 Lead (J)				400	0.6	39
			ug/L	364 Vanadium (J)				560	10	66
			ug/L			.023 1,4 p-Dichlorobenzene		29	0.33	~
			ug/L				.038 Carbon Disulfide	7.4	0.01	~
			ug/L				.006 Chlorobenzene	67	0.01	~
			ug/L				.013 Chloromethane	6.4	0.01	~
			ug/L				.015 1,4 p-Dichlorobenzene	29	0.33	~
BHI Sample	AAB1892	Soil	mg/kg	2,200 Aluminum	None Detected	None Detected	None Detected	~	400	58900
at Soil Tuff	36-3052		mg/kg	1,140 Calcium				~	1000	54400
Interface			mg/kg	3.3 Chromium				400	2	34.2
			mg/kg	9 Copper				3000	.5	15.7
			mg/kg	7030 Iron				~	20	35600
			mg/kg	0.21 Mercury				24	0.04	0.1
			mg/kg	122 Mangenese				11000	3	1030
			mg/kg	4.5 Lead				400	0.6	39
			mg/kg	43.2 Zinc				24000	4	101

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MEASURED CONCENTRA OF COPCs FOR OU 1130

Location	Sample # and Location ID	Sample Type	Units	Metals	Cyanide	SVOCs	VOCs	SALs mg/kg	CRQLs mg/kg	Background mg/kg
BH1 Sample	AAB1894	Soil	mg/kg	19,400 Aluminium	None Detected	None Detected	None Detected	~	40	58900
at 2 ft into	36-3052		mg/kg	3.2 Arsenic				~	2	11.6
Tuff			mg/kg	96.6 Barium				5600	40	1140
			mg/kg	2.1 Beryllium				~	1	3.31
			mg/kg	4520 Calcium				~	1000	54400
			mg/kg	1.4 Cadmium				80	1	2.7
			mg/kg	13 Chromium				400	2	34.2
			mg/kg	13 Copper				3000	5	15.7
			mg/kg	19,500 Iron				~	20	35600
			mg/kg	0.13 Mercury				24	0.04	0.1
			mg/kg	2590 Potassium				~	1000	6180
			mg/kg	3220 Magnesium				~	1000	16100
			mg/kg	203 Manganese				11000	3	1030
			mg/kg	10.6 Lead				400	0.6	39
			mg/kg	28.4 Vanadium				560	10	66
			mg/kg	66.1 Zinc				24000	4	101
BH2 Sample	AAB1893	Soil	mg/kg	1,650 Aluminum	None Detected		None Detected	~	40	58900
at Soil Tuff	36-3053		mg/kg	3.9 Chromium				400	2	34.2
Interface			mg/kg	9 Copper				3000	5	15.7
			mg/kg	6,340 Iron				~	20	35600
			mg/kg	0.17 Mercury				24	0.04	0.1
			mg/kg	84.5 Manganese				11000	3	1030
			mg/kg	9.6 Lead				400	0.6	39
			mg/kg	44 Zinc				24000	4	101
			mg/kg			.610 Di-n-butylphthalate		8000	0.33	~
BH2 Sample	AAB1897	Soil	mg/kg	1,970 Aluminum	None Detected		None Detected	~	40	58900
at Soil Tuff	36-3053		mg/kg	3.6 Chromium				400	2	34.2
Interface			mg/kg	10 Copper				3000	5	15.7
			mg/kg	5,560 Iron				~	20	35600
			mg/kg	0.18 Mercury				24	0.04	0.1
			mg/kg	75.8 Manganese				11000	3	1030
			mg/kg	9.3 Lead				400	0.6	39
			mg/kg	40.8 Zinc				24000	4	101
			mg/kg			.420- Di-n-butylphthalate				
BH2 Sample	AAB1898	Soil	mg/kg	1,110 Aluminum	None Detected		None Detected	~	40	58900
at 2ft into	36-3053		mg/kg	5,940 Iron				~	20	35600
Tuff			mg/kg	99.4 Manganese				11000	3	1030
			mg/kg	4.7 Lead				400	0.6	39
			mg/kg	38.7 Zinc				24000	4	101
			mg/kg			2.100 Bis(2-ethylhexyl)phthalate				

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MEASURED CONCENTRATIONS OF COPCs FOR OU 1130

Location	Sample # and Location ID	Sample Type	Units	Metals	Cyanide	SVOCs	VOCs	SALs mg/kg	CRQLs mg/kg	Background mg/kg
BH3 Sample	AAB1900	Soil	mg/kg		None Detected	None Detected	None Detected			
at Soil Tuff	36-3054		mg/kg							
Interface			mg/kg	864 Aluminum(s)				~	40	58900
			mg/kg	0.56 Chromium(s)				400	2	34.2
			mg/kg							
			mg/kg							
BH3 Sample	AAB1901	Soil	mg/kg	2,300 Aluminum		None Detected	None Detected	~	40	58900
2ft into Tuff	36-3054		mg/kg	2.2 Chromium				400	2	34.2
			mg/kg	4,480 Iron				~	20	35600
			mg/kg	180 Manganese				11000	3	1030
			mg/kg	3 Lead				400	0.6	39
			mg/kg	22.8 Zinc				24000	4	101
			mg/kg		0.97 Cyanide			1600	2	~
BH4 Sample	AAB1903	Soil	mg/kg	3,310 Aluminum	None Detected	None Detected	None Detected	~	40	58900
at Soil	36-3055		mg/kg	2.3 Chromium				400	2	34.2
Interface			mg/kg	4,920 Iron				~	20	35600
			mg/kg	199 Manganese				11000	3	1030
			mg/kg	2.8 Lead				400	0.6	39
			mg/kg	22 Zinc				24000	4	101
BH4 Sample	AAB1904	Soil	mg/kg	2,420 Aluminum	None Detected	None Detected	None Detected	~	40	58900
at 2ft into	36-3055		mg/kg	2.7 Chromium				400	2	34.2
Tuff			mg/kg	3,620 Iron				~	20	35600
			mg/kg	115 Manganese				11000	3	1030
			mg/kg	5.1 Lead				400	0.6	39
			mg/kg	21.1 Zinc				24000	4	101
			mg/kg							
			mg/kg							
BH4 Sample	AAB1895	Soil	mg/kg	None Detected	None Detected	None Detected				
2ft into Tuff	36-3055		mg/kg				.015 Methylene Chloride	5.6	0.01	~
			mg/kg							
BH5 at	AAB1906	Soil	mg/kg	2,650 Aluminum	None Detected	None Detected	None Detected	~	40	58900
Soil Tuff	36-3056		mg/kg	7,770 Iron				~	20	35600
Interface			mg/kg	141 Manganese				11000	3	1030
			mg/kg	5.1 Lead				400	0.6	39
			mg/kg	45.8 Zinc				24000	4	101

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MEASURED CONCENTRATI[illegible] OF COPCs FOR OU 1130

Location	Sample # and Location ID	Sample Type	Units	Metals	Cyanide	SVOCs	VOCs	SALs mg/kg	CRQLs mg/kg	Background mg/kg
BH5 at	AAB1907	Soil	mg/kg	12,500 Aluminum	None Detected	None Detected	None Detected	~	40	58900
2 ft into	36-3056		mg/kg	2.4 Arsenic				~	2	11.6
Tuff			mg/kg	108 Barium				5600	40	1140
			mg/kg	1.5 Beryllium				~	1	3.31
			mg/kg	2,800 Calcium				~	1000	54400
			mg/kg	8.8 Chromium				400	2	34.2
			mg/kg	8.1 Copper				3000	5	15.7
			mg/kg	14,600 Iron				~	20	35600
			mg/kg	1,720 Potassium				~	1000	6180
			mg/kg	2,290 Magnesium				~	1000	16100
			mg/kg	278 Manganese				11000	3	1030
			mg/kg	9.6 Nickel				1600	8	26.7
			mg/kg	11.2 Lead				400	0.6	39
			mg/kg	18 Vanadium				560	10	66
			mg/kg	37.6 Zinc				24000	4	101
BH6 Sample	AAB1909	Soil	mg/kg	1,870 Aluminum	None Detected	None Detected	None Detected	~	40	58900
at Tuff	36-3057		mg/kg	2.5 Chromium				400	2	34.2
Interface			mg/kg	5.6 Copper				3000	5	15.7
			mg/kg	6,530 Iron				~	20	35600
			mg/kg	158 Manganese				11000	3	1030
			mg/kg	5.4 Lead				400	0.6	39
			mg/kg	40 Zinc				24000	4	101
BH6 Sample	AAB1910	Soil	mg/kg	23,700 Aluminum	None Detected	None Detected	None Detected	~	40	58900
2ft into	36-3057		mg/kg	4.1 Arsenic				~	2	11.6
Tuff			mg/kg	95.8 Barium				5600	40	1140
			mg/kg	2 Beryllium				~	1	3.31
			mg/kg	4,270 Calcium				~	1000	54400
			mg/kg	15.9 Chromium				400	2	34.2
			mg/kg	11.9 Copper				3000	5	15.7
			mg/kg	22,700 Iron				~	20	35600
			mg/kg	2,290 Potassium				~	1000	6180
			mg/kg	4,070 Magnesium				~	1000	16100
			mg/kg	168 Manganese				11000	3	1030
			mg/kg	11.1 Nickel				1600	8	26.7
			mg/kg	18.1 Lead				400	0.6	39
			mg/kg	28.6 Vanadium				560	10	66
			mg/kg	59 Zinc				24000	4	101

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