Los Alamos National Laboratory

Voluntary Corrective Action Plan for Aggregate TAs -53 and -20 Group 6

Field Unit 2

PRS 53-010, Bermed Mineral Oil Storage Area
PRS 20-003 (c), Navy Gun Site

ICF Kaiser Engineers, Inc.

August 9, 1995

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1.0 INTRODUCTION

The potential release sites (PRSs) at Los Alamos National Laboratory (LANL) addressed in this voluntary corrective action (VCA) plan have been aggregated on the basis of proximity to each other and the fact that they do not exhibit high levels of contamination. All sites have been sampled as part of site characterization activities.

These VCA sites are in Field Unit 2 at Technical Areas (TAs) -53 and -20, and are part of the formerly designated OU 1100.

1.1 PRS 53-010, Bermed Mineral Oil Storage Area

This bermed area was secondary containment from 1989 to 1990 for two 3,000-gal. tanks and eighteen 55-gal. drums containing mineral-oil-based scintillator liquid. The storage area is approximately 30 ft by 35 ft with 2-ft-high soil berms. The interior slopes of the berms and the floor were lined with a geotechnical liner covered with soil. The secondary containment appeared to be intact when the area was closed, but exposure to the elements may have caused deterioration of the liner. The drums and tanks were removed in 1990, and two small areas of visual contamination were cleaned. This site will be remediated as a housekeeping measure.

When the area was sampled for a Phase I investigation, the geotechnical liner was intact and samples were taken to the depth of the liner, 0 to 6 in. below the surface. The samples were analyzed for semi-volatile compounds (SVOCs) and total petroleum hydrocarbons (TPH). Soil results indicated non-detectable levels for SVOCs, and elevated readings for TPH ranging from 0.0498 mg/kg to 5100 mg/kg. Further characterization of the site will be conducted the week of August 7, 1995 to identify the volatiles in the TPH by collecting an additional sample at the location of the highest TPH concentration (5100 mg/kg). The sample will be analyzed for volatile organic compounds (VOCs), including pseudocumene (1,2,4-trimethylbenzene), a component of the mineral-oil-based scintillator liquid stored in the PRS. Waste from the cleanup will consist of the geotechnical liner, soil, and decontamination liquid.

1.2 PRS 20-003(c), Navy Gun Site

This area was the site of a Navy gun mounting between 1945 and 1948, and guns were fired into the nearby canyon walls. Buildings were removed, but the concrete pad, approximately 20 ft by 20 ft by 1 ft thick with anchor bolts, is still in place. The concrete pad is covered by soil and is not readily visible. A Phase I investigation conducted at the PRS showed low levels of radionuclides, including isotopes of uranium, and detectable levels of metals. Non-detectable levels of high explosives (HE) and Sr-90 were reported. Samples for VOCs or SVOCs were not collected because there was no reason to believe that contamination from organic compounds was present. The metals detected were below the Resource Conservation and Recovery Act (RCRA) toxicity characteristic (TC) screening levels and total uranium was below the upper threshold limit (UTL) background.

During subsurface sampling, the sampling team discovered other debris, for instance, conduit and electrical wire. In addition, electrical utilities pass through the area. The area has been cleaned several times: after the site was closed, before the construction of East Jemez Road, and in 1988. The concrete pad will be removed as a housekeeping measure, and surrounding areas that exhibit young vegetation will be scraped to look for debris, which will be removed from the site. Waste from the cleanup will consist of the debris and small amounts of soil.

2.0 SITE TYPE AND DESCRIPTION

Table 2-1 identifies each PRS along with corresponding location, type, potential waste type, and figure numbers. Figure 2-1 shows the general site location.

Table 2-1
PRS Location, Description, and Waste Type

PRS No.	PRS Location	PRS Type/Description	Waste Type/Description	Figure Number
53-010	SE of the fenced area that includes TA-53-1031	Earth-bermed secondary container for a mineral oil storage area	I contaminated with mineral oil and 1,2,4-trimethyl benzene (pseudo cumene). Geotechnical liner	Figure 2-2
20-003(c)	NE of Jemez Rd	Firing site. Concrete pad, 20' x 20' x 1'. Rubble.	Debris (electrical and concrete rubble) and small amount of soil (possibly radioactive due to detection of radionuclides)	Figure 2-3

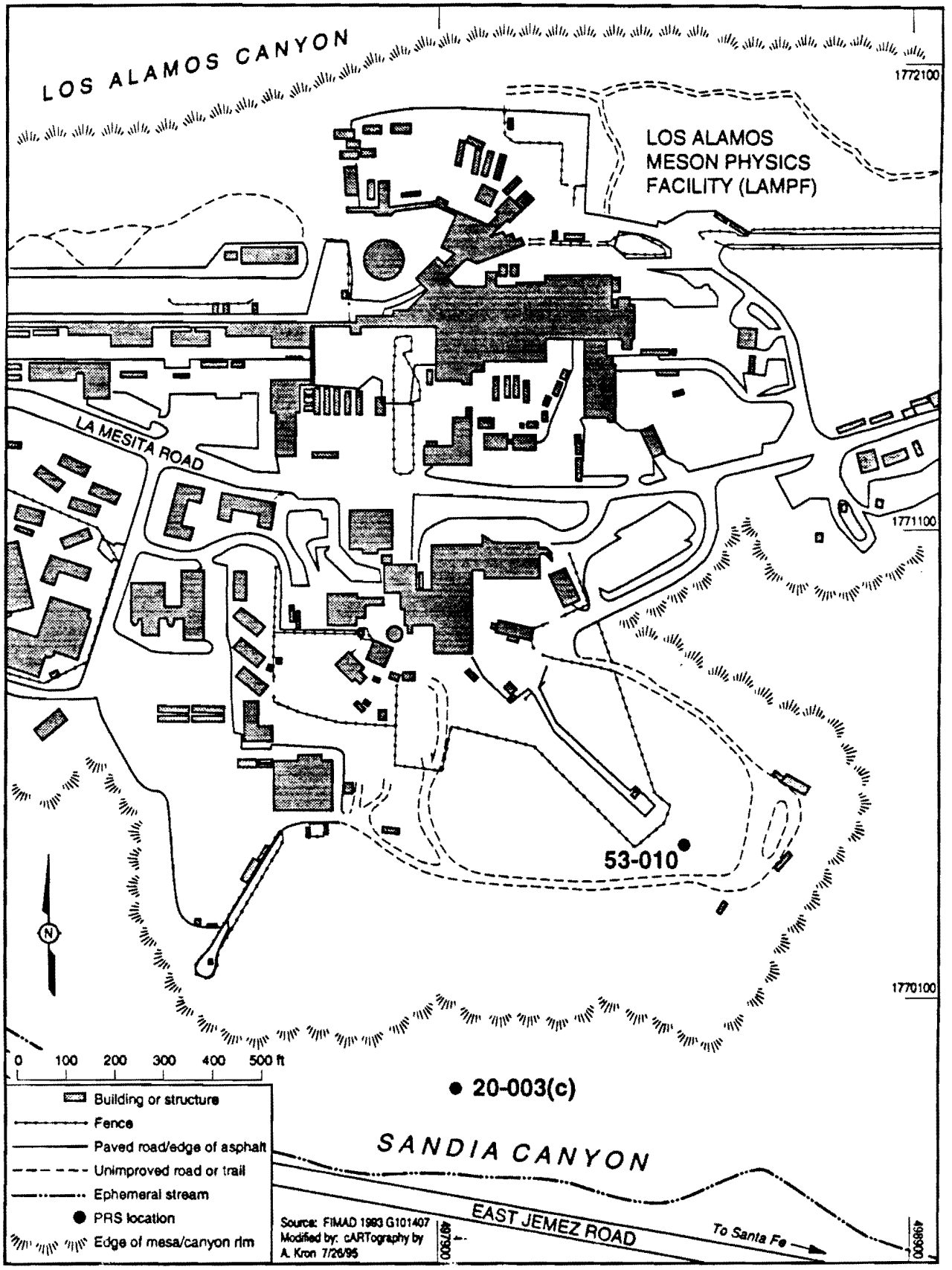
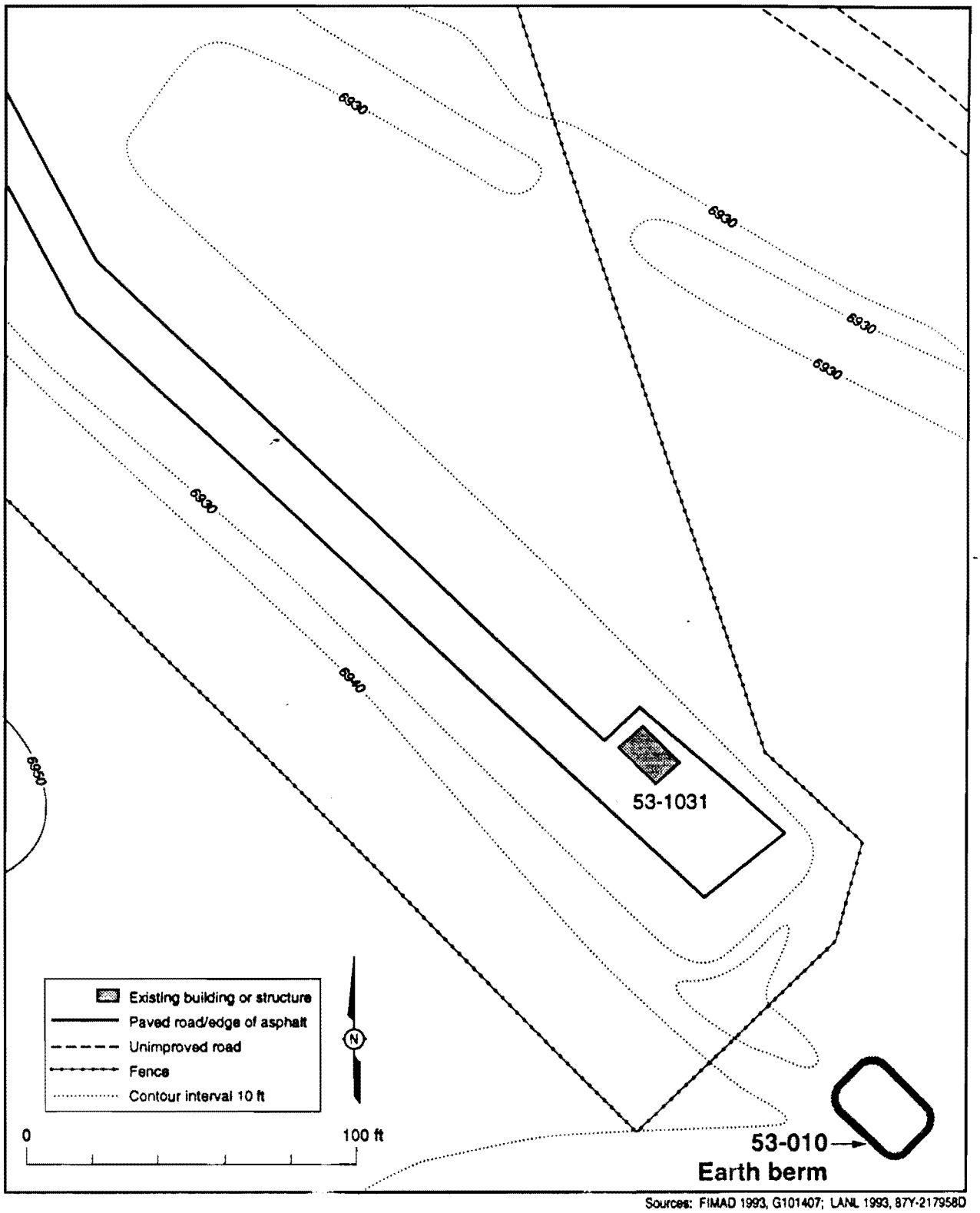
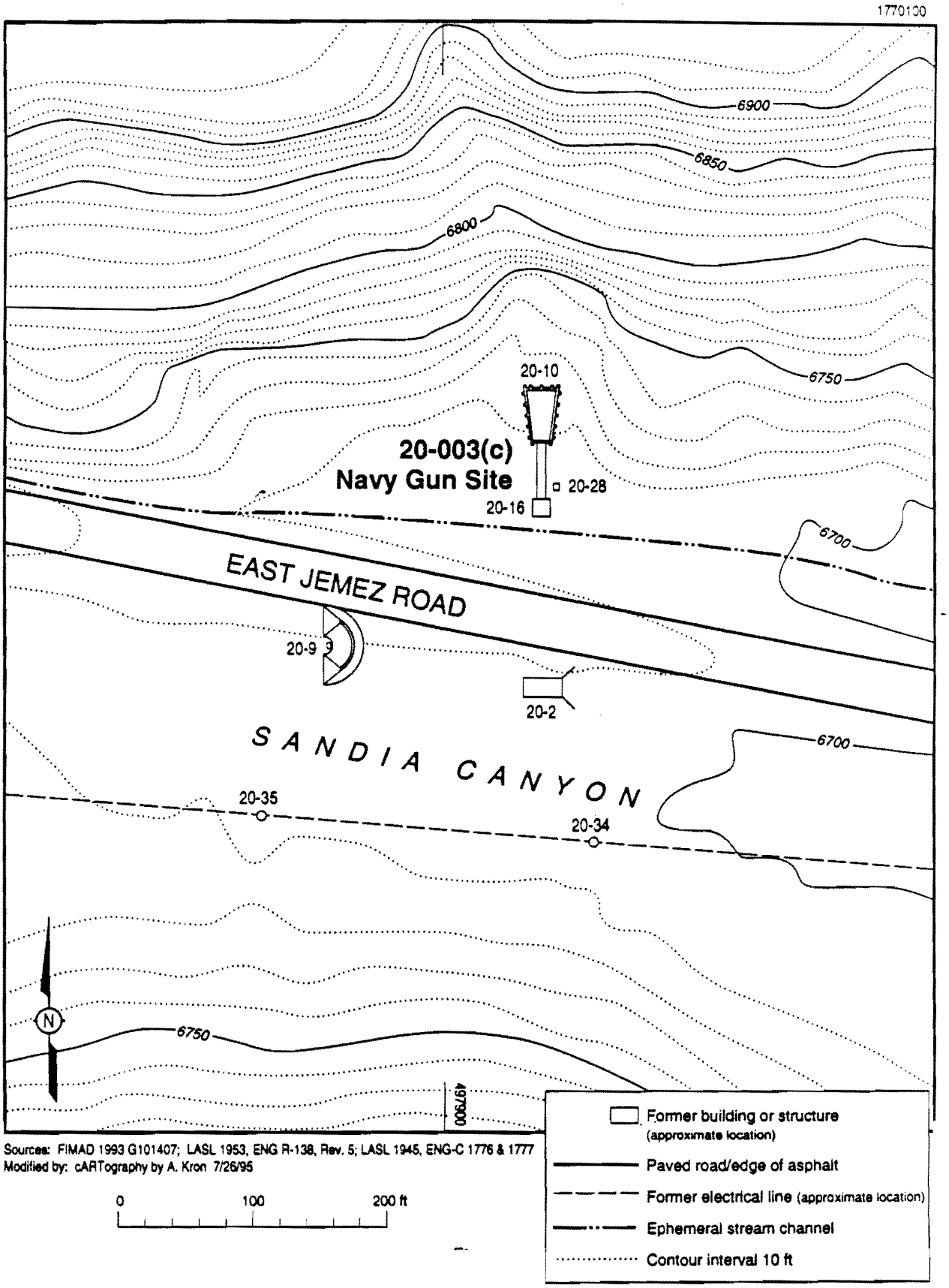


Figure 2-1. Locations of PRSs 53-010 and 20-003(c)



Sources: FIMAD 1993, G101407; LANL 1993, 87Y-217958D
Modified by: cARTography by A. Kron 7/26/95

Figure 2-2. Location of PRS 53-010, earth berm



Sources: FIMAD 1993 G101407; LASL 1953, ENG R-138, Rev. 5; LASL 1945, ENG-C 1776 & 1777
Modified by: cARTography by A. Kron 7/26/95

Figure 2-3. Location of PRS 20-003(c), Navy gun site

3.0 PROPOSED REMEDY

Site characterization of these PRSs has been conducted. Site characterization included geomorphic surveys, HE screening, field screening for radioactivity, and sampling for radionuclides and metals at the Navy gun site. Sampling for SVOCs and TPHs was conducted at the berm area. The results of site characterization (Appendix B) indicate the type, amount, and extent of contamination. Background information is recorded in the OU 1100 RCRA Facility Investigation (RFI) Work Plan, which reported the history and use of the PRS sites. Using all available information, remedies have been proposed for housekeeping and cleanup of the PRSs.

A field screening plan is described in Appendix A.

In lieu of a detailed Waste Management Plan (WMP), each PRS in this VCA has been detailed on Characterization Strategy Forms (CSFs); these forms are included in Appendix C. The CSFs include a site description, an investigation or remediation waste description and excavated volume estimate, a characterization strategy, a preliminary RCRA determination, and a listing of analyte suites to be used to characterize the waste. Waste Profile Forms (WPFs) and Chemical Waste Disposal Requests (CWDR) forms will be completed and approved before transfer of the waste to the Waste Management Service Group.

All waste removed from the sites will be segregated, containerized, labeled, stored, handled, prepared for transportation and disposal, and managed in compliance with the suspected waste type presented in the CSF. Waste materials from these VCAs that are not contaminated with hazardous or radioactive materials, nor governed by the Toxic Substances Control Act (TSCA), will be disposed of in an industrial landfill. Some nonhazardous, nonradioactive, nontoxic wastes can be buried at TA-54, Area J, if appropriate for administrative reasons.

Soil and debris will be moved by backhoe/loader and hand-held tools, and welding equipment will be necessary during removal of the concrete pad. Confirmatory sampling for VOCs will be conducted at PRS 53-010 and sampling for gamma spectroscopy will be conducted at PRS 20-003(c) to compare against site-specific background. Efforts will be made to minimize disturbance of site vegetation. Uncontaminated excavated soils will be used for backfilling and recontouring, although additional fill soils may be needed to complete backfilling. All disturbed areas will be regraded to match adjacent contours and reseeded with native species.

All work will be done according to this VCA plan. If the situation in the field becomes markedly different from this plan, the criteria in Brad Martin's document, "Framework for Reconsidering or Stopping Work on Expedited Cleanups and Voluntary Corrective Actions," will be used to evaluate further action. This document is included as Appendix D.

All required permits have been or will be obtained before field work actually starts. Table 3-1 shows the permits required and the current status of each.

Table 3-1
Permit Requirements and Status

Excavation Permits	Submitted on July 24, 1995 for urgent response
NEPA	Blanket NEPA approval for the ER Project VCA and EC cleanups
NPDES	VCA will not discharge water. Equipment cleanup water will be drummed and taken to LANL sanitary treatment plant
NESHAPS	VCA will not produce air emissions
Health and Safety Plan	H&S Plan being prepared
Biology	Can use permit obtained from the spring sampling activity
Archeology	Can use permit obtained from the spring sampling activity. ESH-20 indicated that they must be present prior to removal of material
Characterization Strategy Forms (CSF)	See Appendix B
Waste Profile Forms (WPF)	To be completed after cleanup
Chemical Waste Disposal Request Forms (CWDR)	To be completed after cleanup

3.1 PRS 53-010, Bermed Mineral Oil Storage Area

Because of the TPH contamination discovered during the Phase I investigation, further characterization of this site for VOCs, in particular for 1,2,4-trimethylbenzene (pseudocumene) will be conducted. Samples will be taken at the location of the highest concentration of TPH (5100 mg/kg), which is above the geotechnical liner. The soil and the geotechnical liner will be removed during the VCA as a housekeeping measure. Waste material (the geotechnical liner, soil, and decontamination liquid) will be characterized based on the results of the previous site characterization and the VOC results from the additional sample taken during the week of August 7, 1995. Once the waste has been characterized, it will be handled according to LANL-ER-AP-05.3, Management of Environmental Restoration Project Wastes.

Confirmatory (verification) sampling will be performed below the geotechnical liner to ensure that the chemical of concern (COC) is at or below the established cleanup level (See Section 6.0). Six confirmatory samples will be analyzed for VOCs, including 1,2,4-trimethylbenzene. The remaining soil below the geotechnical liner will remain in place if the soils are not contaminated.

3.2 PRS 20-003(c), Navy Gun Site

The concrete pad on this site will be removed as a housekeeping measure. Removal of the pad may require welders because of the reinforcing bar imbedded in the concrete. An area of about 150 ft by 50 ft by 5 ft will be considered for removal, but only the actual debris will be removed, taking minimal amounts of soil. This area adjoins East Jemez Road, making physical site access readily available for cleanup crews. However, traffic along East Jemez Road may be minimally disturbed during the VCA work. The waste will be placed in B-25 boxes if the waste is radioactive. The B-25 boxes will be placed by forklift in a storage area near East Jemez Road. Backhoes and personnel with shovels will load the waste into dump trucks at the waste site. The loaded dump trucks will then be taken to the B-25 storage area where the waste will be loaded into the B-25 boxes and taken to TA-54. If the waste is not radioactive, it will be placed in covered roll-off bins or tip trucks and disposed of in an industrial landfill.

After the removal of debris and soil, a grab sample for gamma spectroscopy will be collected to compare against site-specific background levels. The area will then be backfilled with clean fill, if necessary, and reseeded.

4.0 JUSTIFICATION/RATIONALE

4.1 PRS 53-010

This bermed area has been out of service for five years. After the oil drums and tanks were removed, local areas of contamination were remediated. However, the liner and bermed sides were left in place, giving the impression of an abandoned structure with the attendant problems. Leaving a secondary container berm in place with a damaged geotechnical liner will prompt questions about potential contamination remaining at the site. Also, bringing an inactive area back to its original condition is good environmental policy. This site will be completely remediated by removing the soil above the geotechnical liner and the liner. The raised berms will be removed and the area will be recontoured and reseeded.

4.2 PRS 20-003(c)

This site may pose radiological concerns, based on previous site characterization. The debris and soil will be field screened for gross alpha, gross beta, and gross gamma in accordance with LANL-ER-SOP-10.07, Field Monitoring for Surface and Volume Radioactivity Levels. All remaining debris will be removed for safety reasons, and good environmental policy is to restore the area to its original condition as much as possible. The site is readily accessible to the public.

5.0 ESTIMATED WASTE VOLUMES BY TYPE

Table 5-1 identifies each PRS, with the corresponding waste types and descriptions, estimated bulk volume, proposed containers, and anticipated disposal destination.

Table 5-1
Waste Descriptions

PRS No.	Waste Type	Waste Description	Estimated Volume	Disposal Container	Anticipated Disposal
53-010	Industrial	Geotechnical liner	14 ft^3	2 55-gal. drums for liner	Liner to be taken to industrial landfill
		Contaminated soil	27 yd^3	2 roll-off boxes	Soil above liner taken to industrial landfill
		Decontamination liquid	100 gal.	2 55-gal. drums	Combined with other non-hazardous decon liquids and taken to TA-50
20-003(c)	Industrial	Debris and rubble with some soil	19 yd^3	6 B-25 Boxes, or roll-off bins, or tip trucks	Industrial landfill or TA-54

6.0 CLEANUP LEVELS

The results of the analytical data for PRS 53-010 indicated a maximum contaminant concentration for TPH of 5,100 mg/kg. Since the analyte was unidentified, pseudocumene (synonym 1,2,4-trimethylbenzene), a component of the mineral-oil-based scintillator liquid, was selected as the indicator at a maximum detected concentration of 5,100 mg/kg. The cleanup level may need to be re-calculated using the results from the VOC sample collected during the week of August 7, 1995. How will target compared to State. EPA

Evaluation of the data for the Navy gun site, PRS 20-003(c), indicated the radionuclides, U-235 and Co-60, were below their respective SALs, and did not contribute to the multiple constituent analysis. Of the total radionuclides (6) detected, Cs-137 is the only isotope for which background has been established. The maximum concentration of 0.963 pCi/g for Cs-137 was below the UTL background of 1.4 pCi/g, and was eliminated from further consideration. Ba-140 had a maximum concentration of 20.8 pCi/g and has no SAL. Since the half-life for this naturally occurring isotope is 12 days it is unlikely that this isotope is present at this concentration, and is not considered to be a potential health concern. Ru-106 and Na-22 were detected at maximum concentrations of 0.353 pCi/g and 0.033 pCi/g and have no SALs. Cs-137 was selected as the indicator for these two isotopes because it is the most health-conservative of the radionuclide suite. The cleanup goal for Cs-137 is 30 pCi/g. Therefore, Ru-106 is a factor of 85 less than the cleanup goal and Na-22 is a factor of 909 less than the cleanup goal of the indicator isotope. As a result of the following evaluation of the data, no COCs have been identified.

A site-specific clean-up level was calculated using the equation presented in Appendix E. The toxicity values used in this equation were obtained from the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Table (HEAST), both updated through March 1995. The equation was used to calculate the site-specific cleanup level for a noncarcinogenic contaminant using a nonintrusive industrial soil exposure scenario. The methodology is consistent with US EPA Risk Assessment Guidance for Superfund, Part B, using LANL-specific exposure scenario parameters. The methodology calculates a soil concentration for noncarcinogens from a hazard index of 1, and combines across exposure pathways to include ingestion and inhalation exposures, where toxicity criteria are available.

A site-specific cleanup goal and a maximum chemical concentration for the noncarcinogenic COC is presented in Table 6-1. The maximum concentration of 5,100 mg/kg for 1,2,4-trimethylbenzene (pseudocumene) at PRS 53-010 is a factor of 5 greater than the cleanup goal of 1,020 mg/kg based on a nonintrusive industrial scenario.

The approach to using site-specific cleanup goals with confirmatory sample data is presented in Appendix E.

Table 6-1
Cleanup Goal for PRS 53-010

Noncarcinogenic Chemical of Concern	Maximum Concentration of Indicator Chemical of Concern (mg/kg)	Cleanup Goal Based On Hazard Index of 1 (mg/kg)
1,2,4-trimethylbenzene*	5,100	1,020

NOTE:
* Indicator chemical based on historical use at this site.

7.0 DESCRIPTION OF CONFIRMATORY SAMPLING

7.1 PRS 53-010

PRS 53-010 is a recent site, operated as secondary containment only from 1989 to 1990. Mineral-oil-based scintillator liquid, described as containing a small percentage of pseudocumene, were stored in the containment, but all oil was removed in 1990. Two areas of visible contamination were also removed. Because the area and its use were well known, analyses were limited to radioactivity, SVOCs, and TPH. No analysis was performed for polychlorinated biphenyls (PCB) because the mineral oil was stored at the site after the use of PCB oil was banned in 1979. No other contaminants were of concern at the site because of the knowledge of its use. The area was found to have elevated TPH levels. Out of the six samples, above the geotechnical liner, three samples contained TPH at concentrations above 1000 mg/kg. The highest concentration was 5100 mg/kg. Because of the TPH contamination, further characterization of the site for VOCs, including 1,2,4-trimethylbenzene (pseudocumene), will be conducted where the highest concentration of TPH was found. Based on the results of the sample collected during the week of August 7, 1995, the soils beneath the geotechnical liner may or may not be left in place. If the soils below the geotechnical liner exceed SALs or at or below RCRA regulatory levels, an addendum to this VCA plan and an additional CSF for this wastestream will be submitted.

A statistical analysis was conducted to determine the required sample size for confirmatory sampling. (EPA 1988). A rectangular grid system has been selected and six samples will be collected below the geotechnical liner to verify that the remaining soils are not contaminated (Appendix F). The samples will be analyzed for VOCs, including 1,2,4-trimethylbenzene (pseudocumene).

7.2 PRS 20-003(c)

PRS 20-003(c) is an old site, active as a gun firing site from 1945 to 1948. After the initial site restoration in 1948, the site was disturbed numerous times, including during the construction of East Jemez Road. In 1988 the site was screened for radioactivity, and elevated levels of radioactivity were not noted. Two 10-ft trenches were dug across the site for sampling, which were deeper than noted debris, and adequate samples were taken to provide confidence that contaminants are not present. No samples were taken for VOCs and SVOCs. No known sources for VOCs and SVOCs were reported in the RFI Work Plan. Since this site was a gun firing site, small amounts of HE may have been used; however, HE analytical results from the site characterization were negative. Several radionuclides (Cs-137, U-234, -235, -238, Eu-152, Eu-179, Ru-106, Ba-140, Na-22) were detected at low levels (Appendix B). The source of these radionuclides has not been determined, but some may have been fallout from atomic testing. The concentrations of metals detected were all below RCRA TC screening levels.

No statistical analysis for confirmatory sampling was conducted because the radionuclides were below SALs. Because no COCs were identified, verification sampling for cleanup is not necessary. Field screening for radioactivity will be conducted as described in the Field Screening Plan (Appendix A) and a grab sample will be collected for gamma spectroscopy to compare to site-specific background levels.

8.0 ESTIMATED SCHEDULE AND COST TO COMPLETE EACH VCA

Table 8-1 indicates each PRS with corresponding types of operation for cleanup, types of contractors required, estimated costs, and construction start and end dates. Cost projections include on-site personnel, contractors, equipment, and confirmatory sampling analyses. Cost estimate summaries are included in Appendix G.

Table 8-1
Estimated Cost and Schedule for Each VCA

PRS No.	Type of Operation(s)	Proposed Types of Contractor(s)	Estimated Cost	Start Date	Complete Date
53-010	Remove liner, scrape and take soil to fill area. Recontour and reseed	Construction contractor using backhoes, bobcats, shovels 6 samples for VOCs, including 1,2,4-trimethylbenzene (non-expedited)	$19,690 $2000	8/14/95	8/18/95
20-003(c)	Remove 20' x 20' x 1' concrete pad. Remove other debris minimizing removal of soil. Refill, recontour, and reseed	Construction contractor using backhoes, bobcats, jackhammer, welding equipment, shovels 1 sample gamma spectroscopy (non-expedited)	$27,304 $120	8/21/95	8/25/95

9.0 REFERENCES

LANL, May 1994. "RFI Work Plan for Operable Unit 1100," LANL Report LA-UR-94-1097, Los Alamos, New Mexico. (LANL 1994, 1157)

LANL, November 1990. "Solid Waste Management Units Report," LANL Report, Los Alamos, New Mexico. (LANL 1990, 0145)

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)

APPENDIX A

Field Screening Plan

Field Screening Plan

This plan outlines the steps to be taken for field screening of soil and debris during VCAs at PRS 53-010 and 20-003(c). All cleanup efforts have been based on results from sampling. During the cleanup, screening techniques will be used for health and safety reasons in the potentially contaminated areas if required by the health and safety plan. Field screening of soils and debris will be used to detect alpha, beta, and gamma radiation and VOCs with ionization potentials less than 11.7 eV. In the field screening process, these steps will be followed:

1. Visual Survey
2. Radiation Screening
3. VOC/SVOC Screening
4. HE Field Test

The visual survey of each PRS will involve a walkaround of the site before and during debris and soil removal. The purpose of visually surveying the site before the start of work is to identify the work area perimeter and the specific material(s) to be removed. Personnel performing this visual survey will be looking for surface debris, stained soil, evidence of mounds or piles, flags or stakes from previous surveys or investigations, and any other evidence delineating the site. Conditions that may hamper this activity include rain; regrading, recontouring, or revegetation of the site; discovery of archaeological artifacts; active Laboratory work; vegetation covering the site; and anything else that may inhibit the visual survey.

In addition to the visual survey, radiation screening will be done before the start of work activities. This will be done at each site, regardless of whether radioactive materials are suspected to be present. Screening equipment to be used will be approved by the LANL Health Physics Measurement Group (ESH-4) prior to their utilization. The debris and soil at PRS 20-003(c) will be screened for gross alpha, beta, and gross gamma in accordance with LANL-ER-SOP-10.07, Field Monitoring for Surface and Volume Radioactivity Levels. Gross alpha will be analyzed using an alpha probe, gross beta will be analyzed using a beta/gamma probe, and gross gamma will be analyzed using a micro-R. The frequency of debris or soil screening will be at the discretion of the on-site health protection technician (HPT). Personnel will be screened only if radiation is found above background.

For sites where radioactive contamination is identified as being above background, additional radiation screening will ensure that preliminary information is sufficient and that the waste is consistent with anticipated radiation levels. During the VCA at PRS 20-003(c), site-specific background levels will need to be established for the radionuclides that were previously detected. The site-specific background will be compared with the gamma spectroscopy analyses of the grab sample to determine whether the soils are radioactive.

In areas where VOCs are identified as COCs, soil or debris will be collected, placed in jars, and allowed to volatilize in a warm area for approximately 5 minutes. A photo ionization detector (PID) will then be used to check the headspace for VOCs. The only compounds that would be detected, if present, are those that have an ionization potential (IP) of less than 11.7 eV. The most probable instrument to be used for this is an Hnu PI-101. The data collected will help determine whether any contaminants may become airborne and affect the health and safety of site workers. The screening frequency will be determined in the field, based on whether any VOCs are identified as contaminants and whether any detections are registered during excavation and removal activities. Confirmatory samples will be collected at PRS 53-010 and sent to an off-site laboratory.

As field work progresses, decisions may be made by the Field Team Leader in conjunction with the Field Team Manager to reduce or increase the frequency of field screening. Other screening measures may be implemented if additional information is obtained concerning previously unidentified contaminants, or if more appropriate field screening measures are identified.

Table A-1 indicates the screening techniques that will be used on the waste to determine if the waste is radioactive. During debris and soil removal, field screening will be provided on an intermittent basis; that is, a portion of the contents of each B-25 box will be screened for radiation. In addition, debris may be swiped, as practical, for radiological testing.

Table A-1
Field Screening for Contaminants

PRS	Contaminants	Screening Techniques
53-010	TPH	PID
53-010 20-003(c)	Gross alpha, gross beta, and gross gamma	Alpha proble, beta/gamma probe; Micro-R

All calibration and techniques will be conducted and recorded according to the ESH-1 and ER procedures. Additionally, swiping, screening, and determination of background readings will be made according to ER and ESH-1 procedures.

APPENDIX B

Samping Results

Sampling Results for PRS 53-010

PRS	Location	Sample Number	Gamma Spec pCi/g	HE	Metals mg/kg	Pesticide/PCBs mg/kg	SVOC	Sr-90 pCi/g	Total U µg/g	TPH mg/kg	VOCs
53-010	Bermed area of	0253-95-0039					ND			10.3	
	former oil	0253-95-0040					ND			14.1	
	storage	0253-95-0041					ND				
		0253-95-0042					ND			0.0498	
		0253-95-0043					ND			13.2	
		0253-95-0044					ND			7.93	
		0253-95-0045					ND			3440	
		0253-95-0046					ND			3520	
		0253-95-0047					ND			5100*	

Sampling Results for PRS 20-003(c)

PRS	Location	Sample Number	Gamma Spec pCi/g	HE	Metals mg/kg	Pesticide/PCBs mg/kg	SVOC	Sr-90 pCi/g	Total U µg/g	TPH mg/kg	VOCs
20-003(c)	Navy gun site	0220-95-0116	0.047 Cs-137, 0.84 U-234, 0.03 U-235, 0.78 U-238	ND	2300 Al, 4450 Fe, 4.5 Pb, 104 Mn, 11.5 Zn			ND	2.33		
		0220-95-0117	0.254 Cs-137, 0.203 Eu-152, 1.24 U-234, 0.07 U-235, 1.23 U-238	ND	5770 Al, 44.9 Ba, 1160 Ca, 3.3 Cr, 6500 Fe, 8.2 Pb, 265 Mn, 36.8 Zn			ND	3.87		
		0220-95-0118	0.273 Eu-179, 0.353 Ru-106*, 1.96 U-234, 0.07 U-235, 1.93 U-238	ND	3890 Al, 3970 Ca*, 3.1 Cr, 3880 Fe, 5.6 Pb, 164 Mn, 24.8 Zn			ND	5.75		
		0220-95-0119	20.6 Ba-140*, 0.650 Cs-137, 0.278 Eu-152, 1.09 U-234, 0.07 U-235, 1.27 U-238	ND	6090 Al, 54.5 Ba, 1310 Ca, 3.7 Cr, 7330 Fe, 11.6 Pb, 300 Mn, 1370 K, 40.5 Zn*			ND	4		
		0220-95-0120	1.19 U-234, 0.07 U-235, 1.16 U-238	ND	3600 Al, 45.9 Ba, 1220 Ca, 2.8 Cr, 3940 Fe, 9.2 Pb, 220 Mn, 1360 K, 21.5 Zn			ND	3.76		
		0220-95-0121	0.034 Cs-137, 0.186 Eu-152, 0.033 Na-22*, 0.93 U-234, 0.04 U-235, 0.91 U-238	ND	4390 Al, 1130 Ca, 4.7 Cr, 4500 Fe, 7.1 Pb, 179 Mn, 23.2 Zn			ND	2.92		

PRS	Location	Sample Number	Gamma Spec pCi/g	HE	Metals mg/kg	Pesticide/PCBs mg/kg	SVOC	Sr-90 pCi/g	Total U µg/g	TPH mg/kg	VOCs
		0220-95-0122	0.223 Cs-137, 1.06 U-234, 0.05 U-235, 1.08 U-238	ND	4970 Al, 66 Ba, 1360 Ca, 3.1 Cr, 6220 Fe, 12.8 Pb, 307 Mn, 1460 K, 35.4 Zn			ND	3.55		
		0220-95-0123	2.46 U-234, 0.11 U-235*, 2.32 U-238	ND	3150 Al, 2950 Fe, 7.3 Pb, 162 Mn, 18.9 Zn			ND	6.95		
		0220-95-0124	0.153 Eu-152, 1.24 U-234, 0.07 U-235, 1.32 U-238	ND	3590 Al, 2410 Ca, 2.8 Cr, 3820 Fe, 7.5 Pb, 179 Mn, 24.2 Zn			ND	4.33		
		0220-95-0125	0.963 Cs-137*, 0.224 Eu-152, 1.53 U-234, 0.06 U-235, 1.50 U-238	ND	7700 Al*, 59 Ba, 1920 Ca, 5.0 Cr, 4.9 Cu, 7320 Fe, 16 Pb, 1200 Mg, 261 Mn, 1910 K*, 10.4 V, 37.3 Zn			ND	4.37		
		0220-95-0126	0.028 Cs-137, 0.164 Eu-152, 1.18 U-234, 0.05 U-235, 1.32 U-238	ND	6480 Al, 52.9 Ba, 1380 Ca, 4.1 Cr, 6770 Fe, 9.2 Pb, 1060 Mg, 281 Mn, 1430 K, 34.3 Zn			ND	3.97		

PRS	Location	Sample Number	Gamma Spec pCi/g	HE	Metals mg/kg	Pesticide/PCBs mg/kg	SVOC	Sr-90 pCi/g	Total U µg/g	TPH mg/kg	VOCs
		0220-95-0127	0.035 Co-60, 0.027 Cs-137, 0.201 Eu-152, 1.37 U-234, 0.06 U-235, 1.43 U-238	ND	6000 Al, 52.1 Ba, 1540 Ca, 3.8 Cr, 6440 Fe, 9.1 Pb, 277 Mn, 1400 K, 35.3 Zn			ND	4.01		
		0220-95-0128	0.279 Cs-137, 0.164 Eu-152, 1.04 U-234, 0.07 U-235, 1.02 U-238	ND	5250 Al, 74.2 Ba, 1310 Ca, 3.7 Cr, 5370 Fe, 13.1 Pb, 254 Mn, 1310 K, 37.3 Zn			ND	3.62		
		0220-95-0129	0.111 Eu-152, 1.79 U-234, 0.07 U-235, 1.80 U-238	ND	5510 Al, 1360 Ca, 4.1 Cr, 6090 Fe, 9.2 Pb, 266 Mn, 1190 K, 39.2 Zn			ND	5.11		
		0220-95-0130	0.175 Eu-152, 1.74 U-234, 0.07 U-235, 1.65 U-238	ND	5080 Al, 48.3 Ba, 1.0 Br, 1490 Ca, 3.2 Cr, 5330 Fe, 9.0 Pb, 241 Mn, 1090 K, 30.6 Zn			ND	5.01		
		0220-95-0131	0.379 Cs-137, 0.226 Eu-152, 1.75 U-234, 0.10 U-235, 1.64 U-238	ND	4060 Al, 42.7 Ba, 1470 Ca, 2.4 Cr, 5180 Fe, 12.1 Pb, 226 Mn, 1080 K, 36.4 Zn			ND	5.68		

PRS	Location	Sample Number	Gamma Spec pCi/g	HE	Metals mg/kg	Pesticide/PCBs mg/kg	SVOC	Sr-90 pCi/g	Total U µg/g	TPH mg/kg	VOCs
		0220-95-0139	0.331 Eu-152*, 2.83 U-234*, 0.11 U-235*, 2.90 U-238*	ND	1830 Al, 1070 Ca, 2310 Fe, 3.8 Pb, 107 Mn, 13.5 Zn			ND	9*		
		0220-95-0140	0.606 Cs-137, 0.235 Eu-152, 0.87 U-234, 0.06 U-235, 0.97 U-238	ND	7770 Al*, 2.2 As*, 207 Ba*, 1.1 Br*, 2670 Ca, 5.7 Cr*, 7.4 Cu*, 7640 Fe*, 16.2 Pb*, 1710 Mg*, 325 Mn*, 1760 K, 15.5 V*, 34.9 Zn			ND	3.31		
		0220-95-0141	0.137 Eu-152, 0.71 U-234, 0.03 U-235, 0.73 U-238	ND	3900 Al, 39.4 Ba, 4.4 Cr, 7.4 Cu*, 4350 Fe, 5.8 Pb, 179 Mn, 23.2 Zn			ND	2.37		
		0220-95-0142	1.24 U-234, 0.05 U-235, 1.31 U-238	ND	4420 Al, 50.3 Ba, 1180 Ca, 3.1 Cr, 4450 Fe, 7.4 Pb, 219 Mn, 24.7 Zn			ND	3.97		

FRS	Location	Sample Number	Gamma Spec pCi/g	HE	Metals mg/kg	Pesticide/PCBs mg/kg	SVOC	Sr-90 pCi/g	Total U µg/g	TPH mg/kg	VOCs
		0220-95-0132	0.301 Eu-152, 1.81 U-234, 0.09 U-235, 1.81 U-237	ND	3500 Al, 0.98 Br, 1130 Ca, 4420 Fe, 7.7 Pb, 222 Mn, 29.7 Zn			ND	6.08		
		0220-95-0133	0.195 Eu-152, 1.78 U-234, 0.09 U-235, 1.71 U-238	ND	3820 Al, 1440 Ca, 2.1 Cr, 4660 Fe, 7.9 Pb, 205 Mn, 31.4 Zn			ND	5.53		
		0220-95-0134						ND			
	Field blank	0220-95-0135	16.3 Ba-140, 3.07 Co-60*, 0.01 U-234, 0.01 U-235, 0.02 U-238	ND	ND			ND	0.29		
		0220-95-0136	2.70 U-234, 0.11 U-235*, 2.83 U-238	ND	2000 Al, 1180 Ca, 2000 Fe, 4.8 Pb, 91.7 Mn, 14.6 Zn			ND	8.8		
		0220-95-0137	0.442 Cs-137, 0.166 Eu-152, 0.96 U-234, 0.03 U-235, 0.98 U-238	ND	3430 Al, 70.5 Ba, 1250 Ca, 2.3 Cr, 4140 Fe, 10.6 Pb, 198 Mn, 29.5 Zn			ND	3.16		
		0220-95-0138	0.045 Cs-137, 2.24 U-234, 0.08 U-235, 2.20 U-238	ND	4580 Al, 1 Br, 1410 Ca, 3 Cr, 5040 Fe, 8.7 Pb, 220 Mn, 1300 K, 31.9 Zn			ND	7		

APPENDIX C

Characterization Strategy Forms

CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1100/FU2	PRS-20-003(c)	Navy Gun Site

Name: David O'Flynn	**Date:** 8-4-95
FPL: Gene Gould	**WMC:** Ted Norris
Type of Activity: Voluntary Corrective Action (VCA)	

Site Description: This gun firing site located near the center of TA-20 was the site of a Naval gun mounting from which guns were fired into the nearby canyon walls from 1944 to 1948. This site was also used in the past for neutron timing, initiator, and equation-of-state tests. The concrete pad, approximately 20 ft. by 20 ft. by 1 ft. thick, with anchor bolts, is still in place. Several remediation efforts have taken place; after the site was closed, before East Jemez Road was built, and in 1988. The concrete pad is covered by soil and is not readily visible. During Phase 1 of an ER site investigation, two 10-ft. deep trenches that were dug across the area and twelve samples were collected from the trenches. The trenches were deeper than the debris at the site. Some electrical utilities run through the area. Based on process knowledge, the potential contaminants include HE, beryllium, nickel, and cadmium. Strontium-90 and radium could be present because radioactive sources were used during site operations. Polonium-210, lanthanum-140, depleted uranium (U-238), and strontium-90 were used in tests at TA-20. The only radioactive decay product of concern is thorium-234, which is the decay product of U-238. The site investigation samples were sent to an analytical laboratory for gamma spectroscopy, strontium-90, total metals, and HE analyses. HE and strontium-90 were not detected. Total metal concentrations were below the TC screening levels. Numerous radionuclides were detected based on the gamma spectroscopy. It is unclear whether the soil should be considered radioactive because site-specific background levels were not been established for all the detected radionuclides. During the VCA, site-specific background levels will be established for the radionuclides that were previously detected. The site-specific background will be compared with the gamma spectroscopy analyses of the confirmatory samples to determine whether the soils are radioactive.

Investigation or Remediation Waste Description and Volume Estimate:
Waste Types: Debris (e.g., concrete, wood, metal, electrical conduit and wire) and small amounts of soil. The VCA does not call for soil removal; however, small amounts of soil may be mixed with the debris. Decontamination liquids and PPE will not be generated.
Waste Packaging: B-25 type boxes, covered roll-off bins, or tip trucks. The total debris volume is expected to be 19 yd^3.

Characterization Strategy: Debris and the small amounts of soil will be characterized based on the analytical results of the twelve Phase 1 soil samples that were described above. In addition, the debris and soil will be field screened for gross alpha, gross beta, and gross gamma in accordance with LANL-ER-SOP-10.07, Field Monitoring for Surface and Volume Radioactivity Levels. Gross alpha will be analyzed using an alpha probe, gross beta will be analyzed using a beta/gamma probe, and gross gamma will be analyzed using a micro-R. After the debris and soil are removed, a grab sample will be taken of the soil and analyzed using gamma spectroscopy. The results for gamma spectroscopy will be compared with site-specific background levels to determine if the soil is radioactive.

CHARACTERIZATION STRATEGY FORM (Continued)

OU Number	PRS/SWMU Number	Title
1100/FU	PRS-20-003(c)	Navy Gun Site

Preliminary RCRA Determination (place "X" in front of "Non-RCRA" or "RCRA" below)

X	Non-RCRA: (No 90-Day Storage Requirement) Describe how waste will be stored/handled:
	RCRA: (90-Day Storage Requirement) Waste will be stored/handled in accordance with 20 NMAC 4.1 Generator Requirements

Analyte Suites

Analyte Category	Analytical Method	Direct Sampling of Containerized Waste	Acceptable Knowledge	
			Existing Information Present	Existing Information Absent	Data from Site Characterization
Volatile Organic Compounds				X	
Semi-Volatile Organic Compounds	SW 8270			X	
Organic Pesticides and PCBs				X	
High Explosive Compounds				X	
Gross Alpha	field screen (see text)				X
Gross Beta	field screen (see text)				X
Gross Gamma	field screen (see text)				X
Tritium*				X	
Asbestos				X	
TCLP				X	
Metals				X	
Organics				X	
Pesticides, herbicides				X	
Gamma Spectroscopy (Lab Analysis)	901.1				X
Strontium-90 (Lab Analysis)	905.0			X	

*If Absent is checked under existing information for tritium, you must specify (in the "Characterization Strategy" box) the existing information supporting your contention that elevated tritium levels are not present.

Signatures: ER Project Representative _____

Waste Management Representative Rosemary Blanco 8-8-95

Form Author Julie Wanslow

CHARACTERIZATION STRATEGY FORM

OU Number/FU	PRS/SWMU Number	Title
1100/FU2	PRS-53-010	Bermed Mineral Oil Storage Area

Name: David O'Flynn	**Date:** 8-4-95
FPL: Gene Gould	**WMC:** Ted Norris
Type of Activity: Voluntary Corrective Action (VCA)	

Site Description: The site is located southeast of the fenced area that includes TA-53-1031. This bermed area was used as a secondary containment storage area for two 3,000-gal. tanks and eighteen 55-gal. drums of mineral-oil-based scintillator liquid, described as containing a small percentage of pseudocumene. The site was in use from 1989 to 1990. The storage area is approximately 22 ft by 34 ft with 2-ft-high soil berms. The interior slopes of the berms and the floor were lined with a geotechnical liner covered with soil. The drums and tanks were removed in 1990, and two small areas of visual contamination were cleaned up. During Phase 1 of an ER site investigation, six soil samples were collected above the liner and sent to an analytical laboratory for semi-volatile organic compound (SVOC) and total petroleum hydrocarbon (TPH) analyses. No SVOCs were detected. Three of the samples contained TPH concentrations above 1,000 mg/kg. The highest concentration was 5100 mg/kg. If pseudocumene (which is also known as 1,2,4-trimethylbenzene) is the cause of the elevated TPH concentrations, this site may pose a risk. Therefore, it has been decided that additional site investigation is needed. During the week of August 7, 1995, one additional soil sample will be collected at the location of the highest TPH concentration. This sample will be analyzed for volatile organic compounds (VOC) using SW-846 8260A and the laboratory will be requested to specifically quantify 1,2,4-trimethylbenzene because this constituent is not a routine analyte of Method 8260A. This information will be used to determine if the soil poses a risk due to specific VOCs. Based on the six, site investigation analytical results, the soil does not contain SVOCs. Based on process knowledge, the mineral oil storage area is not contaminated with tritium or asbestos. Based on process knowledge, the following RCRA-regulated constituents are not expected to be present in the waste: organic pesticides and PCBs, inorganic compounds, high explosive compounds, TCLP metals, TCLP organics, TCLP pesticides and herbicides. Based on the high concentrations of TPH, it is known that the waste will contain VOCs, however, the types of VOCs are unknown. Based on process knowledge, it is expected that the VOCs will not be RCRA-regulated. As mentioned above, the types of VOCs will be confirmed before the waste is generated.

Investigation or Remediation Waste Description and Volume Estimate:
Waste Types: Geotechnical liner, soil, decontamination liquids, and PPE.
Waste Packaging: The geotechnical liner will be placed in 55-gal. drums. Two drums are expected to be needed. The soil above the liner will be placed in roll-off boxes. The total soil volume is expected to be 27 yd^3. The decontamination liquids will be placed in 55-gal. drums. The total volume of decontamination liquid is expected to be two drums. No visibly contaminated PPE is expected to be generated.

Characterization Strategy: The soil above the geotechnical liner will be removed and placed in roll-off boxes. The liner will be removed and placed in the 55-gal. drums. The liner and the excavated soil will be characterized based on the analytical results of the six Phase 1 soil samples and the one additional sample collected during the week of August 7, 1995, as described above. In addition, the excavated soil and liner will be field screened for gross alpha, gross beta, and gross gamma in accordance with LANL-ER-SOP-10.07, Field Monitoring for Surface and Volume Radioactivity Levels. Gross alpha will be analyzed using an alpha probe, gross beta will be analyzed using a beta/gamma probe, and gross gamma will be analyzed using a micro-R. The soil may need to be treated by an offsite facility to reduce the elevated TPH levels. After the soil and liner are removed, confirmatory, random, grab samples will be taken of the soil below the liner and analyzed for VOCs (including 1,2,4-trimethylbenzene). If the soil below the liner must be removed, another strategy form will be completed. The decontamination liquids will be characterized based on the results of the soil samples described above. The PPE will be decontaminated and visually inspected afterward to determine if there is any visible contamination. If the PPE is not visibly contaminated, it will be placed in plastic bags and disposed as non-hazardous waste. If the PPE is visibly contaminated, it will be placed in 55-gal. drums and will be characterized based on the analytical results of the soil samples.

CHARACTERIZATION STRATEGY FORM (Continued)

OU Number	PRS/SWMU Number	Title
1100/FU	PRS-53-010	Burned Mineral Oil Storage Area

Preliminary RCRA Determination: (place "X" in front of "Non-RCRA" or "RCRA" below)

X	Non-RCRA: (No 90-Day Storage Requirement) Describe how waste will be stored/handled:
	RCRA: (90-Day Storage Requirement) Waste will be stored/handled in accordance with 20 NMAC 4.1 Generator Requirements

Analyte Suite:

Analyte Category	Analytical Method	Direct Sampling of Containerized Waste	Acceptable Knowledge	
			Existing Information Present / Absent	Data from Site Characterization
Volatile Organic Compounds	8260A**		X	
Semi-Volatile Organic Compounds	SW 8270		X	
Organic Pesticides and PCBs			X	
High Explosive Compounds			X	
Gross Alpha	field screen (see text)			X
Gross Beta	field screen (see text)			X
Gross Gamma	field screen (see text)			X
Tritium*			X	
Asbestos			X	
TCLP			X	
Metals			X	
Organics			X	
Pesticides, herbicides			X	
TPH	MCAWW 418.1		X	

*If Absent is checked under existing information for tritium, you must specify (in the "Characterization Strategy" box) the existing information supporting your contention that elevated tritium levels are not present.

** Will include 1,2,4-trimethylbenzene which is not a routine analyte

Signatures: ER Project Representative _____

Waste Management Representative Rosemary Glenn 8-8-95

Form Author Julie Wanslow

Los Alamos
NATIONAL LABORATORY
memorandum
Engineering Sciences and Applications Division
ESA-DE Design Engineering Support Group

To/MS: Memo To The File
From/MS: T. E. Gene Gould, G787
Phone/FAX: 7-0402/5-1976
Date: August 7, 1995

SUBJECT: CHARACTERIZATION STRATEGY FORM

Based on my review of available information and my professional judgment, it is not necessary to sample for tritium because it is not a potential contaminant at PRSs 53-010 and 20-003(c).

APPENDIX D

Reconsidering or Stopping Work for VCAs

FRAMEWORK FOR RECONSIDERING OR STOPPING WORK ON EXPEDITED CLEANUPS AND VOLUNTARY CORRECTIVE ACTIONS

During the conduct of expedited cleanups (ECs) or voluntary corrective actions (VCAs), it is important to **preplan** a framework for understanding when the potential release site (PRS) conceptual model is flawed to the extent that continuing an EC or VCA should be **reconsidered**. This determination may not be straight forward and may be complicated by factors that are not readily apparent. While pursuing the EC or VCA is important to the ER project success, we must be careful to ensure that the pursuit of a "bean" does not tempt us to ignore emerging problems during the field work. The Field Project Leader (FPL) should reconsider any time information becomes available that indicates the site conceptual model may be off target. Furthermore, if the additional information warrants, **work should be stopped**.

Several past examples demonstrate the need for reconsideration and stopping criteria:

- Waste type was thought to be solely hazardous, but was in reality "mixed waste".
- Volume of waste was thought to be small , but was, in fact, much larger.
- Spatial boundaries of the site were thought to be defined, but subsequently were found to be much larger.
- Waste was thought to be uncontaminated debris, but upon disposal was determined to be contaminated with radionuclides.

Have we just been unlucky? Probably not. These are classic examples of the old maxim that if something can go wrong, it will. We must, therefore, maximize the opportunity to reconsider or stop work before it becomes a safety hazard, a professional embarrassment, or a bottomless pit for scarce resources, such as budget dollars or site disposal capacity.

If one or more factors change the prevailing site conceptual model, then **reconsider** the consequences of the change(s) and **stop work** if the change warrants it. Consider the following as a framework, **not** as a prescriptive solution to this difficult problem. The examples provided below are **not** intended to be an exhaustive listing of all possible changes, only an indication of changes frequently encountered.

When stopping work is determined to be the appropriate action, it is crucial to have a plan that describes "safe" shutdown for the site EC or VCA operation. "Safe" in this context should consider such things as worker and trespasser safety, safe storage of wastes generated to date, and a shutdown configuration that ensures conditions at the site do not further mobilize contaminants or provide enhanced pathways for off site migration.

POSSIBLE CRITERIA FOR RECONSIDERING AND/OR STOPPING WORK ON ECs/VCAs

1) **WASTE** - Changes in type, volume, disposal capacity, disposal location, etc.

- If the composition of waste changes and there is limited capacity for the site waste, such as mixed wastes,

- If the volume of waste begins to grow by more than 50%[1] of the initial estimate, or

- If the disposal or treatment capacity for the site waste is not immediately available and would require waste storage for more than 90 days.

Reconsider the consequences of the change(s) and **Stop**, if the change warrants it.

2) **COST** - Changes in available budget, total cost of project, etc.

- If the budget for site EC or VCA grows by more than 50%[1] of the initial estimate, or

- If sites are prioritization similarly, those with increasing costs may go down in project priority due to added costs, as the project would accomplish fewer EC/VCAs, or

- If continuation will affect the program's ability to take action at sites of equal or greater urgency.

Reconsider the consequences of the change(s) and **Stop**, if the change warrants it.

3) **LEVEL OF PROBLEM UNDERSTANDING** - Changes in contamination type or level, job difficulty, etc.

- If the waste constituents change and impact the selected treatment/disposal alternatives,

- If the extent of contaminant movement or the contaminant transport mechanism affects the overall job difficulty, or

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[1] Initial estimates of engineering costs are typically only good within a range of + or - 50%. The relationship of waste management volume to waste management cost is usually linear, so that if volume increases 50% then so do costs.

- If the impact of continuing the action creates a greater problem (e.g., regulatory, public relations, ecological, etc.) than stopping work.

Reconsider the consequences of the change(s) and **Stop**, if the change warrants it.

4) RESOURCES - Changes in knowledge, expertise, equipment, services, etc.

- If new or additional site data causes the site problem to change from understood/ documented historical site data,

- If the remediation equipment needed for the changed site problem is unavailable,

- If the expertise of available staff does not match the changed site problem, or

- If the sensitivity or analytical detection limits of available analytical methods for the changed site problem does not meet the revised site cleanup requirements.

Reconsider the consequences of the change(s) and **Stop**, if the change warrants it.

5) SAFETY - Changes in engineering plan or risk to remedial site worker, LANL worker, or off-site citizen, etc.

- If additional site findings suggest a new or greatly increased risk of an acute or chronic nature to remedial site worker, LANL worker, or off-site citizen,

- If a change to the remedial engineering plan, such as the depth of excavation, differs from the site safety plan, or

- If getting a "bean" by end of the fiscal year appears to compromise safety.

Reconsider the consequences of the continued action(s) and **Stop**, if the finding warrants it.

6) "LAUGH" TEST - Question the appropriateness of what is being done.

- If you doubt that your actions are consistent with common sense, or

- If you think you are being asked to do something stupid, but in a smarter way.

Reconsider the consequences of the continued action(s) and **Stop**, if the finding warrants it.

APPENDIX E

Methodologies for Developing Site-Specific Cleanup Goals to Demonstrate Clean Closure

METHODOLOGIES FOR DEVELOPING SITE-SPECIFIC CLEANUP GOALS TO DEMONSTRATE CLEAN CLOSURE

1.0 APPROACH

A site-specific risk-based cleanup level was calculated PRS 53-010. Results of the analytical data for PRS 53-010 indicated a maximum contaminant concentration for total petroleum hydrocarbon (TPH) of 5,100 mg/kg - analyte unknown; however, no semi-volatiles (SVOCs) were detected and no analysis was requested for volatile organics (VOCs) under the work plan. For sites where analytical data are not available, clean-up is based on determining remediation goals for indicator constituents. Indicator chemicals/constituents are suspected COCs that are based on existing information of a site and are the most health conservative.

Referring to the historical use of the site, pseudocumene (synonym 1,2,4-trimethylbenzene) was used as part of the mineral spirit mixture referred to as a scintilation cocktail. Therefore, 1,2,4-trimethylbenzene was selected as the indicator for TPH at a maximum detected concentration of 5,100 mg/kg. Using a soil SAL of 40 mg/kg for 1,2,4- trimethylbenzene, it failed the screening assessment (comparison to SAL), and has been identified as a chemical of concern (COC) as presented in Table E-1. Surface contamination (i.e., the top 6-inches of soil on the liner) is suspect at PRS 53-010, and no subsurface soil excavation is indicated.

Table E-1, Indicator Chemical of Concern

PRS	Chemical of Concern
53-010	1,2,4-trimethylbenzene

2.0 Cleanup Goals

2.1 Chemical Constituents

A site-specific cleanup goal was calculated using a modified Environmental Protection Agency (EPA) equation and site-specific input parameters. Because of the location of this site, the cleanup goal is based on a reasonable maximum exposed individual (a healthy working adult) under a continued laboratory operations land use scenario.

Under the industrial land use scenario, risk from exposure to chemicals is assumed to be a result of direct ingestion and inhalation of particulates from the soil. EPA default parameters are based on nonintrusive work and the physical properties of the COCs. Calculations of cleanup goals are consistent with Risk Assessment Guidance for Superfund (RAGS) Part B (EPA 1991a) and RAGs Supplemental Guidance (EPA 1991b) and consider updates to the RAGs Part B equations (EPA 1994).

The cleanup goal for 1,2,4 trimethylbenzene was developed using toxicity criteria provided by EPA's Environment Criteria and Assessment Office. Equation 1 was used to calculate a cleanup goal for nonintrusive industrial work. The equation for soil combines across pathways for direct exposures through ingestion and inhalation, where toxicity criteria is available. Table D-2, Spreadsheet for Calculating A Noncarcinogenic Cleanup Goal for Industrial Exposure (Nonintrusive Work) was used in equation 1 to derive the goal. Table D-3, Cleanup Goal Based On Hazard Index Of 1 (Nonintrusive Work) provides the cleanup goal for 1,2,4-trimethylbenzene.

Equation 1: Direct Exposures to Noncarcinogenic Constituents in Industrial Soil (Nonintrusive Work)

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

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) Considered to be 25 years (EPA 1991a)
EF_o	=	Exposure Frequency - occupational (d/y) Considered to be 250 d/y (EPA 1991b)
RfD_o	=	Reference dose-oral (mg/kg-d) (IRIS, HEAST, or ECAO)
IRS_o	=	Soil ingestion - occupational (mg/day) Considered to be 50 mg/day (EPA 1991a)
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) Considered to be zero for all chemicals with a molecular weight >200 g/mole and Henry's Law constant < 1 x 10^{-5} atm-m^3/mole
PEF	=	Particulate emission factor (m^3/kg) Considered to be 1.11 x 10^{+7} (m^3/kg) (LANL)

Table D-2, Spreadsheet for Calculating A Noncarcinogenic Site-Specific Cleanup Goal for Industrial Exposure
(Nonintrusive Work)

Chemical of Concern	Oral RfD* (mg/kg/day)	Inhalation RfD (mg/kg/day)
1,2,4-Trimethylbenzene	5E-04	NA

NOTE:
* RfD: Reference dose

Table D-3, Cleanup Goal Based On Hazard Index of 1
(Nonintrusive Work)

Chemical of Concern	Cleanup Goal Based On Hazard Index of 1 (mg/kg)
1,2,4-Trimethylbenzene	1,020

REFERENCES:

EPA (US Environmental Protection Agency) 1991. "Risk Assessment Guidance for Superfund, Volume 1, 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, DC (EPA 1991a).

EPA (US Environmental Protection Agency) 1991. 'Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Supplemental Guidance,' "Standard Default Exposure Factors," Interim Final Report, OSWER Directive 9285.6-03, Office of Solid Waste and Emergency Response, Toxics Integration Branch, Washington, DC, 1989. (EPA 1991b).

EPA (US 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).

APPENDIX F

Statistical Plan for PRS 53-010

SUBJECT: CONFIRMATORY SAMPLE SIZE FOR PRS 53-010

A statistical analysis of the data for determining the required sample size for confirmatory sampling has been completed. Based on the size of the area size at PRS 53-010, the required confirmatory sampling size and associated length between sample locations is provided below (Table 1). Statistical information is also provided. We followed the guidelines specified in EPA Methods For Evaluating the Attainment of Cleanup Standards Volume1: Soils and Solid Media (1988).

Please follow the directions below and the table as specified.

- A rectangular grid system has been selected for this site.
- To introduce a random component into the sampling, initially select the first sampling point, at random, and from there on follow the specified spacing indicated for the site (Table 1)
- 6 samples (n) is the sample size for confirmatory sampling
- CV = .5
- F = .5
- Beta = 0.13 (the likelihood of a false negative; the site is dirty when it is really clean is 13%. NOTE: want this to be low.
- Spacing between adjacent locations for a rectangular grid are as follows:

Table 1. Sampling Size and Distance Between Points

Site Number	53-010
Approximate Area (sq ft)	748
Length of Ray Between Sampling Points (ft.)	11

APPENDIX G

Cost Estimate

Bid Item Summary
Sorted by: Potential Release Sites
(Costs Adjusted to Bid Quantities)

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Nat'ls	Equip.	Supplies	Sub-contracts	Total Cost
Potential Release Sites 53-010: Bermed Mineral Oil Storage									
53-101	Excavation Permits	1 LS					530		530
53-102	Highway Hauling Permit	1 LS					265		265
53-103	Utility Location/Relocation Permit	1 LS					265		265
53-201	Security Escort for Site Work								
53-202	Medical Examinations of Workmen	1 LS					375		375
53-203	Hazwoper 40 hr. Training	1 LS					1,500		1,500
53-204	Rad II Training for Each Workman	1 LS							
53-301	ESH Supplies and Expenses	1 LS					1,395		1,395
53-401	Waste Temporary Storage & Monitoring	1 LS	30	712		20	71		803
53-501	Tech. Area 53 Exc. Waste Soils Unit costs:	26 CY	111 4.265	3,087 118.737	700 26.924	450 17.318	1,612 61.996		5,849 224.975
53-502	Subcontractor Decon Operation	1 LS	20	535	90	67	590		1,282
53-601	Characterization Lab Analysis	1 LS							
53-602	Confirmatory Lab Analysis	1 LS					3,182		3,182
53-604	Field Screening Samples	1 LS					1,061		1,061
53-605	Decon Water Sample Analysis	1 LS					3,182		3,182
53-701	Work Reports, Daily, Weekly, Monthly	1 LS							
	Subtotal, Bermed Mineral Oil Storage		161	4,334	790	537	14,028		19,689
	Takeoff Units:	26 CY	6.203	166.725	30.385	20.650	539.530		757.290
	Adjusted to Bid Quantity: Unit costs:	26 CY	161 6.192	4,335 166.731	790 30.385	537 20.654	14,028 539.538		19,689 757.308

Bid Item Summary
Sorted by: Potential Release Sites
(Costs Adjusted to Bid Quantities)

Sheet No.	Description	Quantity	Manhours	Labor	Perm. Nat'ls	Equip.	Supplies	Sub-contracts	Total Cost
Potential Release Sites 20-003-C: Navy Gun Site									
20-101	Excavation Permits	1 LS					530		530
20-102	Highway Hauling Permit	1 LS					265		265
20-103	Utility Location/Relocation Permit	1 LS					265		265
20-201	Security Escort for Site Work								
20-202	Medical Examinations of Workmen	1 LS					375		375
20-203	Hazwoper 40 hr. Training	1 LS					1,500		1,500
20-204	Rad II Training for Each Workman	1 LS							
20-301	ESH Supplies and Expenses	1 LS					1,992		1,992
20-501	Tech. Area 20 Exc. Waste Soils Unit costs:	19 CY	187 9.868	5,629 296.264	9,832 517.476	1,854 97.602	1,880 98.965		19,195 1,010.307
20-601	Characterization Lab Analysis	1 LS							
20-602	Confirmatory Lab Analysis	1 LS					3,182		3,182
20-701	Work Reports, Daily, Weekly, Monthly	1 LS							
	Subtotal, Navy Gun Site		187	5,629	9,832	1,854	9,989		27,304
	Takeoff Units:	19 CY	9.868	296.264	517.476	97.602	525.758		1,437.100
	Adjusted to Bid Quantity: Unit costs:	19 CY	187 9.842	5,629 296.263	9,832 517.474	1,854 97.579	9,989 525.737		27,304 1,437.053