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RFI Report for Potential Release Sites at TA-14 and TA-12/67

(located in former
Operable Unit 1085)

Field Unit 2

Environmental Restoration Project

February 1996

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-96-511

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Prepared for Los Alamos National Laboratory
by
ICF Kaiser Engineers, Inc.
Los Alamos, New Mexico

February 19, 1996

EXECUTIVE SUMMARY

The former Operable Unit (OU) 1085, located in the northwest quadrant of Los Alamos National Laboratory, consists of two active technical areas (TA), TA-14 and TA-67, and one decommissioned area, the former TA-12.

- The former TA-12 lies primarily within the boundaries of TA-67. Also known as L-Site, the TA was established in 1945 as a testing site for the Explosives (X) Division, which abandoned it in 1946.

  In 1950, the Biomedical Group used TA-12 and constructed a radiation test bunker for conducting an experiment using a 100-Ci radioactive lanthanum-140 source; and in 1951 the Explosives Testing Group began using the area, reportedly firing 600 shots per month (LANL 1994, 1156). By 1953 the entire site was vacated; most of the structures were decontaminated, decommissioned, and burned in 1960.

- TA-14, known as Q-Site, has always been used for explosives development and testing, including tests involving radioactive materials. The TA, which lies west of TA-67, is an active area constructed in 1944 by X Division for close observation work on small explosive charges. In 1952, the firing site was renovated, structures were removed, and a new firing site was constructed (LANL 1994, 1156).

Chemicals of potential concern (COPC) at TA-14 and the former TA-12 include spent high explosives (HE) and their known residual products as well as other chemicals associated with firing sites and their activities. Radionuclide COPCs include uranium and strontium-90 and their daughter products.

Field activities at the former OU 1085 began in April 1995 and were completed by December 1995. Data analysis for 30 of the sites show no contamination of either soil or water. The analytical data received by the laboratory underwent a quality assurance/quality control program, and the results showed that 97% of the data was acceptable and defensible.

The overall objectives of this Phase I field investigation were:
- to determine the nature and extent of contamination (if any) at the PRSs, any risks posed by this contamination, whether contaminants have migrated from their sources;
- the need for corrective action; and
- to satisfy those regulatory requirements that pertain to OU 1085.

Four active Potential Release Sites (PRS) — PRS 14-001(g), PRS 14-005, PRS 14-004(a), and PRS 14-004(b) — were not sampled during this investigation; action on these sites will be deferred until decommissioning. In addition, seven PRSs — PRS 12-001(a), PRS 12-001(b), PRS 14-001(f), PRS 14-002(a), PRS 14-003, PRS 14-009, and PRS 14-010 — will be addressed in separate voluntary corrective action (VCA) plans. The remaining 30 sites have been proposed for no further action using the criteria presented in the Project Consistency Team Policy Number 015, "No Further Action Criteria" (PCT 1995, 1116). Table ES-1 presents all the PRSs considered here and the proposed action for each.

TABLE ES-1
SUMMARY OF PROPOSED ACTIONS

PRS	HSWA Permit	NFA Criteria	Further Action	Rationale	Section Number
12-001(a)	√		VCA	Contaminants found require further action	5.1
12-001(b)	√		VCA	Contaminants found require further action	5.2
C-12-001		4			5.3
C-12-002		4			5.4
C-12-003		4			5.5
C-12-004		4			5.6
C-12-005		4			5.7
12-004(a)		4			5.8
12-004(b)		4			5.9
14-001(f)			VCA	Contaminants found require further action	5.10
14-002(a)	√		VCA	Contaminants found require further action	5.11
14-002(b)	√	1			5.12
14-002(f)	√	1			5.13
14-009	√		VCA	Contaminants found require further action	5.14
14-010	√		VCA	Contaminants found require further action	5.15
C-14-002		1			5.16
C-14-008		4			5.17
14-001(a)		2			5.18
14-001(b)		2			
14-001(c)		2			
14-001(d)		2			
14-001(e)		2			
14-001(g)			Deferred	Site in use	5.19
14-004(c)		4			5.20
14-005	√		Deferred	Site in use	5.21
14-006	√	4			5.22
C-14-003		4			5.23
C-14-004		4			5.24
C-14-005		4			5.25
C-14-006		4			5.26
C-14-007		4			5.27
Central Area Drainage		4			5.28
14-007	√	4			5.29
14-004(a)			Deferred	Site in use	5.30
14-004(b)	√		Deferred	Site in use	5.31
14-002(c)	√	4			5.32
14-002(d)	√	4			5.33
14-002(e)	√	4			
Firing Pad Drainage		4			5.34
14-003	√		VCA	Contaminants found require further action	5.35
C-14-001		4			5.36
C-14-009		4			5.37

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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT

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1.0 INTRODUCTION

1.1 General Site History

The former Operable Unit OU1085 consists of two active technical areas (TA), TA-14 and TA-67, and one decommissioned area, the former TA-12. It is located within the northwestern quadrant of Los Alamos National Laboratory (Laboratory) and south of the Los Alamos townsite (Figure 1.1-1). The OU is approximately 1.75 mi long and 0.7 mi at its widest point and is situated near the head of Pajarito and Threemile mesas.

The former TA-12 lies primarily within the boundaries of TA-67 (Figure 1.1-2), which serves as an inactive buffer area for Laboratory activities. TA-12, the boundaries of which were never clearly defined, was incorporated into TA-67 during the 1989 Laboratory redefinition of technical area boundaries (LANL 1994, 1156).

The former TA-12, known as L-Site, was established in 1945 as a testing site for the Explosives (X) Division. A number of buildings were constructed in support of the explosives testing. An open section was used as a firing site where a number of shots were detonated, including one 70-kg charge. The site was abandoned by X Division in 1946. In 1950, the Biomedical Group (H-4) used TA-12 and constructed a radiation test bunker for conducting an experiment using a 100-Ci radioactive lanthanum-140 source. Starting in 1951, the Explosives Testing Group began using the area, reportedly firing 600 shots per month (LANL 1994, 1156). By 1953 the entire site was vacated, and most of the structures were decontaminated, decommissioned, and burned in 1960.

TA-14, known as Q-Site, has been used for explosives development and testing since 1944, including tests involving radioactive materials (LANL 1994, 1156). The TA, which lies west of TA-67, is an active area constructed in 1944 by X Division for close observation work on small explosive charges. Both open and closed firing chambers were used. Supporting structures include magazines, control buildings, and equipment boxes. In 1952, the firing site was renovated; many structures were removed, and a new firing site was constructed.

Chemicals of potential concern (COPC) at TA-14 and the former TA-12 include the spent high explosives (HE) and their known residual products. Radionuclides possibly present include uranium and strontium-90, and analyses were conducted for these analytes and their daughter products, depending on the site history. A number of other chemicals associated with firing sites and their activities are included in the COPCs at the site. Inorganic constituents possibly present include barium, beryllium, cadmium, chromium, cyanide, lead, and silver. Additional organic COPCs could have resulted from product leaks or spills; analyses were conducted for both volatile (VOC) and semivolatile (SVOC) organic compounds, depending on the site history.

The sites at the former OU 1085 were combined into six aggregates in the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan for Operable Unit 1085 (LANL 1994, 1156). These aggregates consisted of the inactive firing sites, the radioactive lanthanum site, the western area of TA-14, the central area of TA-14, the septic tank, and the east site and west magazine. The bases for aggregation included the type of history and geographical proximity of the sites.

Aggregation was practical for field sampling activities, but is of less value when evaluating analytical results and discussing recommendations for individual potential release sites (PRS). Therefore, aggregates will not be used in this report; instead, PRSs will be discussed individually.

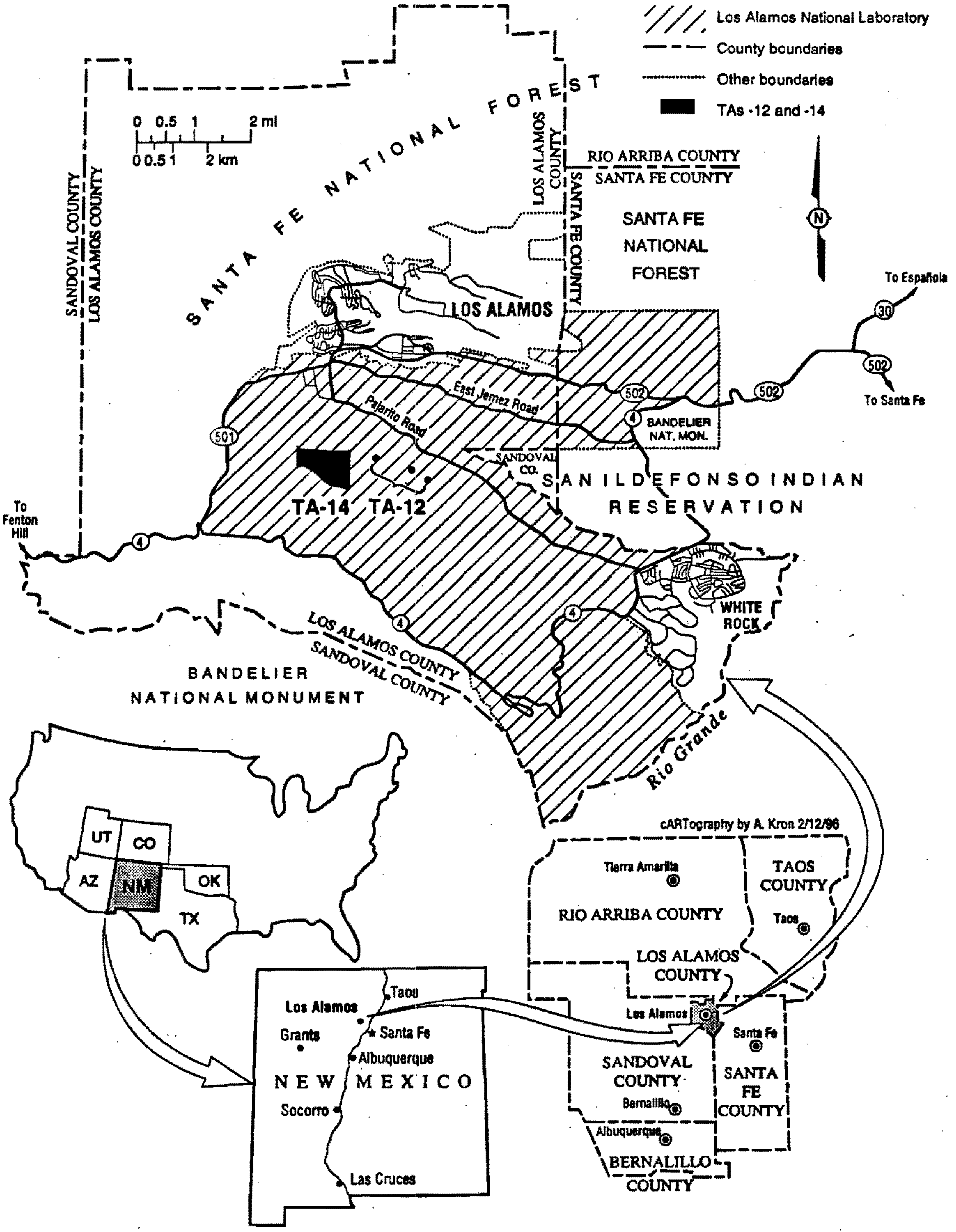


Figure 1.1-1 Location map of TA-14 and the former TA-12 within the Laboratory, Los Alamos County, New Mexico

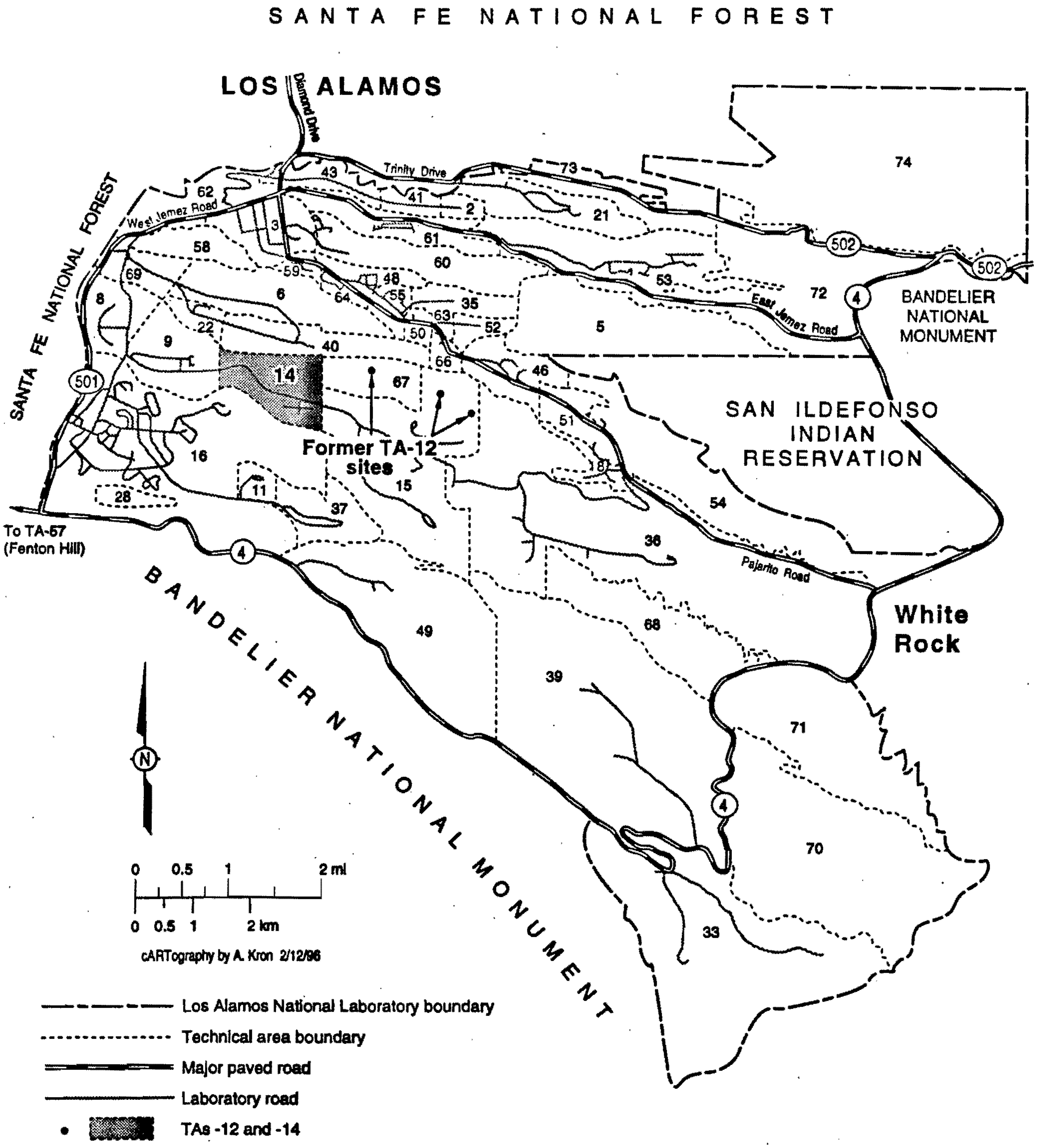


Figure 1.1-2 Location of TA-14 and the former TA-12 with respect to Laboratory TAs and surrounding landholdings.

1.2 RFI Overview

The overall objectives of the Phase I field investigations at the former OU 1085, as outlined in the RFI Work Plan, were to determine

- if any releases occurred at the PRSs, and, if so, the nature and extent of any contamination;
- the risks posed by any contamination to workers and the public; and
- the need for corrective action.

These investigations also satisfy the site-specific regulatory requirements contained in the Laboratory's RCRA operating permit, specifically in Module VIII, which contains the HSWA corrective action requirements (LANL 1995, 1275). The Laboratory sites that are reported on herein include SWMUs and areas of concern (AOCs are sites that contain potentially hazardous substances, such as radionuclides, not regulated under RCRA) which collectively are called potential release sites (PRS).

The RFI Work Plan, which governed the investigations, was submitted to the U.S. Environmental Protection Agency (EPA) on May 23, 1994, amended to correct deficiencies noted by EPA, and accepted by them on December 22, 1994.

The RFI Work Plan, that governed the investigations, was submitted on May 23, 1994, amended to correct deficiencies noted by the U.S. Environmental Protection Agency (EPA), and accepted on December 22, 1994.

The conceptual model developed for the RFI Work Plan identifies sources of contaminants, release mechanisms, and exposure routes. The elements for this model are presented in Table 4-1 of the RFI Work Plan (LANL 1994, 1156). This information was used to develop a conceptual model for each sampling aggregate and to make decisions regarding the sampling and analyses required to adequately characterize a site. The majority of sites discussed in this report had dispersion, runoff, and either infiltration or radiological decay as potential release mechanisms; and direct contact, inhalation, and ingestion as the exposure routes.

Four PRSs — PRS 14-001(g), PRS 14-005, PRS 14-004(a), and PRS 14-004(b) — were not sampled during this investigation because they are still active. Action on these sites will be deferred until decommissioning.

In addition, the following seven PRSs will be addressed not in this report but in separate voluntary corrective action (VCA) plans:

- PRS 12-001(a), Decommissioned steel pit firing site
- PRS 12-001(b), Open pit firing site
- PRS 14-001(f), Inactive firing site
- PRS 14-002(a), Decommissioned and removed firing site
- PRS 14-009, Surface disposal area
- PRS 14-010, Decommissioned sump
- PRS 14-003, Inactive burn area

A voluntary corrective action (VCA) can be proposed at any stage of the RFI process if performing a VCA is shown to provide an obvious, feasible, and final remedy for a site and a more cost-effective action than completing the RFI/Corrective Measures Study process.

Thirty sites discussed in this report have been proposed for no further action (NFA). A site can be proposed for NFA if it meets one of the four criteria presented in Environmental Restoration (ER) Project

Consistency Team Policy Number 015, "No Further Action Criteria" (PCT 1995, 1116). Figure 1.2-1 presents each PRS and the criterion under which it is proposed for NFA.

FIGURE 1.2-1
PRSs SLATED FOR NFA AND CRITERION

Criterion 1: The site has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes and/or constituents, or other CERCLA hazardous substances.

C-14-002 14-002(b) 14-002(f)

Criterion 2: No release to the environment has occurred.

14-001(a-e)

Criterion 4: The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants of concern are either not present or are present in concentrations that would pose an acceptable level of risk under future land use.

C-12-001 C-12-002 C-12-003 C-12-004 C-12-005 C-14-008
C-14-001 C-14-003 C-14-005 C-14-005 C-14-006 C-14-007
C-14-009 12-004(a) 12-004(b) 14-002(c) 14-002(d) Central Area Drainage
14-002(e) 14-007 14-004(c) 14-006 Firing Pad Drainage

1.3 Field Activities

Field activities for this Phase I field investigation (See Section 1.2), as outlined in the RFI Work Plan, consisted of field surveys, sampling, and field screening. Field activities commenced in April 1995 and were completed by December 1995.

Radiological surveys were used for PRSs where radionuclides were suspected to be present to pinpoint areas of potential contamination for biased sampling for screening assessment. Land surveys were performed at all the sites to set grid points and sample locations using established survey monuments and coordinates published in the LANL Survey Monument Network Manual (LANL 1994). A Sokkia Set IIIB Total Station with SDR Data Collector was used to conduct the survey. A geophysical survey was conducted to locate the drainline outlet at PRS 14-010 (Appendix F). Sample locations were determined on the basis of this survey, which found the drainline and the outlet located belowground.

Field screening was performed at each sample location and on the collected sample material to determine potential hazards and to protect the health and safety of on-site workers. Portable radiation detection instruments included a Ludlum Model 2221 scaler/ratemeter with a 44-10 2x2 scintillator and an Eberline ESP-1 survey meter with an HP260 detector. A photoionization detector was used to measure organic vapors.

An HE spot test kit was used to screen every sample location before the start of any intrusive activities. The kit, designed by the Laboratory High Explosives - Science and Technology Group. It tests for common HE such as Composition B, cyclonite (RDX), octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), nitroglycerine, nitrocellulose, trinitrotoluene (TNT), and tetryl(methyl-2,4,6-

trinitrophyenylnitramene). These can be detected down to a concentration of 100 ppm. perrrtaerythritol tetranitrate can be detected down to 500 pprn; triaminotrinitrobenzene (TATB) can be detected, but its lower limit has not yet been established. The test was not used to attempt to quantify the content of HE in any particular sample; its purpose was to indicate the presence of HE that could create special packaging and shipping requirements.

X-ray fluorescence (XRF) was used for all soil samples to determine lead and uranium content. These data, along with the radiological data, were then used to determine which samples, based upon the highest results, would be sent to the fixed analytical laboratory for analysis.

Samples collected were principally soil, both surface and subsurface; one water sample was collected from PRS 14-007. All applicable Los Alamos National Laboratory Environmental Restoration (ER) Standard Operating Procedures (LANL-ER-SOP) were followed, unless otherwise noted in Chapter 5.

2.0 ENVIRONMENTAL SETTING

The environmental, geologic, and hydrologic setting of the Laboratory are described in Sections 2.4 and 2.5 of the Installation Work Plan (IWP) for Environmental Restoration (LANL 1995, 1164). A detailed discussion of the environmental setting for OU 1085, including climate, geology, hydrology, and a conceptual hydrogeologic model for the area, is presented in the RFI Work Plan (LANL 1994, 1156). A summary is presented in the following sections.

2.1 Climate

Los Alamos County, including the Laboratory, has a semiarid, temperate mountain climate. Summers are generally sunny, with moderate, warm days and cool nights. The high altitude, light winds, clear skies, and dry atmosphere allow summer temperatures to range from 45°F to 95°F. During the winter, temperatures typically range from 15°F to 50°F. Average annual precipitation is 18.7 in., but there is a large east-to-west gradient in precipitation across the area. July and August storms account for 36% of the precipitation. Streamflow in the canyons result from summer storms and spring snowmelt runoff (Environmental Protection Group, 1994, 1179).

2.2 Geology

2.2.1 Geologic Setting

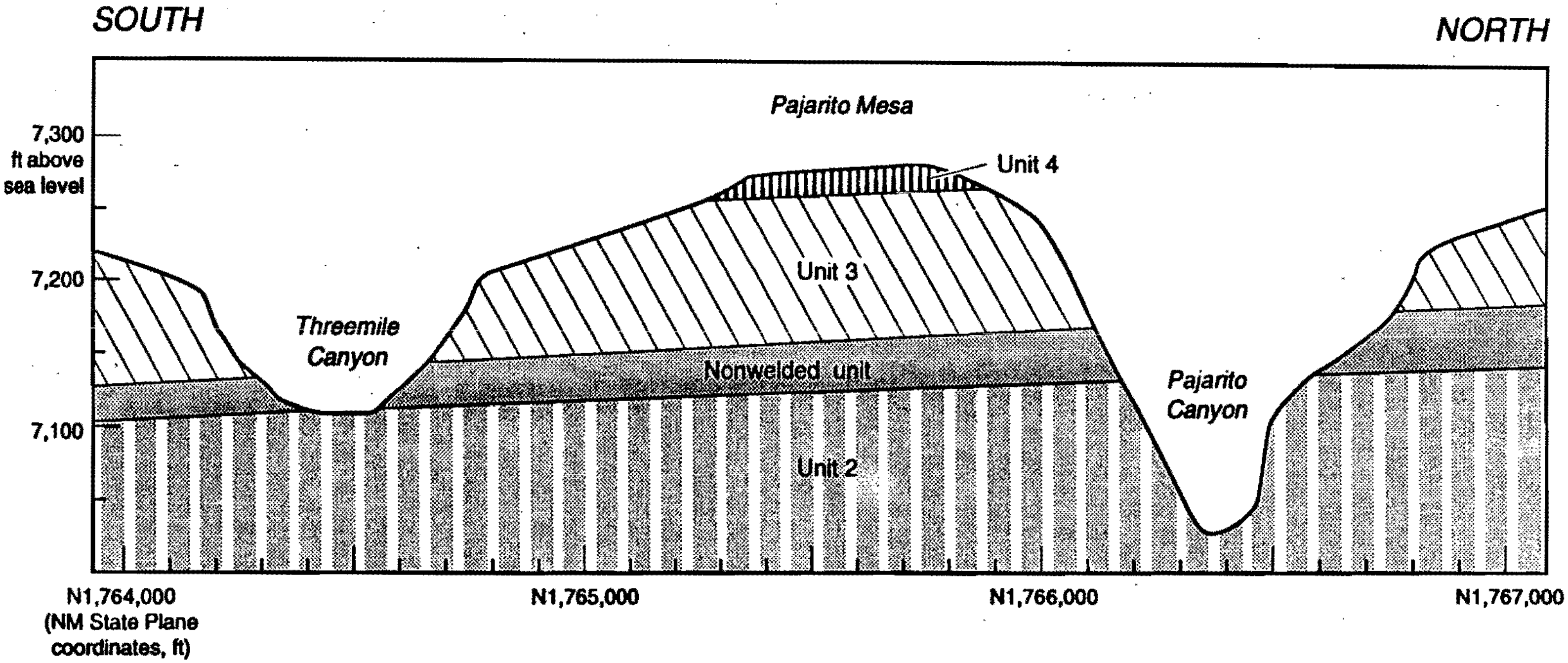
The mesas of the former OU 1085 are underlain by Bandelier Tuff of Pleistocene age, which is exposed on the mesa tops and in canyon walls. Stratigraphic relationships within this area have been inferred from mesa-top and canyon-side mapping. A simplified section through Pajarito Mesa and between Threemile and Pajarito canyons is shown in Figure 2.2.1-1 (Broxton et al., no date, 21-0092).

The top layer of this area consists of the Tshirege Member of the Bandelier Tuff, which is approximately 285 ft deep, although the depth varies across the area. The Otowi Member of the Bandelier Tuff underlies the Tshirege Member and is about 300 ft deep. The deepest large zone below the Otowi Member is the Puye Formation Conglomerates, approximately 450 ft deep. The water table is below the Puye Formation at an elevation of about 6100 ft, or a depth of about 1000 ft (Broxton et al. 1994, 1116).

2.2.2 Soils

The description of the soils at the former OU 1085 is based on the study by Nyhan et al. (1978, 0161). The soils were derived from Bandelier Tuff bedrock and eolian material. A wide variety of soil types with varying thickness occurs at this area (Table 2.2.2-1). Soils are generally thicker in the western portions of the former OU.

Erosion on the mesa tops at the former OU 1085 is caused primarily by shallow runoff on the relatively flat mesa surfaces, by deeper runoff in channels cut into the mesa surfaces, and by rockfalls and colluvial transport from the steep canyon walls. Erosion in the canyon bottoms occurs because of channelized flow along stream courses in the canyon floor. Contaminated sediments in the canyons are most likely to be transported in major runoff events. The waste sites most likely to be susceptible to off-site mobilization are those that lie close to the edges of mesas or near active channels (LANL 1994, 1156).



Vertical exaggeration = 3:1

cARTography by A. Kron 2/12/96

Figure 2.2.1-1 Generalized stratigraphy of OU 1085.

TABLE 2.2.2-1
SOILS AT THE FORMER OU 1085

Name	Location	Typical Thickness (in.)
Tocal very fine sandy loam	Western end of OU 1085	11.0 – 14.2
Carjo loam	TA-14 eastern firing site	20.1 – 40.2
Pogna fine sandy loam	TA-14 western firing site	5.1 – 11.8
Frijoles very fine sandy loam	TA-14 central firing site, TA-12 west of firing site	18.1 – 60.0+
Hackroy sandy loam	TA-12	7.9 – 19.7
Nyjack loam	TA-12 firing site	19.7 – 47.2

Source: Nyhan et al., 1978, 0161

2.3 Hydrology

2.3.1 Surface Water

Surface water runoff from the former OU 1085 flows as ephemeral streams in Cañon de Valle, Threemile Canyon, and Pajarito Canyon (Figure 2.3.1-1). Although permanent alluvial aquifers are not known in the three canyons within OU1085, surface runoff occasionally recharge short-lived alluvial systems (LANL 1994, 1156). There are perennial water flows in parts of Cañon de Valle and Pajarito Canyon from spring discharge. The flow in Pajarito Canyon, combined with snowmelt and storm runoff, recharges an alluvial aquifer in Pajarito Canyon east of OU 1085 (LANL 1993, 1005).

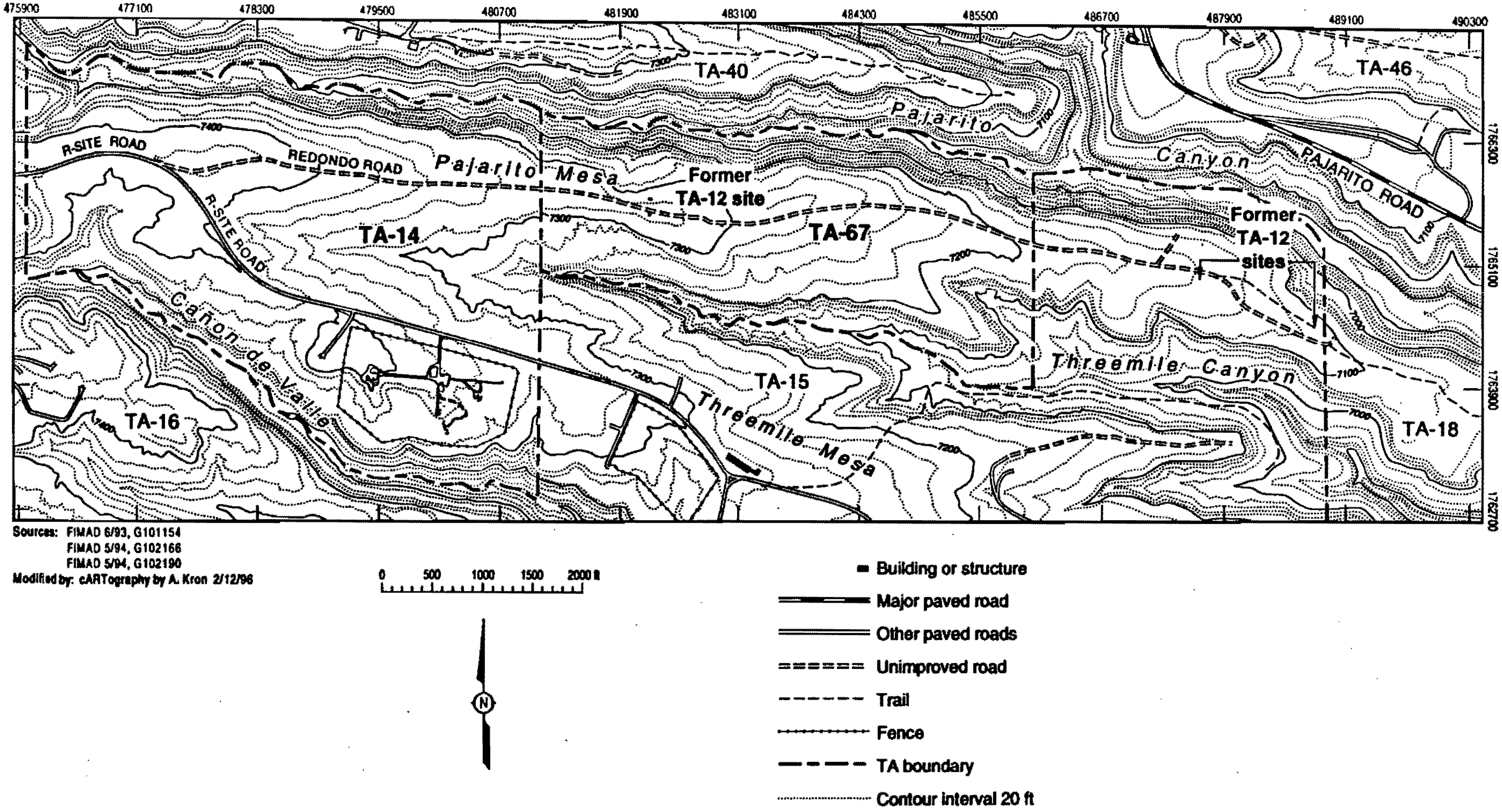
2.3.2 Groundwater

The depth to the main aquifer has not been determined precisely, but it is approximately 1000 ft, and the potential for impact on this aquifer from contaminants is extremely low (LANL 1994, 1156). Ephemeral alluvial aquifers have not been investigated in the former OU 1085; the shallow aquifer in Pajarito Canyon is addressed in the January 1995 RFI Report for former OU 1093 (Environmental Restoration Project 1995, 1203). Perched water could also occur in this area, but it has not been investigated.

2.4 Biological Surveys

Biological resource field surveys have been conducted at the former OU 1085 for compliance with the Endangered Species Act (US Senate 1983) and the associated New Mexico legislation; Executive Order 11990, "Protection of Wetlands" (The White House 1977, 0635); Executive Order 11988, "Floodplain Management" (The White House 1977, 0634); 10 CFR 1022; "Compliance with Floodplain/Wetlands Environmental Review Requirements" (DOE 1979, 0633) and DOE Order 5400.1, "General Environmental Protection Program" (DOE 1988, 0075).

The Laboratory Environmental Protection Group conducted biological surveys during 1992 and 1993 at the former OU 1085 to determine whether precautions were needed to protect threatened, endangered, or sensitive species. The habitat surrounding the PRSs in this report was found to have high potential for supporting the Northern goshawk; moderate potential for supporting the Jemez Mountain salamander and Mexican spotted owl; and low potential for supporting an additional two bird species, two mammal species, and 11 plant species (Benson et al. 1995).



Sources: FIMAD 6/93, G101154
FIMAD 5/94, G102166
FIMAD 5/94, G102190
Modified by: cARTography by A. Kron 2/12/96

Figure 2.3.1-1 Topography of OU 1085.

General landscape condition and the potential for receptor access to COPCs was ranked during a site survey as described in the Laboratory guidance document "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277). Results of the habitat ranking are listed in Table 2.4-1.

2.5 Cultural Surveys

A cultural resource survey has been conducted at the former OU 1085 in the areas of the RFIs, as required by the National Historic Preservation Act (amended) (USC 1980). Eight archaeological sites are located in the areas surveyed, and seven of these are eligible for inclusion on the National Register of Historic Places under Criterion D, "Potential to Yield Research Data."

TABLE 2.4-1
SUMMARY OF HABITAT ASSESSMENT

PRS/AOC	Description	Landscape Condition[a]	Receptor Access[b]
12-001(a)	steel pit, firing site	2	2
12-001(b)	open pit, firing site	2	2
C-12-001	trim building	2	2
C-12-002	control building	2	2
C-12-003	magazine	2	2
C-12-004	generator building	2	2
C-12-005	junction box	2	2
12-004(a)	radiation shelter	2	2
12-004(b)	aluminum pipe; runoff	2	3
14-001(f)	bullet test facility	2	2
14-002(a)	sandbag	2	2
14-002(b)	firing pedestal	2	2
14-002(f)	junction box	2	2
14-010	sump	2	2
14-009	surface disposal area	2	3
C-14-002	control building	2	2
C-14-008	magazine	2	2
14-001(a)	pullboxes	2	2
14-001(b)	pullboxes	2	2
14-001(c)	pullboxes	2	2
14-001(d)	pullboxes	2	2
14-001(e)	pullboxes	2	2
14-001(g)	pullboxes	2	2
14-005	incinerator	2	2
14-006	sump and outfall	2	3
C-14-003	HE preparation building	2	2
C-14-004	electronics shop	2	2
C-14-005	storage building	2	2
C-14-006	magazine	2	2
C-14-007	storage building	2	2

TABLE 2.4-1 (continued)
SUMMARY OF HABITAT ASSESSMENT

PRS/AOC	Description	Landscape Condition[a]	Receptor Access[b]
14-004(b)	satellite storage	3	3
14-007	septic tank and outfall	2	3
14-002(c)	firing site	2	3
14-002(d)	firing site	2	3
14-002(e)	firing site	2	3
14-003	burn area	2	2
C-14-001	magazine	2	2
C-14-009	magazine	2	3
Central Area Drainage	drainage for former Aggregate 4	2	3
Firing Pad Drainage	drainage for former Aggregate 6	2	3

[a] 1 = heavily disturbed/developed, 2 = moderately disturbed, 3 = lightly disturbed or not disturbed

[b] 0 = no potential for receptor access to COPCs or for COPC transport, 1 = low potential for access or transport, 2 = moderate potential for access or transport, 3 = high potential for access or transport

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSES

The decision approach used for the sites described in this report involves a series of quantitative steps that occur after the field investigation, chemical analysis, and data reporting are complete. These steps begin with routine data validation and continue with more focused data validation, if necessary. Routine validation involves validating each data item against specific targets and adding qualifier flags to the data, signifying a potential deficiency. Focused validation consists of analyzing quality assurance/quality control (QA/QC) data for their potential impact on the succeeding data assessment steps (i.e., comparing site data to background concentration data, verifying the identities of detected organic chemicals, comparing site data to screening action levels [SAL] for human health impacts, and performing human health or ecological risk assessments when necessary). The following subsections provide overviews of the methods used to complete these quantitative steps.

3.1 Sample Analyses

All samples requiring chemical and radiological analyses and chain-of-custody documentation were submitted directly to the fixed analytical laboratory from the field. Each soil sample was field screened for radionuclides (See Section 1.3); water samples were submitted to the Mobile Radiological Analysis Laboratory for screening. XRF analysis for inorganics was conducted by field personnel in the field trailer. In addition, a sample of standard reference material was analyzed at a frequency of approximately 10%.

3.1.1 Analytical Methods

All samples were analyzed using EPA SW-846 methods (EPA, 1222) or equivalent and/or radiological methods as described in Quality Control Data Use (in preparation). The RFI Work Plan stipulated all samples would be analyzed for isotopic uranium; but following discussions with DOE and the Laboratory ER Project Office a total uranium analysis was conducted.

3.1.2 Data Validation

Data verification and validation procedures are used to determine whether data packages have been generated according to specifications, are of known quality, and contain the information necessary to determine data sufficiency for decision-making.

Data verification is a check of data deliverables against a set of stated requirements to ensure that what has been ordered has been delivered. All analytical data generated in support of the ER Project are verified.

Data validation is the process of determining whether individual results can be reliably used to support the decision-making process. During the process, validators determine whether data should be qualified or used with caution because of the potential impact of noted flaws or the failure to achieve precision or bias constraints.

Routine data validation is the comparison of quality indicators (such as surrogate recovery, measurements of method blanks, holding times, differences between replicate measurements) with clearly defined limits to determine whether limitations may need to be placed on the use of the data. Routine validation is most suitable for routine analyses and for those nonroutine analyses for which clearly defined limits have been established.

The focused data validation process addresses those characteristics (e.g., precision and bias) that directly affect the decision(s) to be based on the data. The same data set may undergo different focused validations for different decisions.

3.2 Evaluation of Radionuclide Data

Radioactive samples taken from former DOE experimental or production sites are sent to radiological analytical laboratories for determination of their radionuclide content and activity level. Data from the laboratories are then evaluated by screening out those samples whose values are less than the laboratory's detection level. The resultant radionuclide list is then evaluated for the presence of DOE activity-introduced radionuclides. The evaluation process examines each reported radionuclide based on its likely origin, whether it is natural or man-made, the DOE site's history, and a general knowledge of the environmental inventory of nuclides and isotopes. The evaluation requires the application of radioactive statistical processes as well as technical expertise and judgment.

Each radionuclide in today's environment has a particular origin that helps determine the likelihood of its resulting from a previous DOE activity. The environmental legacy of former DOE/AEC activities consists of the man-made radionuclides tritium, cobalt-60, and isotopes of uranium, neptunium, plutonium, and americium. Depleted uranium (DU), which is 99.75% uranium-238 (a natural radionuclide), is also considered man-made because it has been "depleted" of most of its uranium-234 and uranium-235 in the gaseous diffusion process and has been widely used in a variety of experiments at many laboratory sites since 1945. Enriched uranium is likewise considered man-made for this application.

The following natural and man- made radionuclides are always present in soil, with background data widely reported: potassium (averaging 25 pCi/g of soil), radium (1.3 pCi/g), thorium (1.3 pCi/g), uranium (1.3 pCi/g), cesium (1.4 pCi/g), and strontium (1 pCi/g). Background values for the Los Alamos area are also available in ER Project databases and are frequently updated. For some radionuclides, such as tritium and uranium-238 (which may be naturally occurring, man-made, or both), knowledge of the site history is required before any radionuclide can be ruled out as resulting from DOE activities. Other, more "exotic" radionuclides, such as rare earth, and other activation products from accelerator operations may be present in very limited quantities at certain DOE sites, again requiring knowledge of the site history.

Phase I. The evaluation process begins by examining the environmental sample results from the analytical laboratories. Picocurie/gram (pCi/g) concentration values for individual radionuclides are reported. These are based on either alpha particle or gamma-ray spectroscopy. Gross alpha, beta, and gamma results are not used as a screening aid, although these data may be used for comparison purposes later on.

Because reporting of the individual uranium isotopes is based on alpha particle spectra, "total uranium" is not normally used; it is a heavy metal chemical analysis, not a radiological one, and is not directly comparable to radiological sample results for individual uranium isotopes. However, if no isotopic uranium data are reported, the total uranium data can be compared with LANL uranium background, and the activity estimated by assuming natural uranium.

Ideally, a statistical Decision Amount (DA) and Minimum Detectable Activity (MDA) value would be reported for each sample result. The DA and MDA would then be used for sample screening. In most cases, however, the analytical laboratory reports method precision as either ±1 or ±2 times the standard deviation(s). In these cases, a 3σ value for the precision data for each sample must be calculated (assuming it is known whether the precision value is σ or 2σ). This is then used as a DA. If the sample activity is less than 3σ, it is screened out. If the sample value is greater than 3σ, the sample is considered to be positive. If lab blank values are also reported, this value is then subtracted from the sample result value, before comparing with the 3σ screening value.

DOE states that "nonradioactive waste contains no measurable increase in radioactivity *(at a statistically defined confidence level)* above background, in bulk or volume, resulting from DOE operations," for radioactive waste determinations. Therefore, if the activity is greater than the DA, it is considered to be radioactive. When screening for other purposes, the MDA and DA are used as usual.

Phase II. The radionuclides remaining from Phase I are next reviewed for possible laboratory artifacts. Gamma-ray spectrometer computer programs may falsely identify radionuclides. Such radionuclides could not be present because of half-life, production, nonavailability or other reasons and are screened out. The singly occurring natural radionuclides of cosmic or primordial origin are readily identifiable at this point and can also be screened out unless abnormally high activity amounts are present that require further analysis.

Phase III. The positive radionuclide results remaining from Phase I are now compared with available Laboratory background data. Isotopes of the three existing natural radioactive decay series are compared with background and can be screened out unless their activity levels or isotope ratios are significantly different than expected from the isotope abundances found in normally occurring natural radionuclides.

Depleted uranium is a separate concern. DU was widely used in early explosives testing and is found throughout many of the Laboratory experimental areas. Uranium-238 from DU will be accompanied by normal levels of thorium-234 and protactinium, the first two daughter products of uranium-238 and lower levels of uranium-234, and by even lower levels of the remaining daughters. These will be present at varying amounts, depending on the age of the DU. In natural uranium, the activity ratio of uranium-238 to uranium-234 is ~1:1; for DU; the ratio is ~10:1 for the oldest (~50 years old) DU, and ~100:1 for DU that is ~3 years old. Thus, using the isotopic activities, the presence of DU can be ascertained. Radium-226, a daughter of uranium-234, is typically present at levels of 1-2 pCi/g in natural uranium deposits but is several orders of magnitude less in DU.

Of the other man-made radionuclides, tritium, cobalt-60, and isotopes of uranium, neptunium, plutonium, and americium would be the most likely ones introduced by DOE operations. Other man-made radionuclides may be fission products produced by fallout from past atmospheric nuclear weapons tests; corrosion products from nuclear reactor operations (not very likely to be found in the environment); activation products such as medical isotopes, or transuranic nuclides above americium in the periodic table, which are used in radioactive sources and in other limited applications.

3.3 Background Comparisons

Once the data validation process is complete and the site data finalized, the next step is to compare site data with available background data. The results of a focused data validation should exclude from consideration for background comparison any contaminant that is identified as an artifact of analytical laboratory or field contamination, analytical interference, or improper analyte identification or quantitation. The purpose of this decision step is to determine if chemicals that have natural or anthropogenic background distributions should be retained as COPCs or eliminated from further consideration.

Background data are available from two sources:

- Soil samples collected throughout Los Alamos County for which chemical analyses were performed for certain inorganic (metal) chemicals and naturally occurring radioactive chemicals (Longmire et al. 1995, 1142 and 1266);
- Background concentrations of radioactive chemicals associated with global fallout from atmospheric nuclear testing (e.g., plutonium, cesium, strontium, and tritium) as reported in the Laboratory environmental surveillance reports (most recently, Environmental Protection Group 1994, 1179).

Certain radiological considerations in this report are assumed in terms of activity levels. Specific long-lived parent isotopes are considered to be equivalent in activity level to certain shorter-lived daughter isotopes. This functional equivalency, referred to as secular equilibrium, is assumed for the following radioisotopes:

thorium-232 ≅ thorium-228 ≅ radium-228; uranium-238 ≅ thorium-234; and uranium-234 ≅ thorium-230 ≅ radium-226. For this report, where activity levels for total uranium and its isotopes exceed background UTL, further evaluation of the data based on ratios of uranium-234 to uranium-238 comparison was performed. In general, if these ratios exceed 10:1 per uranium-234, depleted uranium, as opposed to natural uranium, was assumed.

Comparisons between site data and background data are initially performed by comparing each observed concentration datum with a UTL estimated from background data. The details of statistical methods used to generate UTLs from the background data sets and suggestions for statistical methods of comparing site and background data sets and suggestions for statistical methods of comparing site and background concentration distributions are presented in the guidance document "Statistical Comparisons to Background, Part I" (ER Project Assessments Council 1995, 1218).

If a chemical has a reported concentration that exceeds its UTL or fails other statistical background comparison tests (i.e., the site data are statistically greater than background data), then that chemical is carried forward to the screening assessment process. If a chemical does not have a reported concentration that exceeds the UTL, then that chemical is removed from further consideration. The ER Project has developed UTLs for the most commonly sampled chemicals and the most commonly analyzed media. For chemicals and/or media not included in the Longmire data or in other Laboratory databases, UTLs will be developed by the Decision Support Council as needed.

Some of the inorganics analyzed as part of the analytical suite are not subjected to the data comparison because they are naturally occurring major components of soil and therefore are not considered COPCs. These inorganics include aluminum, calcium, iron, magnesium, potassium, and sodium.

3.4 Evaluation of Organic Constituents

Background data are not available for organic chemicals. This preliminary evaluation of organic chemicals took into consideration detected chemicals and chemicals that were analyzed for but not detected in any sample. The purpose of this decision step is to determine whether organic chemicals should be retained as COPCs or eliminated from further consideration based on detection status. Detection status is determined by the analytical laboratory on a sample-by-sample, analyte-by-analyte basis.

Estimated quantitation limits (EQL) have been established for each analyte as reporting limits when the analyte is not detected. It should be noted that the EQLs reported for individual samples are dependent on a number of factors and may vary from sample to sample and from analysis to analysis. Therefore, the sample-specific EQL for a chemical must be used in this comparison.

If an organic chemical is reported as detected, then that chemical is generally carried forward through the screening assessment process. If the chemical is not reported as detected in any sample analyses, then it is generally removed from further consideration. Exceptions to these general rules may be made if site-specific process knowledge so indicates. A detected chemical may be removed from further consideration if its presence can be determined to not be a result of Laboratory operations. A chemical that is not detected in any sample may be carried through the decision process if the chemical can be expected to be present at the site based on historical operations.

3.5 Human Health Assessment

3.5.1 Screening Assessment

The screening assessment consists of sequential decisions that are used to determine if chemicals have been released to the environment as a result of historical Laboratory operations at levels that may be hazardous to human health or the environment. The decisions include the following:

- Can reported concentrations be attributed solely to positive analytical laboratory or field bias?
- Are site data greater than background?
- Is the maximum site concentration greater than the SAL?

The purpose of this decision step is to determine whether chemicals should be retained as COPCs or eliminated from further consideration based on comparisons with SALs. This is the last step in the screening assessment process for human health concerns. If COPCs remain after this step, then further action may be proposed. If no COPCs remain after this step, then NFA may be proposed based on human health concerns.

SALs are medium-specific concentrations that are calculated using chemical-specific toxicity information and conservative, default exposure assumptions. A complete description of the methods used to generate SALs is provided in "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277). For those chemicals with SALs, each observed concentration datum is compared with the chemical's SAL. If a chemical has a reported concentration greater than its SAL, then that chemical is retained as a COPC pending further analysis. If a chemical does not have a reported concentration greater than its SAL, then that chemical is generally removed from further consideration. If more than one chemical is present at the site, this decision is deferred pending the results of the multiple chemical evaluation (described below). The decision to identify a chemical as a COPC when a SAL is not available is made on a case-by-case basis, taking into account the availability of process knowledge and toxicological information.

It is possible that COPCs should be retained because of the combined adverse health effects of several chemicals. This possibility is evaluated in the multiple chemical evaluation (MCE), in which the reported concentration for each chemical is divided by its respective SAL, and the resulting normalized values are incorporated into a simple additive model. If the sum of the normalized values (i.e., the total normalized value) is less than 1, then the chemicals are removed from further consideration. If the total normalized value is greater than 1, then chemicals having an individual normalized value greater than or equal to 0.1 are retained as COPCs pending further evaluation.

Only those chemicals that exceed background concentration thresholds (certain inorganics and radionuclides) or are detected (organics) in at least one sample are included in the MCE. These chemicals are divided into three classes: noncarcinogens, chemical carcinogens, and radionuclides. Additive effects are assumed within each class, but each class is evaluated separately. For further information on the calculation of MCEs, see LANL/SNL 1996 (1277).

The screening assessment described in LANL/SNL 1996 (1277) was followed.

3.5.2 Risk Assessment

The human health risk screening assessment(s) presented in Chapter 5 follow the guidance document "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277). The human health risk assessment process consists of four steps:

- COPC identification
- Exposure assessment

- Toxicity assessment
- Risk characterization.

No human health risk assessments were performed for any of the PRSs in this report because either no COPCs were carried forward or no unacceptable risk exists.

3.6 Ecological Assessment

An ecological risk assessment will be conducted when an approach has been approved by federal and state regulators. Identification of threatened and endangered species and sensitive habitats are based on field surveys (Section 2.4). A qualitative habitat screening model was applied to each PRS to evaluate the potential for exposure to ecological receptors. The model evaluates potential ecological risk by ranking general landscape condition (development and disturbance) and the potential for receptors to access COPCs (LANL/SNL 1996, 1277).

4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

Samples were collected, processed, and analyzed in accordance with the Environmental Restoration Quality Assurance/Quality Control (QA/QC) program documented in the Site-Specific Quality Assurance Project Plan (QAPjP), Annex II of the RFI Work Plan for OU 1085 (LANL 1994, 1156). The QA objectives for measured data of precision, accuracy, representativeness, completeness, and comparability are based on the Laboratory Quality Program Plan for Environmental Restoration Activities (LANL 1991, 0840).

A variety of QA/QC samples are used to determine the usability of the data generated from the various analyses. These samples included laboratory blanks, duplicates (field and laboratory), spikes, surrogates, and laboratory control samples. The assessment of QA/QC samples and the potential effect these results may have on data usability were evaluated for all samples.

The QA/QC data associated with this investigation indicated that a majority (≈97%) of the sample analytical data were acceptable and defensible. The QA/QC mechanisms were generally effective in ensuring the reliability of measured data within expected limits of sampling and analytical error. Of the more than 6,000 pieces of analytical data, ≈20% were qualified as UJ or J and only ≈3% of the total was not used in the screening assessment.

4.1 Inorganic Analyses

The QA/QC problems associated with the inorganic data for the former TA-12 and TA-14 are summarized in Tables B-1 and B-2 in Appendix B.

Some inorganic analytes had matrix spike/matrix spike duplicate recoveries and laboratory control samples that were not within the acceptable limits for these QC samples. The data associated with the QC samples were qualified either UJ- or J- because of the bias. However, the data usability for these data was not affected. The data are considered valid because most of the recoveries were either biased high or were < 2% below the lower limit. The inorganic analytes in ten samples that had recoveries within reasonable limits (>50<75%) were also valid because the compounds should have been detected if present. One sample had manganese recovery < 50% and another sample had antimony, barium, and lead recoveries <50%. These sample values are considered valid because even if the values are corrected for the low recoveries, the sample value is still be below the background UTL for manganese and below the SALs for the other analytes. Therefore, the data usability is unaffected, are qualified as UJ- or J- and considered valid.

In addition, several inorganic analytes were found to be present in the laboratory blanks. The sample values for these analytes were greater than five times the blank values and were therefore considered to be valid and data usability unaffected. However, mercury was detected at a concentration less than five times the blank value in one sample and is considered to be due to contamination. This result is not used in the screening assessment.

Several inorganic analytes were J qualified and reported as detected although the sample values were between the respective estimated quantitation limits (EQL) and the method detection limits. In this investigation, the analytes associated with these estimated values are considered to be undetected because the results cannot be accurately distinguished from instrument "noise" levels. Therefore, the usability of these data is affected, and the data are not used in the screening assessment.

4.2 Organic Analyses

The QA/QC problems associated with the organic data (semivolatile,volatile, and high explosives) for the former TA-12 and TA-14 are summarized in Tables B-1 and B-2 in Appendix B.

The organic analytical data had several QC samples that were outside of the acceptable limits resulting in either UJ- or J- qualified data. The QC samples included laboratory control samples and matrix spikes for high explosives, and laboratory control samples, matrix spikes, and surrogates for semivolatile organics. One laboratory blank was found to be contaminated and eleven samples also exceeded the recommended extraction holding times for HE and SVOCs resulting in the data being qualified as UJ- or J-.

Semivolatile organic data for three samples had matrix spike recoveries that were outside of the acceptable limits, while several of the surrogate recoveries for semivolatiles in two samples were outside of the specified limits. A variety of samples also had the laboratory control samples for various semivolatile analytes outside of the acceptable limits. The usability of all of these data was unaffected by the QC problems and are considered valid because most of the recoveries were either biased high or the recoveries were <5% below the limit. The recoveries of SVOC analytes in fifteen samples were within reasonable limits (>50<75%) and were valid because the compounds should have been detected if present. The recoveries for the surrogates in one sample and the matrix spikes in two samples were low, but the data are valid because the spike levels were too low to compensate for the sample dilution. The recoveries of three SVOCs in one water sample were approximately 30%, but are considered valid because if the detection limits are increased by a factor of 3, they are still below SALs. Therefore, the data usability is unaffected and are considered valid.

One water sample exceeded the 7-day recommended extraction holding time for semivolatile organics by 4 days, resulting in the data being qualified UJ or J. These estimated values were considered valid and the usability unaffected because the holding time was not grossly exceeded. In addition, the laboratory blank for two samples had a detected concentration of bis(chloroisopropyl)ether. The samples values for this analyte were less than five times the blank value. As a result, the presence of bis(chloroisopropyl)ether in the samples is considered to be due to contamination and is not included in the screening assessment.

Several organic analytes (high explosives and semivolatiles) were J qualified and reported as detected although the sample values were between the respective estimated quantitation limits (EQL) and the method detection limits. In this investigation, the analytes associated with these estimated values are considered to be undetected because the results cannot be accurately distinguished from instrument "noise" levels. Therefore, the usability of these data is affected and the data are not used in the screening assessment.

The high explosive data for one sample had matrix spike recoveries that were outside of the acceptable limits, while laboratory control samples for several high explosive analytes were outside the acceptable limits for a variety of samples. These data were qualified as UJ or J and their usability was unaffected. The data are valid because most of the recoveries were either biased high or the recoveries were <5% below the limit. The recoveries of HE analytes in three samples were within reasonable limits (>50<75%) and were valid because the compounds should have been detected if present. In addition, the high explosives for ten samples exceeded the recommended 14-day extraction holding time by 2-7 days. These data were considered valid estimated values (qualified UJ) because maximum holding time for samples containing nitramines (RDX and HMX) is up to 8 weeks and no degradation products of nitroaromatics (e.g., TNT and TNB) were detected in any of the samples (Fisk 1993).

4.3 Radiochemistry Analyses

The QA/QC problems associated with the radionuclide data for TA-12 and TA-14 are summarized in Tables B-1 and B-2 in Appendix B.

The laboratory blanks for nineteen radionuclide samples had detected concentrations of uranium-238. The samples values for this analyte in twelve samples were less than five times the blank values, indicating that the presence of uranium-238 in these twelve samples is due to contamination. The data usability for these samples is affected and the data are not used in the screening assessment. However, the sample values in the other seven samples were greater than five times the blank values. As a result, the uranium-238 data for these seven samples are considered to be valid, and the data usability unaffected.

Similarly, the laboratory blanks for nine radionuclide samples had detected concentrations of uranium-235. The samples values for this analyte in seven samples were less than five times the blank values, indicating that the presence of uranium-235 in these seven samples is due to contamination. The data usability for these samples is affected and the data are not used in the screening assessment. However, the sample values in the other two samples were greater than five times the blank values. As a result, the uranium-235 data for these two samples are considered to be valid and the data usability unaffected.

All of the detected concentrations of uranium-235 and uranium-238 that fell within the "noise" range of the instrument and analysis [i.e., within 3 standard deviations (3σ) of the detected value] were considered to be nondetects. The data usability for these reported values was therefore affected and the values were not included in the screening assessment.

5.0 SPECIFIC RESULTS, CONCLUSIONS AND RECOMMENDATIONS

The purpose of sampling at the PRSs and AOCs covered by this report was to determine if any significant chemical, radioactive, or HE contamination could be found at the former TA-12 and TA-14.

Identification of the PRSs and AOCs was based on research in the Laboratory archives; interviews with current and former employees; previously published reports, such as the 1987 CEARP Report (DOE 1987, 0264) and 1990 SWMU Report (LANL 1990, 0145); ground and aerial photographs; on-site inspections; ESH records; maps; structure and utility drawings; and engineering records. Much of this large body of data is now on file at the ER Project Records Processing Facility. AOCs, although not regulated by the EPA, are identified and discussed in this report.

5.1 PRS 12-001(a)

PRS 12-001(a) is a steel pit that was used as a firing site. Based on the sample results and screening assessment, concentrations of metals were detected above their SALs and retained as COPCs, indicating an unacceptable risk to human health. Consequently, a VCA plan is recommended for this site to be submitted to the DOE on April 26, 1996. All specific results, conclusions, and recommendations will be included in the plan.

5.2 PRS 12-001(b)

PRS 12-001(b) was an open pit firing site. Based on the sample results and screening assessment, concentrations of uranium and HE were detected above their SALs and retained as COPC, indicating an unacceptable risk to human health. Consequently, a VCA plan is recommended for this site to be submitted to the DOE on April 21, 1997. All specific results, conclusions, and recommendations will be included in the plan.

5.3 AOC C-12-001

AOC C-12-001 (TA-12-1) was the trim building for the firing sites at the former TA-12. Two soil samples were collected from the location of the former building. No COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.3.1 History

AOC C-12-001 is discussed in detail in Section 5.1 of the RFI Work Plan (LANL 1994, 1156). The building was built in 1944 and used to prepare HE for detonation. HE was molded at S-Site and then transported to L-Site for final preparation. Sometimes the HE was shaved and trimmed, but no major changes were made to the explosive. Scrap TNT and RDX from the trim building operation would have amounted to only 1 lb per month (Martell 1993, 21-0073).

The building was heated using electricity produced by a nearby generator. The electrical wires running from the generator building (TA-12-5) are still on the ground. Because electrical heating was used, it is believed that the building did not have asbestos shingles for fire protection; no evidence of asbestos is visible at the building site (Martell 1993, 21-0073).

This site was abandoned in 1953 and the buildings burned in 1960 (LANL 1993, 21-0078). The typical procedure for disposing of these wooden buildings was to fill each structure with combustible material (e.g., paper, wood, tires), add diesel fuel, and ignite it. Any small amount of unburned material would normally be taken to the S-Site burning ground; remaining noncombustibles would be taken to the material disposal areas. At the Laboratory, funds were not available for additional cleanup (Martell 1993, 21-0073). Although this building was burned in 1960, some noncombustible debris (e.g., concrete blocks, metal radiators) remains in place.

5.3.2 Description

The building was of wooden frame construction, measuring 16 ft long by 16 ft wide by 9 ft high, with soil fill on three sides and on top (LANL 1993, 21-0078).

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.3.3 Previous Investigation(s)

The building was reported in a 1959 inspection (Blackwell 1959, 21-0002) to be contaminated with HE.

5.3.4 Field Investigation

5.3.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the site and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.3.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. This screening helped determine which samples would be submitted for off-site laboratory analysis based on lead and uranium content.

The results of the field screening and of performance evaluation (PE) sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.3.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-12-001 was to determine if any contamination exists. Two samples were collected from the interior of the trim building site. The RFI Work Plan called for samples to be collected from depths of 0 to 6 in., at one location refusal was encountered at 5 in.

Figure 5.3.4-1 shows all sample locations, and Table 5-1 summarizes the sampling conducted at this AOC.

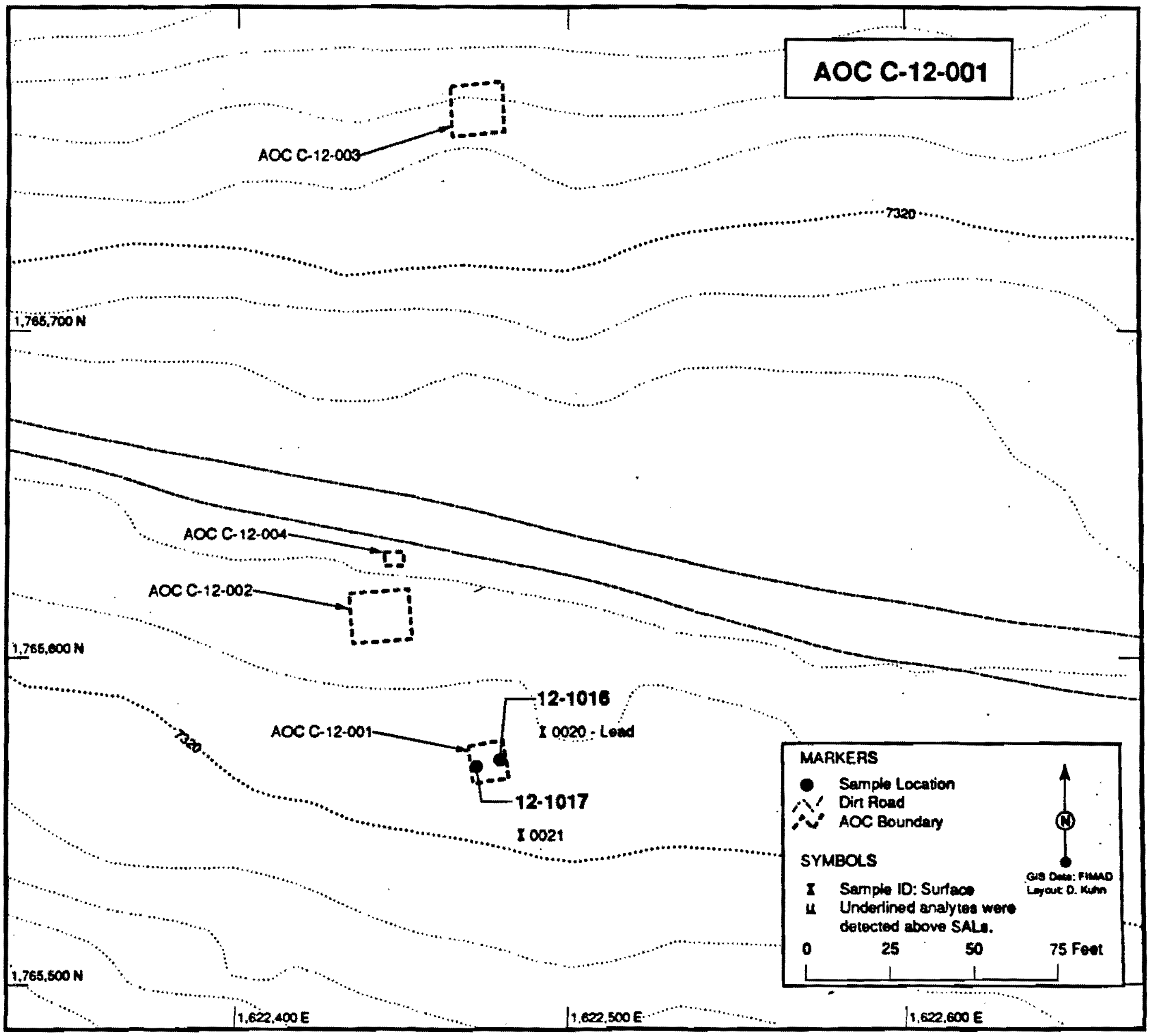


Figure 5.3.4-1 Location of AOC C-12-001 samples

TABLE 5.3.4.1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	Rad*	HE*
12-1016	0212-95-0020	0-5	Soil	69591/70268	69318	69881
12-1017	0212-95-0021	0-6	Soil	Not submitted for analysis in accordance with Work Plan		

* Batch numbers

One sample was submitted to an off-site laboratory in accordance with the RFI Work Plan. The sample was analyzed for HE, target analyte list (TAL) metals, and gamma scan (including total uranium) within the prescribed holding times.

5.3.5 Background Comparisons

The location of the samples with analyte values exceeding background UTL is shown in Figure 5.3.4-1.

Inorganics

Lead was the only inorganic detected at a concentration (33.2 mg/kg) above the background UTL of 23.3 mg/kg and was carried forward to the SAL comparison stage. The inorganics that were either undetected or detected at concentrations less than the background UTLs were not retained as COPCs.

Radionuclides

Uranium-238 was detected in one sample at a concentration (3.01 pCi/g) above the background UTL of 1.82 pCi/g and was carried forward to the SAL comparison stage. The radionuclides that were either undetected or detected at concentrations below background UTLs were not retained as COPCs.

5.3.6 Evaluation of Organic Constituents

No HE compounds were detected and therefore were not retained as COPCs.

5.3.7 Human Health Assessment

5.3.7.1 Screening Assessment

Lead was detected at a concentration below its SAL of 400 mg/kg and was not retained as a COPC. It was not subjected to an MCE because it was the only analyte detected at a concentration above background UTLs and below SALs. No organics were detected.

Uranium-238 was detected at a concentration below its SAL of 67 pCi/g. It was not subjected to an MCE because it was the only radionuclide detected and; therefore, it was not retained as a COPC. No other radionuclides were detected at concentrations above background UTLs.

5.3.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this site.

5.3.8 Ecological Assessment

The general landscape condition around this site is moderately developed, and the potential for receptors to come in contact with ecological COPCs is also moderate (Table 2.4-1). Therefore, this AOC will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.3.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.3.10 Conclusions and Recommendations

Based upon NFA Criterion 4, AOC C-12-001 will not be added to the HSWA module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project List of PRSs.

5.4 AOC C-12-002

AOC C-12-002 (TA-12-2) was the control building for the firing sites at the former TA-12. Two surface soil samples were collected from inside the remains of this building. No COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.4.1 History

AOC C-12-002 is discussed in detail in Section 5.1 of the RFI Work Plan (LANL 1994, 1156). This site was abandoned in 1953 and the buildings burned in 1960 (LANL 1993, 21-0078). The typical procedure for disposing of these wooden buildings was to fill each structure with combustible material (e.g., paper, wood, tires), add diesel fuel, and ignite it. Any small amount of unburned material would normally be taken to the S-Site burning ground; remaining noncombustibles would be taken to the material disposal areas. (Martell 1993, 21-0073)

5.4.2 Description

This structure was located on the south side of Redondo Road, approximately 3000 ft. east of the TA-12 entrance. Built in 1945 of wood frame construction, it measured 8 ft long by 8 ft wide by 8 ft high, with soil fill on three sides and on top (LANL 1993, 21-0078).

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.4.3 Previous Investigation(s)

A 1959 report (Blackwell 1959, 21-0002) indicated that the structure was contaminated with HE. However, a 1993 report (Martell 1993, 21-0073) noted that the presence of radioactivity or chemical COPCs in the structure was unlikely.

5.4.4 Field Investigation

5.4.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the site and establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.4.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. This screening helped determine which samples would be submitted for off-site laboratory analysis based on lead and uranium content.

The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.4.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-12-002 was to determine if any contamination exists. Two samples were collected from the control building. Both were collected at the prescribed depth of 0 to 6 in. Figure 5.4.4.1 shows the sample locations, and Table 5.4.4-1 summarizes the sampling conducted at this AOC.

One sample was submitted to an off-site laboratory in accordance with the RFI Work Plan. The sample was analyzed for HE, TAL metals, and total uranium within the prescribed holding times.

TABLE 5.4.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals	Rad	HE
12-1018	0212-95-0022	0-6	Soil	69591	69304	69881
12-1019	0212-95-0023	0-6	Soil	Not submitted for analysis in accordance with Work Plan		

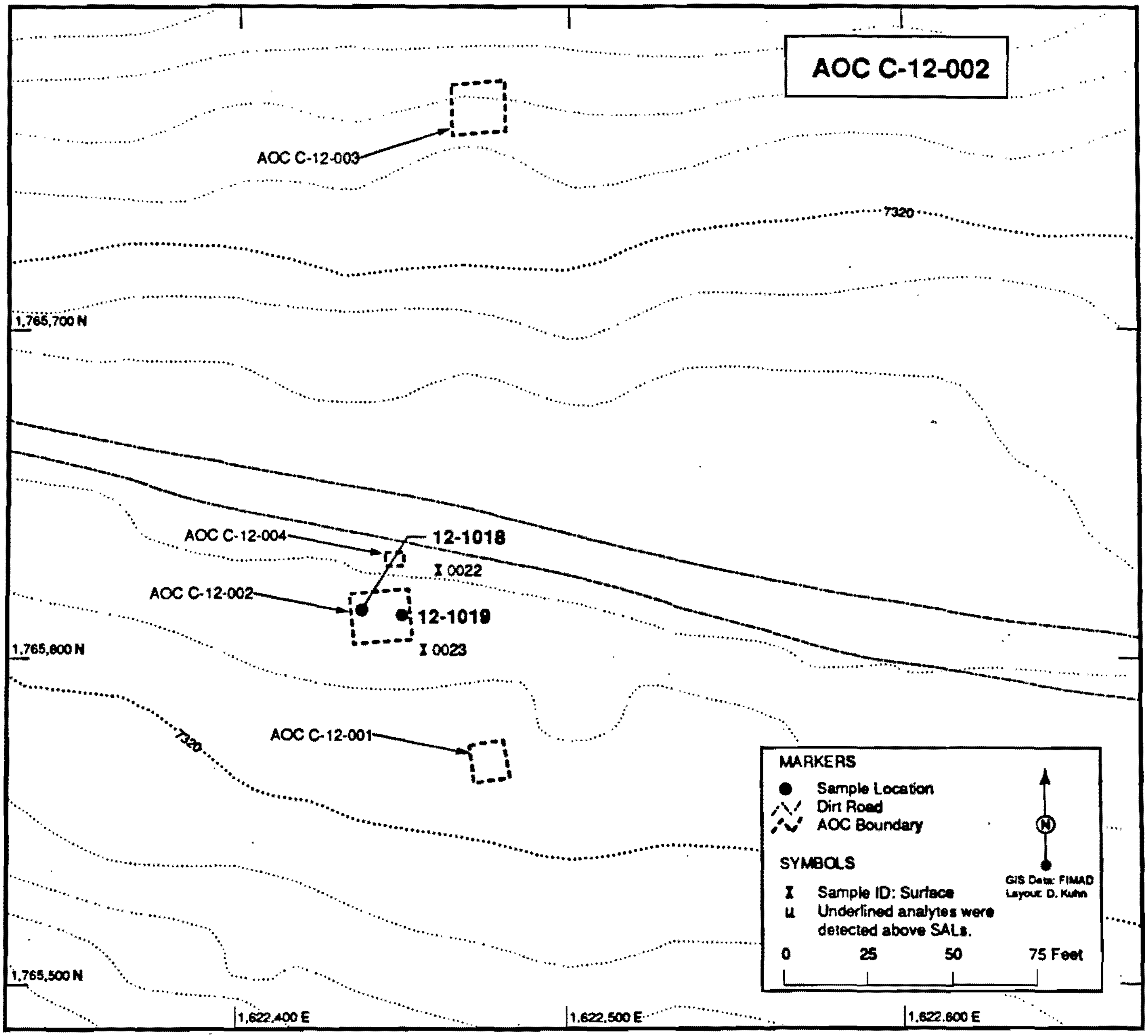


Figure 5.4.4-1 Location of AOC C-12-002 samples

5.4.5 Background Comparisons

Inorganics

No inorganic compounds were detected at concentrations above background UTLs; therefore, they were not retained as COPCs.

Radionuclides

No radionuclide compounds were detected at concentrations above background UTLs; therefore, they were not retained as COPCs.

5.4.6 Evaluation of Organic Constituents

No HE compounds were detected; therefore, they were not retained as COPCs.

5.4.7 Human Health Assessment

5.4.7.1 Screening Assessment

No inorganics or radionuclides were detected at concentrations above background UTLs, and no organics were detected.

5.4.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable health risk exists at this site.

5.4.8 Ecological Assessment

No inorganic compounds, radionuclides, or organic compounds were detected at concentrations above background UTL; therefore, no ecological assessment is required.

5.4.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.4.10 Conclusions and Recommendations

Based upon NFA Criterion 4, AOC C-12-002 will not be added to the HSWA Module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project List of PRSs.

5.5 AOC C-12-003

AOC C-12-003 (TA-12-3) was the HE storage magazine for the firing sites at the former TA-12. Two surface soil samples were collected from the interior of the building remains. No COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.5.1 History

AOC C-12-003 is discussed in detail in Section 5.1 of the RFI Work Plan (LANL 1994, 1156). Because it is not known if explosives were spilled, contamination could exist within the building. The bermed soil is all that remains at the site.

This site was abandoned in 1953 and the buildings burned in 1960 (LANL 1993, 21-0078). The typical procedure for disposing of these wooden buildings was to fill each structure with combustible material (e.g., paper, wood, tires), add diesel fuel, and ignite it. Any small amount of unburned material would normally be taken to the S-Site burning ground; remaining non-combustibles would be taken to the material disposal areas. Funds were not available for additional cleanup (Martell 1993, 21-0073).

5.5.2 Description

This structure was located on the north side of Redondo Road, approximately 3000 ft east of the former TA-12 entrance. The magazine, built in 1944, measured 6 ft long by 6 ft wide by 7 ft high, with soil fill on three sides and top (LANL 1993, 21-0078).

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.5.3 Previous Investigation(s)

A 1959 inspection reported that AOC C-12-003 was contaminated with HE (Blackwell 1959, 21-0002).

5.5.4 Field Investigation

5.5.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the site and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.5.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. This screening helped determine which samples would be submitted for off-site laboratory analysis based on lead and uranium content.

The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.5.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-12-003 was to determine whether contamination exists. One sample was collected from within the magazine; a second was collected 5 ft downgradient. The first sample was collected at the prescribed depth of 0 to 6 in., while refusal was encountered at 3 in. for the second.

Figure 5.5.4-1 shows all sample locations, and Table 5.5.4-1 summarizes the sampling conducted at this AOC.

One sample was submitted to an off-site laboratory in accordance with the RFI Work Plan. The sample was analyzed for HE and TAL metals within the prescribed holding times.

TABLE 5.5.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	HE*
12-1020	0212-95-0024	0-6	Soil	69591/70268	69881
12-1021	0212-95-0025	0-3	Soil	Not submitted for analysis, in accordance with Work Plan	

* Batch numbers

5.5.5 Background Comparisons

Inorganics

No inorganic compounds were detected at concentrations above background UTLs; therefore, they were not retained as COPCs.

Radionuclides

No radionuclide compounds were analyzed at this site.

5.5.6 Evaluation of Organic Constituents

No HE compounds were detected; therefore, they were not retained as COPCs.

5.5.7 Human Health Assessment

5.5.7.1 Screening Assessment

No inorganics or radionuclides were detected at concentrations above background UTLs or SALs, and no organics were detected.

5.5.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this AOC.

5.5.8 Ecological Assessment

No inorganic compounds, radionuclides, or organic compounds were detected at concentrations of concern; therefore, no ecological assessment is required.

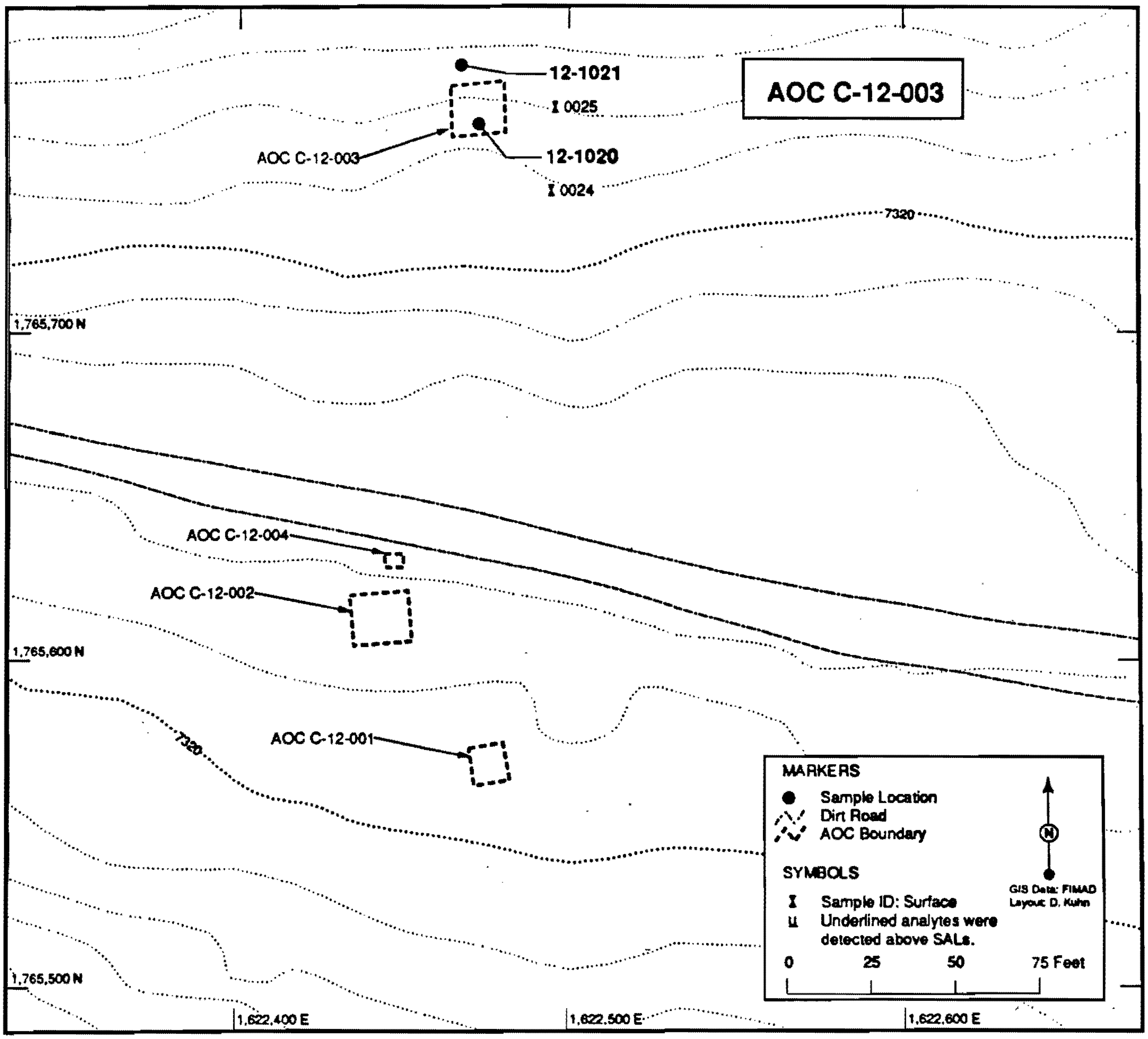


Figure 5.5.4-1 **Location of AOC C-12-003 samples**

5.5.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable for discussion.

5.5.10 Conclusions and Recommendations

Based upon NFA Criterion 4, AOC C-12-003 will not be added to the HSWA module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project List of PRSs.

5.6 AOC C-12-004

AOC C-12-004 (TA-12-5) was a barrel holder at the generator building for the firing sites at the former TA-12. To determine if any fuel had contaminated the soil, two samples were collected. No COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.6.1 History

AOC C-12-004 is discussed in detail in Section 5.1 of the RFI Work Plan (LANL 1994, 1156). This site was abandoned in 1953 and the buildings burned in 1960 (LANL 1993, 21-0078).

5.6.2 Description

The wood frame building was originally located adjacent to TA-12-6 but was relocated 10 ft north of the control building in March 1952 (LANL 1993, 21-0078). The barrel holder that held the drums of fuel oil remains at the site (See Figure 5.6.4-1). Oil and fuel used to produce heat or generate power could have contaminated the ground under the barrel holder (Martell 1993, 21-0056).

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.6.3 Previous Investigation(s)

A 1959 inspection (Blackwell 1959, 21-0002) reported AOC C-12-004 to be free of radioactive and HE contamination.

5.6.4 Field Investigation

5.6.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the site and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.6.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. This screening helped determine which samples would be submitted for off-site laboratory analysis based on lead and uranium content.

The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.6.4.3 Sample Collection and Submittal for Analysis

The objective of sampling was to determine if contamination exists. Two samples were collected from the generator building at the prescribed depth of 0 to 6 in.. Figure 5.6.4-1 shows all sample locations, and Table 5.6.4-1 summarizes the sampling conducted at this AOC.

One sample was submitted to an off-site laboratory in accordance with the RFI Work Plan. The sample was analyzed for SVOCs within the prescribed holding times.

TABLE 5.6.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (In.)	Matrix	SVOCs*
12-1022	0212-95-0026	0-6	Soil	Not submitted for analysis in accordance with Work Plan
12-1023	0212-95-0027	0-6	Soil	69895

* Batch numbers

5.6.5 Background Comparisons

Inorganics

No inorganic compounds were analyzed at this site.

Radionuclides

No radionuclides were analyzed at this site.

5.6.6 Evaluation of Organic Constituents

No organic compounds were detected; therefore, they were not retained as COPCs.

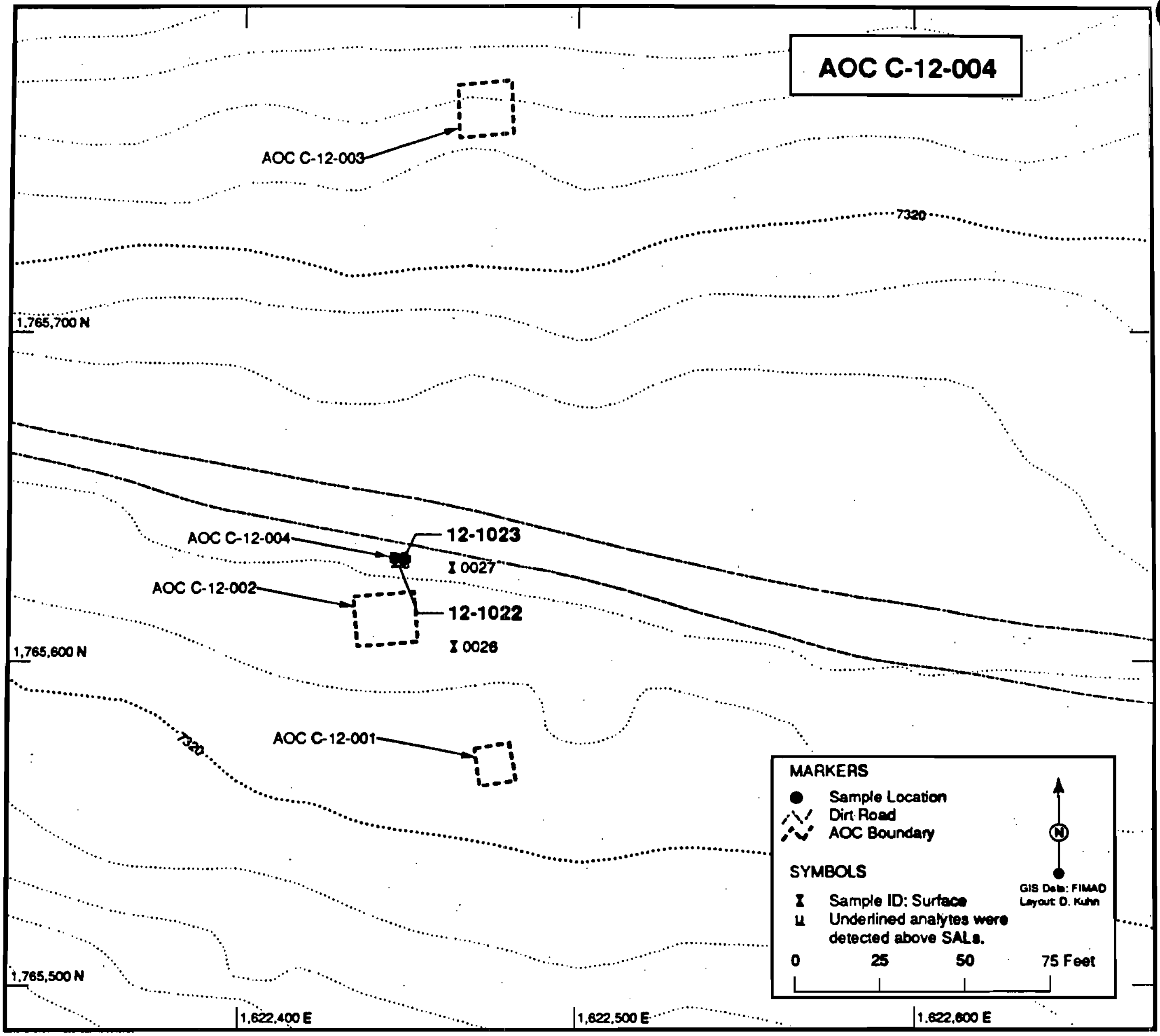


Figure 5.6.4-1 Location of AOC C-12-004 samples

5.6.7 Human Health Assessment

5.6.7.1 Screening Assessment

No organic chemicals were detected.

5.6.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this site.

5.6.8 Ecological Assessment

No organic compounds were detected; therefore, no ecological assessment is required.

5.6.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.6.10 Conclusions and Recommendations

Based upon NFA Criterion 4, AOC C-12-004 will not be added to the HSWA module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project List of PRSs.

5.7 AOC C-12-005

AOC C-12-005 (TA-12-6) was the junction box for the firing sites at the former TA-12. Two samples of surface soil were collected. No COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this PRS under NFA Policy Criterion 4.

5.7.1 History

AOC C-12-005 is discussed in detail in Section 5.1 of the RFI Work Plan (LANL 1994, 1156).. Explosives were not directly associated with the junction shelter (Martell 1993, 21-0056). The purpose of the junction box was to act as a relay between the control building and the two firing sites. Approximately 750 ft of detonation wire connected the junction box with the control building. This detonation wire and some conduit remain at the site

This site was abandoned in 1953 and the buildings burned in 1960 (LANL 1993, 21-0078). The typical procedure for disposing of these wooden buildings was to fill each structure with combustible material (e.g., paper, wood, tires), add diesel fuel, and ignite it. Any small amount of unburned material would normally be taken to the S-Site burning ground; remaining noncombustibles would be taken to the material disposal areas. Funds were not available for additional cleanup (Martell 1993, 21-0073).

5.7.2 Description

The structure, which was built in 1945, measured 3 ft wide by 4 ft long by 4 ft high, with a soil berm on three sides (LANL 1993, 21-0078). It housed diagnostic equipment, signal cables, and electrical power.

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.7.3 Previous Investigation(s)

A 1959 inspection (Blackwell 1959, 21-0002) reported AOC C-12-005 to be free of radioactive and HE contamination.

5.7.4 Field Investigation

5.7.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.7.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were retained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

After sampling, XRF analysis was carried out at the field office. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.7.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-12-005 was to determine if contamination exists. Two samples were collected from the former junction box location. Figure 5.7.4-1 shows all sample locations, and Table 5.7.4-1 summarizes the sampling conducted at this AOC.

Both samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. These samples were analyzed for total uranium, HE, and TAL metals within the prescribed holding times.

TABLE 5.7.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (In.)	Matrix	TAL Metals*	RAD*	HE*
12-1024	0212-95-0028	0-6	Soil	69591/70268	69304	69881
12-1025	0212-95-0029	0-6	Soil	69591/70268	69304	69881

* Batch numbers

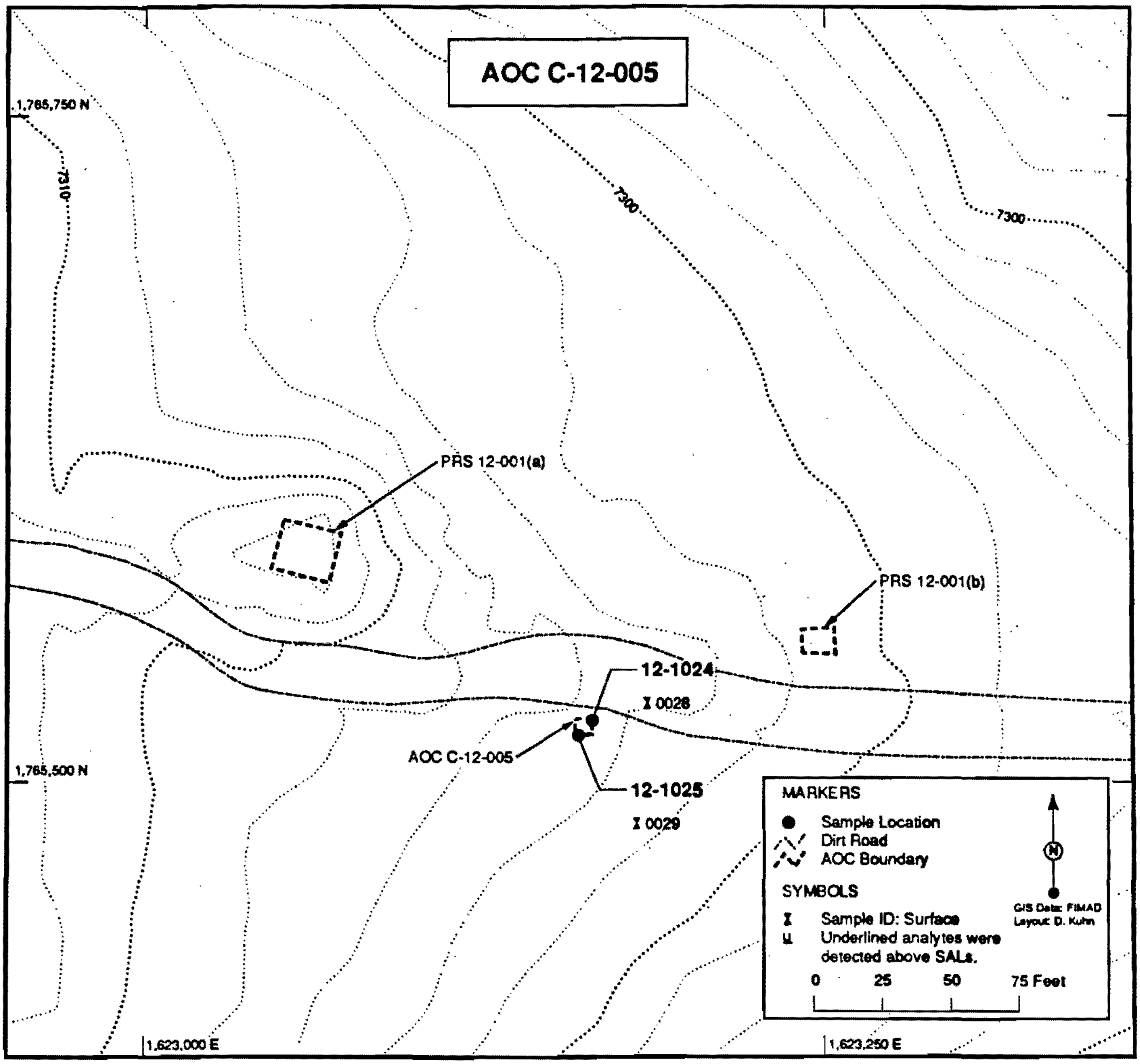


Figure 5.7.4-1 **Location of AOC C-12-005 samples**

5.7.5 Background Comparisons

Inorganics

No inorganic compounds were detected at concentrations above background UTLs; therefore, they were not retained as COPCs.

Radionuclides

No radionuclide compounds were detected at concentrations above background UTLs; therefore, they were not retained as COPCs.

5.7.6 Evaluation of Organic Constituents

HMX was estimated in one soil sample at a concentration of 0.61 mg/kg. This value was qualified as J because it was below the method detection limit for this analyte. The analyte is not retained as a COPC because the result cannot be accurately distinguished from instrument "noise" levels.

5.7.7 Human Health Assessment

5.7.7.1 Screening Assessment

No inorganics or radionuclides were detected above background UTLs.

HMX was estimated at a concentration below its SAL of 3300 mg/kg and was not retained as a COPC (see Section 5.7.6). No other organics were detected at this site.

5.7.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this AOC.

5.7.8 Ecological Assessment

No inorganic compounds, radionuclides, or organic compounds were detected at concentrations of concern; therefore, no ecological assessment is required.

5.7.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.7.10 Conclusions and Recommendations

Based upon NFA Criterion 4, AOC C-12-005 will not be added to the HSWA module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project List of PRSs.

5.8 PRS 12-004(a)

PRS 12-004(a) is the former lanthanum radiation experiment site and the surrounding area, including the drainage. Fifteen surface samples were collected. No COPCs were retained. Based on the sample results and the screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.8.1 History

PRS 12-004(a) is discussed in detail in Section 5.2 of the RFI Work Plan (LANL 1994, 1156). This site was constructed in March 1950 to conduct a radiation experiment with animals. This experiment was conducted over a 3-week period under the direction of H-4 (Walsh 1950, 21-0009).

The experiment used a 1000-Ci source of radioactive lanthanum to test the effects of various radiation doses on animals. Operators deployed the source remotely from the bermed shelter (TA-12-8) by raising the source with a wire strung over the three telephone poles. The source was stored in a lead container (or "pig") at the base of the first pole and could be deployed at various heights by raising it inside of a Lucite guide tube attached to the pole.

5.8.2 Description

PRS 12-004(a) consists of a soil-bermed radiation shelter and three telephone poles. The shelter and the poles, which are still standing, were constructed in a line parallel to a drainage channel that flows southwest from Redondo Road to the edge of Threemile Canyon. The northernmost telephone pole lies 30 ft south of Redondo Road in a drainage, and the second pole lies 58 ft south of the first. The radiation shelter and the third pole are located 40 ft south of the second pole.

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.8.3 Previous Investigation(s)

A 1959 survey (Blackwell 1959, 21-0002) reported the shelter and pole closest to the road to be contaminated with HEs and strontium-90. In 1966, the area was surveyed, and all remaining structures and equipment were found to be contaminated. At some point the area was decontaminated. The lead pig and the Lucite pipe were removed, and the contaminated pole was cut off near ground level and removed (Blackwell 1966, 21-0005). There was also visual evidence that some soil was removed near the base of the pole.

During a 1993 screening radiation survey, a Geiger-Miller thin-window probe gave readings of approximately 10 times background on a cardboard box inside the shelter, indicating the presence of beta/gamma-emitting radionuclides (Martell 1993, 21-0066). No other readings above background were observed.

5.8.4 Field Investigation

5.8.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.8.4.2 Results of Field Screening

HE spot tests were carried out at each of the 14 sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. This screening helped determine which samples would be submitted for off-site laboratory analysis based on lead and uranium content.

The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.8.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 12-004(a) was to determine the extent and concentration of the COPCs. Fifteen surface samples were collected: two at the telephone pole stump, one from the base of each of two standing telephone poles, five from the radiation shelter structure, and six from the drainage. Refusal was encountered at several locations at depths of less than 6 in. Figure 5.8.4-1 shows all sample locations, and Table 5.8.4-1 summarizes the sampling conducted at this PRS.

Six samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. The samples were analyzed for gamma-emitting radionuclides, HE, and TAL metals, most within the prescribed holding times. The HE samples missed the recommended 14-day holding time by 2 to 7 days.

TABLE 5.8.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	RAD*	HE*
12-1026	0212-95-0030	0-4	Soil	69704/70012	69743	70436
12-1027	0212-95-0031	0-6	Soil	Not submitted for analysis in accordance with Work Plan		
12-1027	0212-95-0032	0-6	Soil	Not submitted for analysis in accordance with Work Plan		
12-1028	0212-95-0033	0-6	Soil	Not submitted for analysis in accordance with Work Plan		
12-1029	0212-95-0034	0-6	Soil	69704/70012	69743	70436
12-1030	0212-95-0035	0-6	Soil	69704/70012	69743	70703
12-1031	0212-95-0036	0-0.5	Soil	Not submitted for analysis in accordance with Work Plan		
12-1032	0212-95-0037	0-6	Soil	69704/70012	69743	70703
12-1033	0212-95-0038	0-6	Soil	Not submitted for analysis in accordance with Work Plan		
12-1034	0212-95-0039	0-6	Soil	Not submitted for analysis in accordance with Work Plan		
12-1035	0212-95-0040	0-6	Soil	Not submitted for analysis in accordance with Work Plan		
12-1036	0212-95-0041	0-3	Soil	69704/70012	69743	70703
12-1037	0212-95-0042	0-5	Soil	Not submitted for analysis in accordance with Work Plan		
12-1038	0212-95-0043	0-6	Soil	Not submitted for analysis in accordance with Work Plan		
12-1039	0212-95-0044	0-6	Soil	69704/70012	69743	70703

* Batch numbers

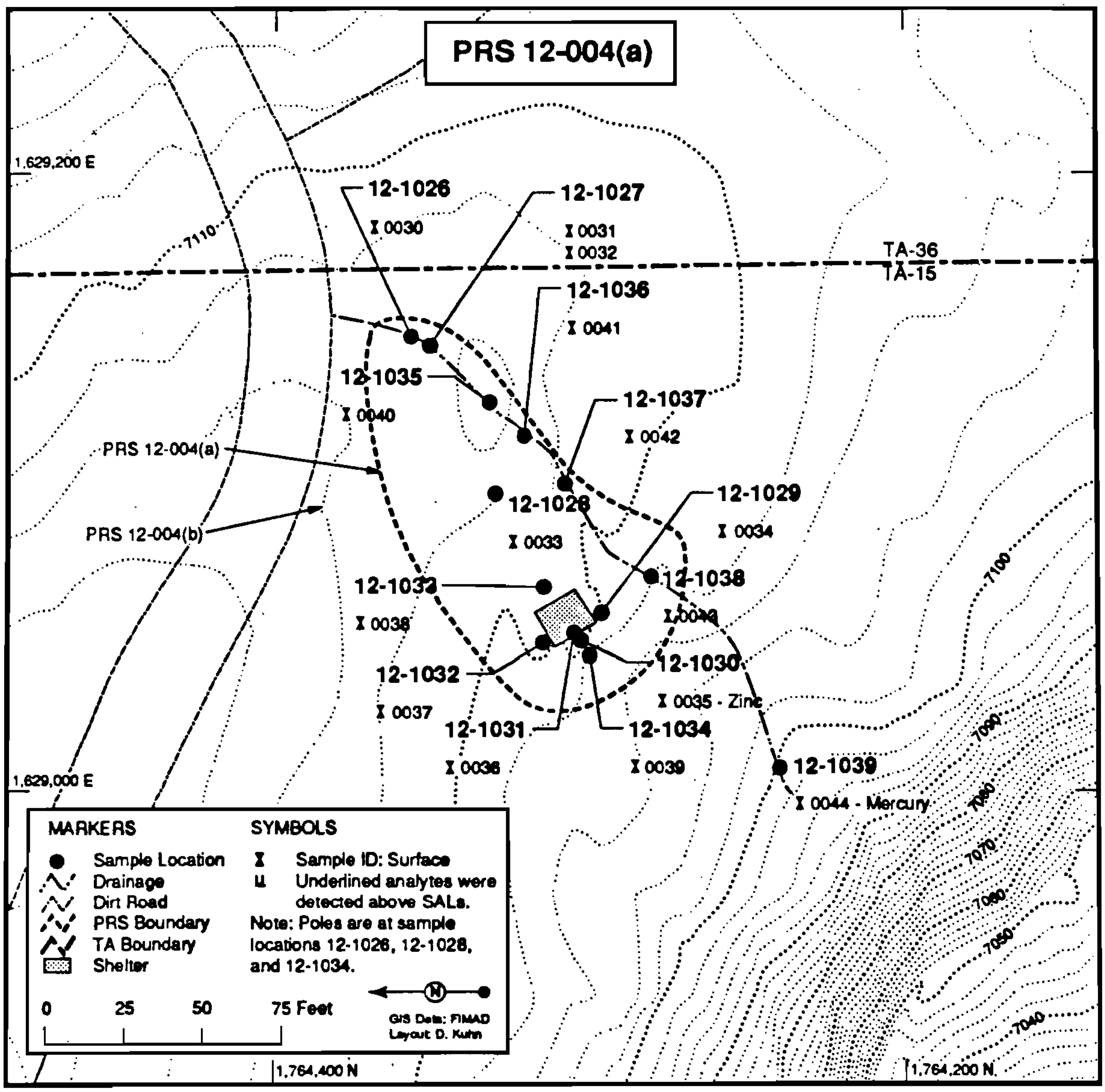


Figure 5.8.4-1 Location of PRS 12-004(a) samples

5.8.5 Background Comparisons

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.8.4-1.

Inorganics

Mercury and zinc were detected at concentrations above background UTLs in the surface soil and were carried forward to the SAL comparison stage (Table 5.8.5-1). The inorganics that were either undetected or detected at concentrations less than the background UTLs were not retained as COPCs.

TABLE 5.8.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 12-004(a)

Sample ID	Depth (in.)	Mercury (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	0.1	50.8
SAL	N/A	23	23000
0212-95-0035	0-6	ND	174
0212-95-0030	0-4	ND	27.3
0212-95-0034	0-6	ND	28.5
0212-95-0037	0-3	ND	21
0212-95-0041	0-6	ND	13.4
0212-95-0044	0-6	0.16	14.6

NA = not applicable ND = not detected

Radionuclides

Uranium-235 and uranium-238 were reported in the soil samples at concentrations greater than the background UTLs (Table 5.8.5-2). However, the sample values are considered to be nondetects because of blank contamination (i.e., the sample values are less than five times the blank value), indicating that the presence of these analytes is due to contamination of the associated blanks. As a result, uranium-235 and uranium-238 are not retained as COPCs.

TABLE 5.8.5-2
RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 12-004(a)[1]

Sample ID	Depth (in.)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
LANL UTL	NA	0.08	1.82
SAL	NA	10	67
0212-95-0030	0-4	0.373	3.91
0212-95-0034	0-6	0.076(U)	1.92(U)
0212-95-0035	0-6	0.201(U)	1.69
0212-95-0037	0-3	0.141(U)	4.94
0212-95-0041	0-6	0.086(U)	4.2
0212-95-0044	0-6	ND	1.04(U)

NA = not applicable ND = not detected

[1] Sample values are considered nondetects because of blank contamination (sample values less than five times the blank value).

5.8.6 Evaluation of Organic Constituents

No organic compounds were detected; therefore, they were not retained as COPCs.

5.8.7 Human Health Assessment

5.8.7.1 Screening Assessment

Mercury and zinc were detected at concentrations below their respective SALs and on that basis were subjected to an MCE. No other inorganics were detected at concentrations above background UTLs.

The radionuclides that were reported at concentrations above background UTLs were not retained as COPCs because of blank contamination (see Section 5.8.5).

No organics were detected at this PRS.

Multiple Chemical Evaluation

The MCE showed two analytes in the noncarcinogenic effects category (Table 5.8.7-1). The sum of the maximum normalized concentrations of these analytes was 0.0146, which was less than the decision value of 1, indicating that no adverse health effects are likely. These two analytes were not retained as COPCs. Neither a radionuclide nor a carcinogenic effects analysis was performed because no analytes were detected in these categories.

TABLE 5.8.7-1
MCE AT PRS 12-004(a)

NONCARCINOGENIC - SOIL	
Analyte	**Maximum Normalized Concentrations**
Mercury	0.0070
Zinc	0.0076
Total	0.0146

5.8.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.8.8 Ecological Assessment

The general landscape condition around this PRS is moderately developed, and the potential for receptors to come in contact with ecological COPCs is moderate (Table 2.4-1). Therefore, this PRS will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.8.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.8.10 Conclusions and Recommendations

Based upon NFA Criterion 4, PRS 12-004(a) will not be added to the HSWA module of the Laboratory RCRA operating permit, and is proposed for removal from the ER Project List of PRSs.

5.9 PRS 12-004(b)

PRS 12-004(b) is an aluminum pipe located on the edge of Redondo Road. Two soil samples were collected at the pipe. No COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this site NFA Policy Criterion 4.

5.9.1 History

PRS 12-004(b) is discussed in detail in Section 5.2 of the RFI Work Plan (LANL 1994, 1156). This PRS has no documented history.

5.9.2 Description

The aluminum pipe sits on the edge of Redondo Road 78 ft north of the radiation shelter (TA-12-8). The pipe protrudes 8 in. aboveground and resembles a manhole outlet without a cover. The opening measures 25.5 in. outer diameter, and 20 in. inner diameter, with a depth of approximately 3 ft. The inside of the pipe is filled with soil, and it is not known how deep the pipe extends into the ground. As specified in the RFI Work Plan, the samples were collected next to the pipe.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.9.3 Previous Investigation(s)

During a 1993 radiation survey (Martell 1993, 21-0066), no readings above background were found, although the pipe's proximity to the source experiments suggest that the pipe could have been contaminated.

5.9.4 Field Investigation

5.9.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.9.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling.

The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.9.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 12-004(b) was to determine if contamination exists. Two samples were collected: one at the surface next to the aluminum pipe, and one at the soil/tuff interface (a depth of 24 to 30 in.) next to the pipe. Figure 5.9.4-1 shows all sample locations, and Table 5.9.4-1 summarizes the sampling conducted at this PRS.

Both samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. The samples were analyzed for gamma scan, HE, SVOCs, and TAL metals, most within the prescribed holding times. The HE samples missed the prescribed 14-day holding time by 7 days.

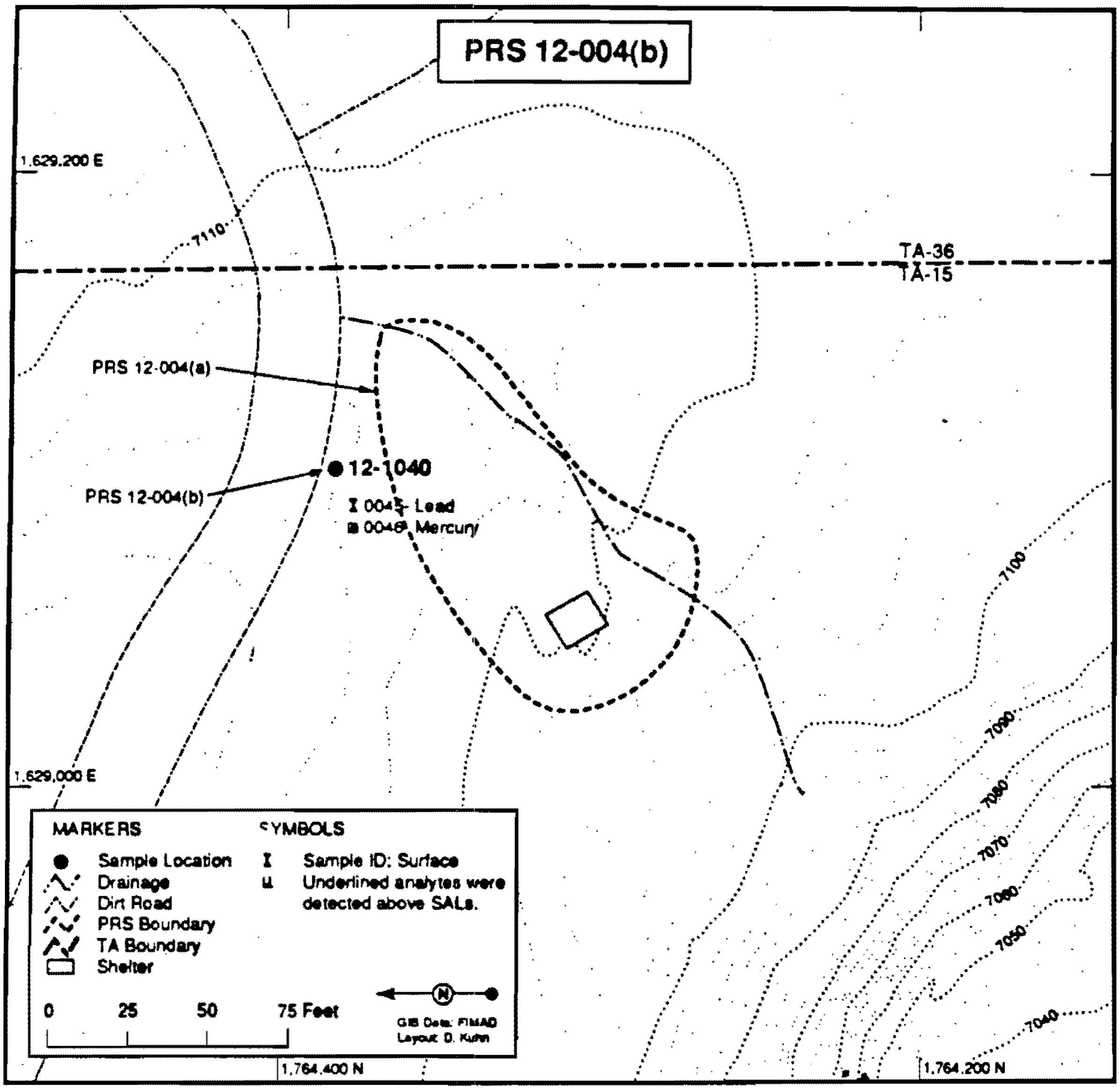


Figure 5.9.4-1 **Location of PRS 12-004(b) samples**

TABLE 5.9.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	RAD*	HE*	SVOCs*
12-1040	0212-95-0045	0-6	Soil	69704/70012	69743	70703	69786
12-1040	0212-95-0046	24-30	Soil	69704/70012	69743	70703	69786

* Batch numbers

5.9.5 Background Comparisons

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.9.4-1

Inorganics

Lead and mercury were detected at concentrations above background UTLs and were carried forward to the SAL comparison stage (Table 5.9.5-1). The inorganics that were either undetected or less than the background UTLs were not retained as COPCs.

TABLE 5.9.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 12-004(b)

Sample ID	Depth (in.)	Lead (mg/kg)	Mercury (mg/kg)
LANL UTL	NA	23.3	0.1
SAL	NA	400	23
0212-95-0045	0-6	33.8	ND
0212-95-0046	24-30	13.8	0.155

NA = not applicable ND = not detected

Radionuclides

Uranium-235 and uranium-238 were reported in the soil samples at concentrations greater than the background UTLs (Table 5.9.5-2). However, the sample values are considered to be nondetects because of blank contamination (i.e., the sample values are less than five times the blank value), indicating that the presence of these analytes is a result of contamination of the associated blanks. As a result, uranium-235 and uranium-238 are not retained as COPCs.

TABLE 5.9.5-2
RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 12-004(b)[1]

Sample ID	Depth (in.)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
LANL UTL	NA	0.08	1.82
SAL	NA	10	67
0212-95-0045	0-6	0.278(U)	2.93
0212-95-0046	24-30	0.163(U)	3.38

NA = not applicable

[1] Sample values are considered nondetects because of blank contamination (sample values less than 10 times the blank value).

5.9.6 Evaluation of Organic Constituents

Bis(2-chloroisopropyl)ether was reported in one soil sample at a concentration of 0.359 mg/kg and was undetected in the other sample. However, the sample value is considered to be a nondetect because of blank contamination (i.e., the sample value is less than 10 times the blank value), indicating that the presence of the analyte is a result of contamination of the associated blank. As a result, bis(2-chloroisopropyl)ether is not retained as a COPC.

5.9.7 Human Health Assessment

5.9.7.1 Screening Assessment

Lead and mercury concentrations were below their respective SALs and on that basis were subjected to the MCE. No other inorganics were detected at concentrations above background UTLs.

The radionuclides that were reported at concentrations above background UTLs were not retained as COPCs because of blank contamination (see Section 5.9.5). No other radionuclides were detected at concentrations above background UTLs.

Bis(2-chloroisopropyl)ether was not retained as a COPC (see Section 5.9.6). No other organics were detected at this PRS.

Multiple Chemical Evaluation

The MCE showed two analytes in the noncarcinogenic effects category (Table 5.9.7-1). The sum of the maximum normalized concentrations of these analytes was 0.0912, which was less than the decision value of 1, indicating that no adverse health effects are likely. These two analytes were not retained as COPCs. Neither a radionuclide nor a carcinogenic effects analysis was performed because no analytes were found in these categories.

TABLE 5.9.7-1
MCE AT PRS 12-004(b)

NONCARCINOGENICS – SOIL	
Analyte	**Maximum Normalized Concentrations**
Lead	0.0845
Mercury	0.0067
Total	0.0912

5.9.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.9.8 Ecological Assessment

The general landscape condition around this PRS is moderately developed, and the potential for receptors to come in contact with ecological COPCs is high (Table 2.4-1). Therefore, this PRS will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.9.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.9.10 Conclusions and Recommendations

Based on NFA Criterion 4, PRS 12-004(b) will not be added to the HSWA module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project List of PRSs.

5.10 PRS 14-010

PRS 14-010 is a former sump that has been removed. The existing drainline was sampled. Based on the sample results and screening assessment, concentrations of uranium and HE were detected above their SALs and retained as COPCs, indicating an unacceptable risk to human health. As a result, a VCA plan is recommended for this site to be submitted to the DOE on May 23, 1996. All specific results, conclusions, and recommendations will be included in the plan.

5.11 PRS 14-001(f)

PRS 14-001(f) is a bullet test facility. The existing drainline was sampled. Based on the sample results and screening assessment, concentrations of metals, uranium, and HE were detected above their SALs and retained as COPCs indicating an unacceptable risk to human health. As a result, a VCA plan is recommended for this site to be submitted to the DOE on May 25, 1996. All specific results, conclusions, and recommendations will be included in the plan.

5.12 PRS 14-002(a)

PRS 14-002(a) is a firing pad that has been removed. Sandbags, presumed to be associated with firing pad, were sampled. The existing drainline was sampled. Based on the sample results and screening assessment, concentrations of uranium were detected above their SALs and retained as COPCs, indicating an unacceptable risk to human health. As a result, a VCA plan is recommended for this site to be submitted to the DOE on May 25, 1996. All specific results, conclusions, and recommendations will be included in the plan.

5.13 PRS 14-002(b)

PRS 14-002(b) was a firing pedestal that was used to hold planar cross-sections of HE-containing weapons. The experiments used uranium, HEs, lead, and copper. No sampling was conducted at this site. We recommend NFA for this site under Criterion 1.

5.13.1 History

PRS 14-002(b) is discussed in detail in Section 5.3 of the RFI Work Plan (LANL 1994, 1156) and the associated NOD response of October 31, 1994 (LANL 1994).

Efforts to locate the site of the former pedestal have proven unsuccessful. A warped 1946 photo shows a horseshoe-shaped bermed area northwest of the area indicated on the FIMAD map. Discussions with a former TA-14 employee (Urizar 1995) also indicated the bermed area being northwest of the mapped location. This employee indicated that the PRS was located where solid tuff outcrops rise next to a paved area. This area was surveyed with a sodium iodide beta/gamma meter, and no radioactivity was detected. An HE spot test was conducted, with negative results. Discussions with a former contractor who built TA-14 (Sandlin 1995) indicated that the former shelter was located where the current fire road is now and was removed in 1952 and mounded next to TA-14-43 and asphalted over.

5.13.2 Description

The horseshoe-shaped pedestal was constructed of reinforced concrete 4 ft long by 4 ft wide by 2 ft thick with a steel plate top and an 8-ft high earthen berm.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.13.3 Conclusions and Recommendations

Based on Criterion 1, a Class III permit modification is requested to remove PRS 14-002(b) from the HSWA module of the Laboratory RCRA permit.

5.14 PRS 14-002(f)

PRS 14-002(f) is a former junction box shelter built in approximately January 1945 and associated with PRS 14-002(b), the firing pedestal. It was removed in March 1952 (LANL 1993, 21-0077). No sampling was conducted at this site. We recommended NFA for this PRS under NFA Policy Criterion 1.

5.14.1 History

PRS 14-002(f) is discussed in detail in Section 5.3 of the RFI Work Plan (LANL 1994, 1156) and the associated NOD response of October 31, 1994 (LANL 1994).

Efforts to locate the former shelter have proven unsuccessful. A warped 1946 photo shows the location of the bermed area further northwest of the mapped area shown by FIMAD. A former employee from the area also indicated the location of bermed area as being northwest of the mapped area. An outcropping of solid tuff is situated next to a paved area where the bermed area supposedly was located. The unpaved area was walked over with a sodium iodide beta/gamma meter, and no radioactivity was detected. An HE spot test produced negative results. Discussions with a former contractor indicated that the former shelter was located where the current fire road is now. No evidence of the former shelter exists at this location.

5.14.2 Description

The structure was a wood frame junction box shelter 6 ft wide by 6 ft tall, with earthen fill on three sides.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.14.3 Conclusions and Recommendations

Based on Criterion 1, a Class III permit modification is requested to remove PRS 14-002(b) from the HSWA module of the Laboratory RCRA permit.

5.15 PRS 14-009

PRS 14-009 is a surface disposal area. Based on visual surface contamination of DU and positive HE spot test results, contamination that presents an unacceptable risk to human health was determined to be present. As a result, a VCA plan is recommended for this site to be submitted to the DOE on May 23, 1997. All specific results, conclusions, and recommendations will be included in the plan.

5.16 AOC C-14-002

AOC C-14-002 is a former control building that has been removed. Its exact location is no known because it is under a paved road. No sampling was conducted at this site. We recommend NFA for this AOC under NFA Criterion 1.

5.16.1 History

AOC C-14-002 is discussed in detail in Section 5.3 of the RFI Work Plan (LANL 1994,1156). It was built in 1944 and removed in 1974, along with a 2-ft-thick concrete pad.

5.16.2 Description

AOC C-14-002 was a wood frame building 8 ft wide by 14 ft long by 8 ft high, with an attached addition 6 ft wide by 6 ft long by 8 ft high.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.16.3 Conclusions and Recommendations

Based on Criterion 1, this AOC will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.17 AOC C-14-008

AOC C-14-008 is a former magazine that has been removed. Two samples were collected from the site of the former structure. No COPCs were retained. Based on the sampling and screening assessment, we recommend this AOC for NFA under NFA Policy Criterion 4.

5.17.1 History

AOC C-14-008 is discussed in detail in Section 5.3 of the RFI Work Plan (LANL 1994, 1156). This former magazine was built in 1945 and removed in 1952. A former contractor at the site pointed out its location during early Fall 1995.

5.17.2 Description

AOC C-14-008 is located in a flat area surrounded by trees. The wood frame structure had an earthen berm on three sides and the top.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.17.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.17.4 Field Investigation

5.17.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.17.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.17.4.3 Sampling Collection and Submittal for Analysis

The objectives of the sampling at AOC C-14-008 were to determine the if contamination exists. Two samples were collected from the former structure site. Figure 5.17.4-1 shows the sample locations, and Table 5.17.4-1 summarizes the sampling conducted at this AOC.

Both samples were submitted to an off-site laboratory to be analyzed for TAL metals, HE, and gamma scan (including total uranium).

TABLE 5.17.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	RAD*	HE*
14-1103	0214-95-0056	0-6	Soil	6529862/6529881/652992	6529823/6929824	6530014
14-1104	0214-95-0057	0-6	Soil	6529862/6529881/652992	6529823/6929824	6530014

*Batch numbers

5.17.5 Background Comparison

Inorganics

No inorganic compounds were detected at concentrations above background UTLs; therefore, they were not retained as COPCs.

Radionuclides

No radionuclide compounds were detected at concentrations above background UTLs; therefore, they were not retained as COPCs.

5.17.6 Evaluation of Organic Constituents

No HE compounds were detected; therefore, they were not retained as COPCs.

5.17.7 Human Health Assessment

5.17.7.1 Screening Assessment

No inorganics or radionuclides were detected above background UTLs, and no organics were detected.

5.17.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable health risk exists at this site.

5.17.8 Ecological Assessment

No inorganic compounds, radionuclides, or organic compounds were detected at concentrations of concern; therefore, no ecological assessment is required.

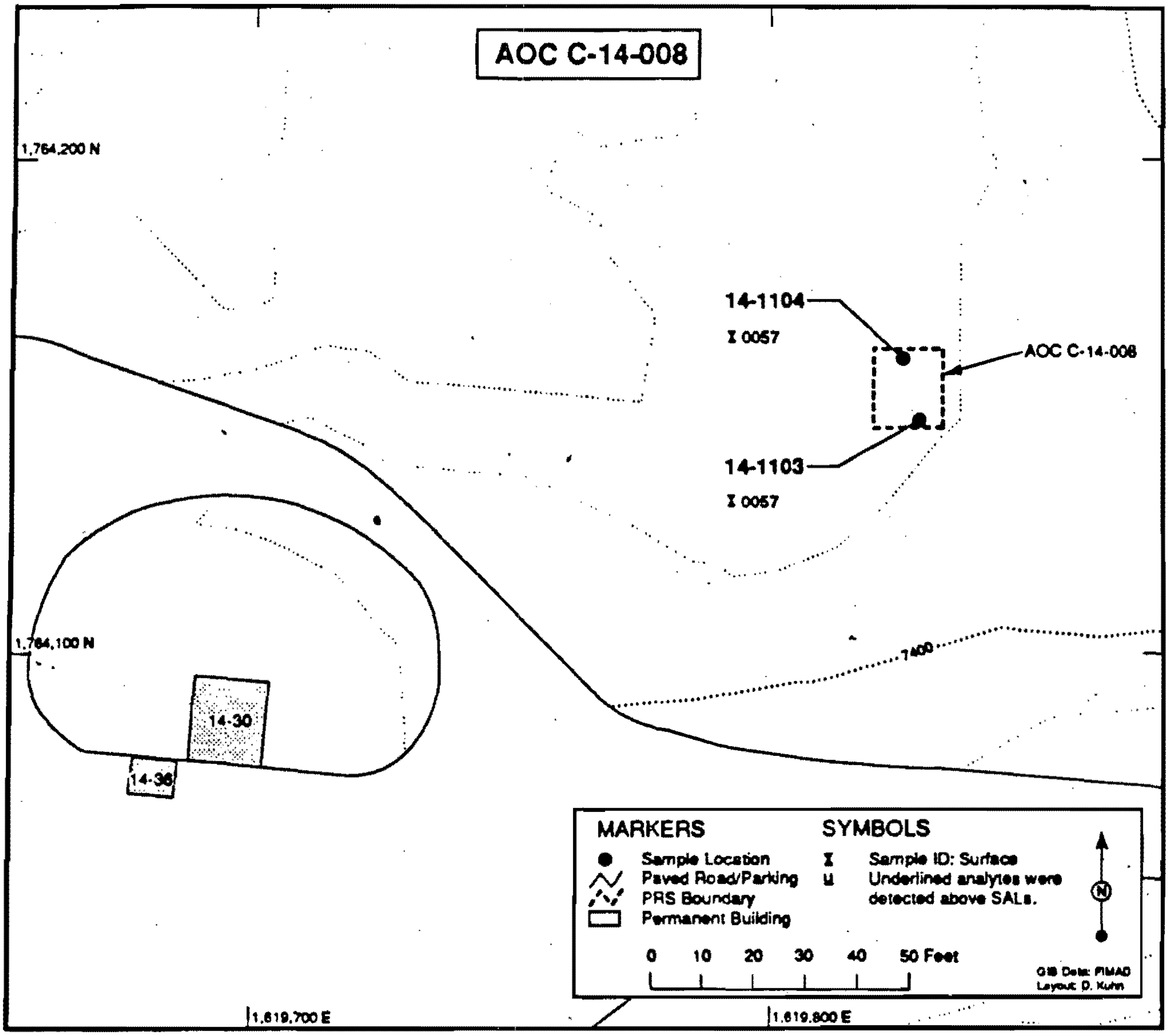


Figure 5.17.4-1 Location of AOC C-14-008 samples

5.17.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.17.10 Conclusions and Recommendations

Based on Criterion 4, AOC 14-008 will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.18 PRSs 14-001(a-e)

PRSs 14-001(a-e) are small steel "pullbox" cavities with metal lids in the ground that hold capacitor discharge units. . These PRSs are still associated with active firing sites and continue to be used. The function of the pullboxes is detonator and diagnostic hookups. Visual inspection found these pullboxes to be void of either soil or water, so no sampling was conducted. In addition, personal communication (Stine, 1996) supports the conclusion that no contamination would originate from these boxes. We recommend PRSs 14-001(a-e) for NFA under on Criterion 2

5.18.1 History

PRSs 14-001(a-e) are discussed in detail in Section 5.4 of the RFI Work Plan (LANL 1994, 1156).

These pullboxes have been used in conjunction with firing sites in the area and are currently being used with the remaining active firing sites.

5.18.2 Description

These five small (26 in. long by 32 in. wide by 32 in. deep) structures are known as "pullboxes" or "pits". Each holds a capacitor discharge unit located next to a firing pad.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.18.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.18.4 Field Investigation

Visual inspection (See Fig. 5.18.4-1) of these sites was conducted to determine if there is a possibility of any soil or water contamination. The pullboxes were found to be void of either soil or water, so no sampling or screening assessment of these media was possible. The inspection showed these pits to be clean and well-sealed by their protective lids.

5.18.5 Extent of Contamination

Visual inspection of these PRSs showed no potential contamination either within the pits or outside the pullboxes.

5.18.6 Conclusions and Recommendations

Based on Criterion 2, PRSs 14-001(a-e) will not be added to the HSWA module of the Laboratory RCRA permit and are proposed for removal from the ER Project List of PRSs.

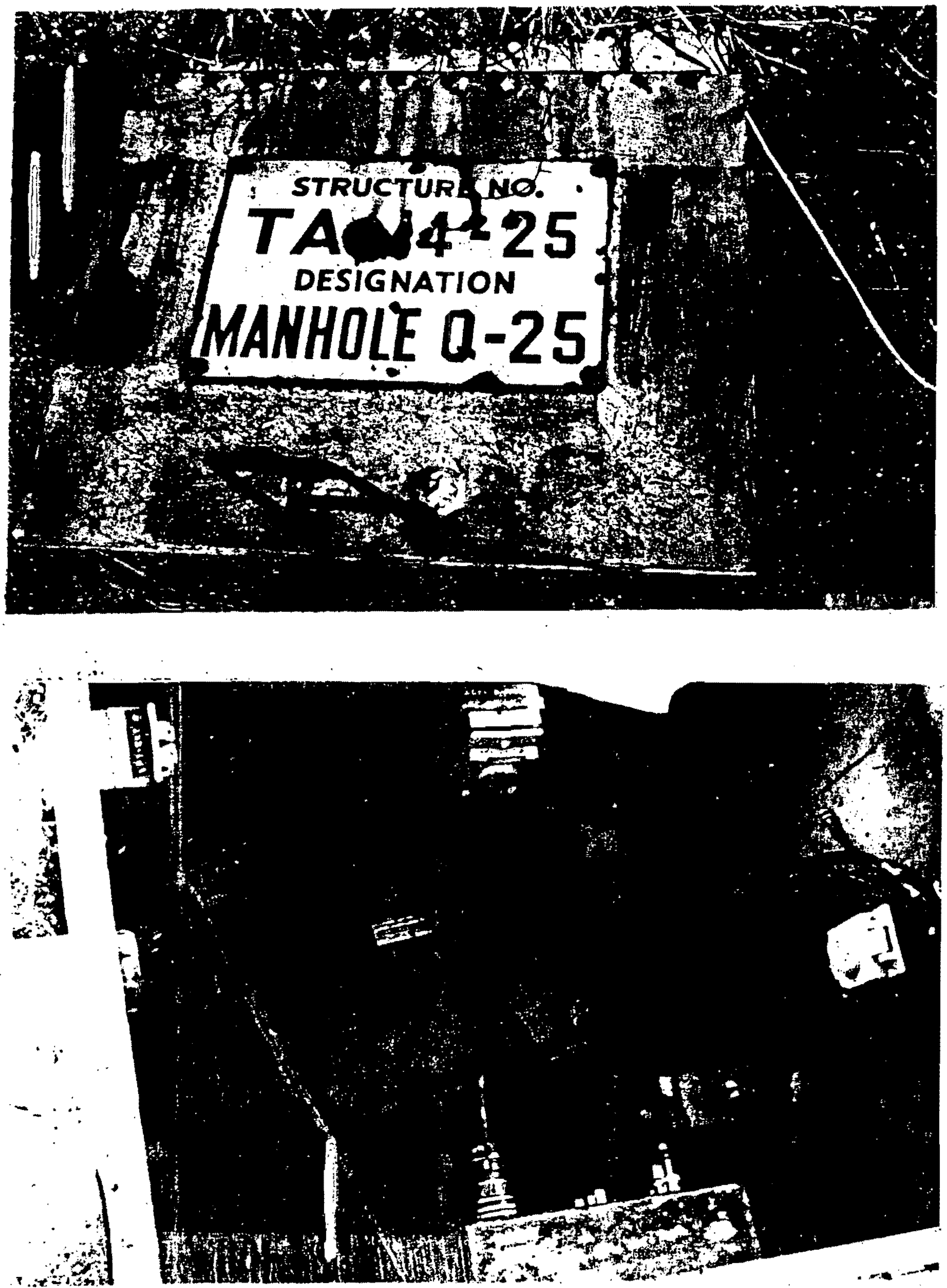


Figure 5.18.4-1 **PRS 14-001(a-e) pullbox**

5.19 PRS 14-001(g)

PRS 14-001(g) is an active firing site. Because the site is still active, any corrective action will be deferred until decommissioning. This site is served by four drainages, which are addressed in Section 5.28 (Central Area Drainage).

5.20 PRS 14-004(c)

PRS 14-004(c) was reported to be a satellite storage area for small amounts of scrap HE. Current site personnel maintain this area never existed. In an attempt to verify whether this site had existed, one surface sample was collected from the location where the storage area was reported in the RFI Work Plan. Based on sample results and the screening assessment, we recommend a finding of NFA under Criterion 1.

5.20.1 History

PRS 14-006 is discussed in detail in Section 5.4 of the RFI Work Plan (LANL 1994, 1156).

The RFI Work Plan (LANL 1994, 1156) states that this satellite storage area was used to store small quantities of scrap HE, which were removed from the area at frequent intervals. However, current TA-14 personnel say that a satellite storage area never existed in this area.

5.20.2 Description

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.20.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.20.4 Field Investigation

5.20.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.20.4.2 Results of Field Screening

An HE spot test was carried out at this sample location before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sampling location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling.

The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.20.4.3 Sample Collection and Submittal for Analysis

The objective of the sampling at PRS 14-004(c) was to verify the presence or absence of contamination that could be associated with a reported satellite storage area at this site. Figure 5.20.4-1 shows the sample locations, and Table 5.20.4-1 summarizes the sampling conducted at this PRS.

The sample collected was submitted to an off-site laboratory in accordance with the RFI Work Plan. The sample was analyzed by gamma scan, and for HE, SVOCs, and TAL metals within prescribed holding times.

TABLE 5.20.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals	Gamma Scan	HE	SVOC
14-1052	0214-95-0076	0-6	Soil	69184/70088	68994	69174	69207

5.20.5 Background Comparisons

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.20.4-1.

Inorganics

Copper, lead, thallium, and zinc were detected at concentrations above background UTLs (Table 5.20.5-1) and were carried forward to the SAL comparison stage. Thallium was estimated in one surface soil sample at a concentration of 1.4 mg/kg. This value was qualified as J because it was below the method detection limit for this analyte. The analyte is not retained as a COPC because the result cannot be accurately distinguished from instrument "noise" levels.

The inorganics that were either undetected or less than background UTLs were not retained as COPCs.

TABLE 5.20.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-004(c)

Sample ID	Depth (in.)	Copper (mg/kg)	Lead (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
LANL UTL	NA	30.7	23.3	1.0	50.8
SAL	NA	2800	400	6.1	23000
0214-95-0076	0-6	308	64.5	1.4 (J)[1]	164

[1] Sample value is considered a nondetect because it is less than the MDLs and cannot be distinguished from instrument "noise".

Radionuclides

No radionuclide compounds were detected at concentrations above background UTLs and therefore were not retained as COPCs.

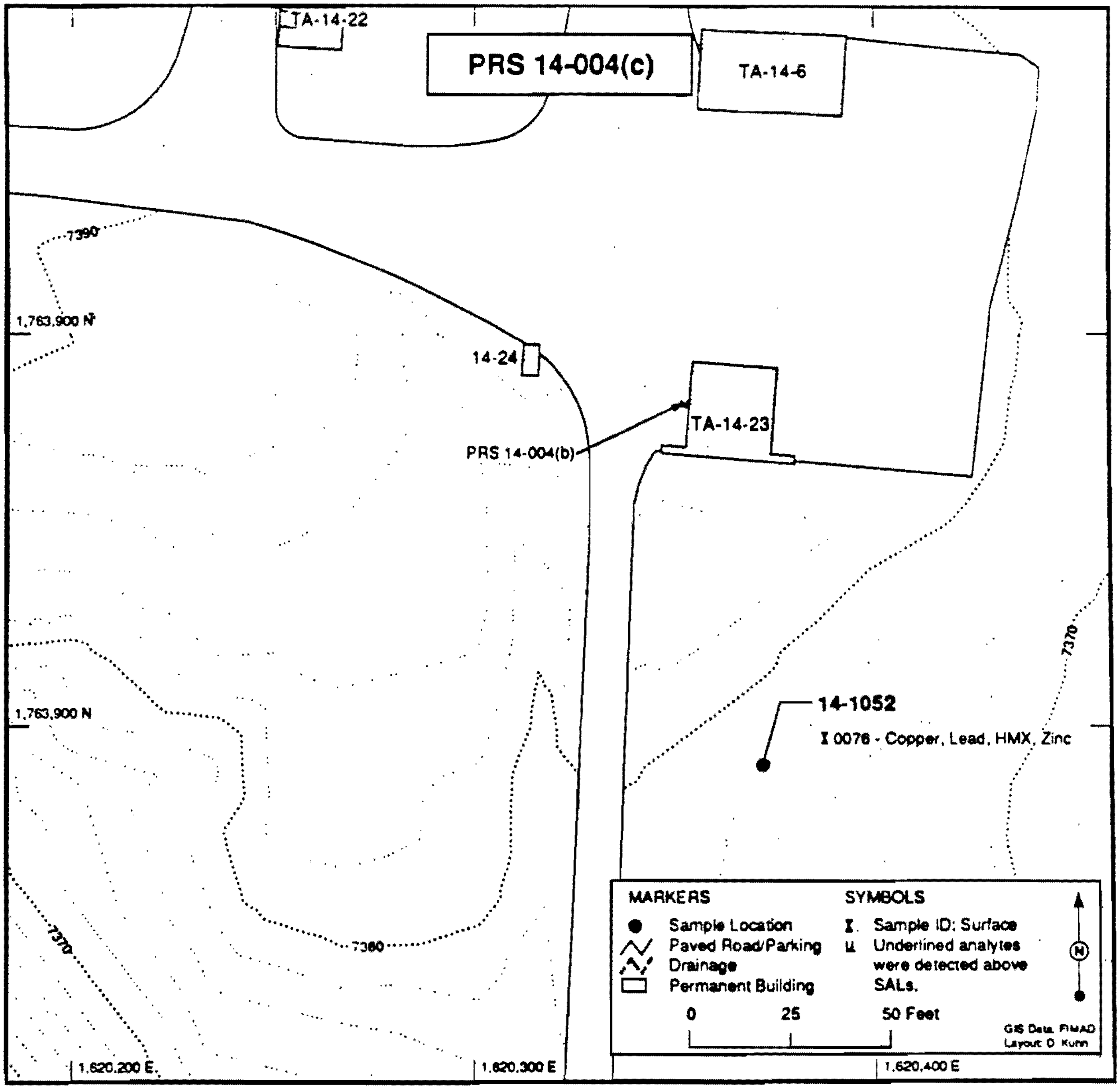


Figure 5.20.4-1 Location of PRS 14-004(c) sample

5.20.6 Evaluation of Organic Constituents

HMX was detected in the surface soil (Table 5.20.6-1) and was carried forward to the SAL comparison stage. Fluoranthene and pyrene were estimated in the surface soil at concentrations of 0.945 mg/kg and 0.826 mg/kg, respectively (Table 5.20.6-1). These values are qualified as J because they were below the method detection limits for the analytes. The analytes are not retained as COPCs because the results cannot be accurately distinguished from instrument "noise" levels.

The organics that were undetected were not retained as COPCs.

TABLE 5.20.6-1
PRS 14-004(c) SOIL CONCENTRATIONS OF ORGANIC ANALYTES WITH VALUES GREATER THAN EQL

Sample ID	Depth (in.)	Fluoranthene (mg/kg)	HMX (mg/kg)	Pyrene (mg/kg)
SAL	NA	2600	3300	2000
EQL	NA	0.33	0.75*	0.33
0214-95-0076	0-6	0.945(J)[1]	112	0.826(J)[1]

NA = not applicable *Value for HMX is method detection limit not EQL.

[1] Sample values are considered nondetects because they are less than the MDLs and cannot be distinguished from instrument "noise".

5.20.7 Human Health Assessment

5.20.7.1 Screening Assessment

Copper, lead, and zinc had concentrations below their respective SALs and on that basis were subjected to an MCE. Thallium was also below its SAL but was not retained as a COPC as discussed in Section 5.20.5.

HMX was detected at a concentration below its SAL and on that basis was subjected to the MCE as a noncarcinogen. Fluoranthene and pyrene were also below their SALs, but were not retained as COPCs as discussed in Section 5.20.6.

Multiple Chemical Evaluation

The MCE included four analytes in the noncarcinogenic effects category (Table 5.20.7-1). The sum of the normalized concentrations of these analytes was 0.3122, which was less than the decision value of 1, indicating that no adverse health effects are likely. These analytes were not retained as COPCs. Neither a carcinogenic nor a radionuclide effects analysis was performed because no analytes were found in these categories.

TABLE 5.20.7-1
MCE AT PRS 14-004(c)

NONCARCINOGENIC - SOIL	
Analyte	**Maximum Normalized Concentrations**
Copper	0.1100
HMX	0.0339
Lead	0.1612
Zinc	0.0071
Total	0.3122

5.20.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were identified as a result of the screening assessment and no unacceptable human health risk exists at this site.

5.20.8 Ecological Assessment

The general landscape condition around this site is moderately developed, and the potential for receptors to come in contact with ecological COPCs is moderate (Table 2.4-1). Therefore, this PRS will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.20.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.20.10 Conclusions and Recommendations

Based on Criterion 4, PRS 14-004(c) will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.21 PRS 14-005

PRS 14-005 is an active open burn unit. Investigation will be deferred until the decommissioning of the site.

This open burn unit is operating under an Interim Status RCRA Permit Part B, Rev. 4.1, dated November 1989, granted by EPA Region VI. This permit includes the storage barrel, PRS 14-004(b), on the west side of TA-14-23. The open burn unit is also permitted by the State of New Mexico Air Quality section, which lists the unit as a 30-gallon waste combustor unit under 20 New Mexico Administrative Code (NMAC) 2.60 (ESA 1996).

5.22 PRS 14-006

PRS 14-006 consists of a sump (TA-14-31), associated drain line, and unpermitted outfall for TA-14-23. Six samples were collected. No COPCs were retained. Based on the sampling results and screening assessment, we recommend NFA for this site under Criterion 4.

5.22.1 History

PRS 14-006 is discussed in detail in Section 5.4 of the RFI Work Plan (LANL 1994, 1156). The sump, which was used to separate small pieces of HE from liquid, is plugged at the outfall drainline. The sludge was removed from the sump, and it was swiped for HE.

5.22.2 Description

The sump is a steel and concrete unit, 4.5 ft wide by 8.3 ft long by 4.8 ft deep. Two floor drains and an asphalt roof drain from TA-14-23 bypass the sump in a metal covered concrete culvert and discharge to the outfall. Stormwater from the adjacent parking lot flows into the concrete culvert and also discharges to the outfall line.

5.22.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.22.4 Field Investigation

5.22.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.22.4.2 Results of Field Screening

HE spot tests were carried out at each of the four sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. This screening helped determine which samples would be submitted for off-site laboratory analysis based on lead and uranium content.

The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.22.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 14-006 was to determine the extent, concentration, and depth profiles of the COPCs. Six samples were collected at PRS 14-006. A backhoe was used to excavate to 4 ft on the downslope side of the sump. Two samples were collected from the backhoe bucket using the spade and scoop technique. Four additional soil samples were collected from the drainline outfall and further downgradient. Figure 5.22.4-1 shows all sample locations, and Table 5.22.4-1 summarizes the sampling conducted at this PRS.

All samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. The samples were analyzed by gamma scan, and for total uranium, HE, SVOCs, and TAL metals within the prescribed holding times.

TABLE 5.22.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	RAD*	HE*	SVOC*
14-1076	0214-95-0101	48-48	Soil	68038/68100	68054/67992	68051	68345
14-1076	0214-95-0102	48-48	Soil	68038/68100	68054/67992	68051	68345
14-1077	0214-95-0103	0-6	Soil	68038/68100	68054/67992	68051	68345
14-1077	0214-95-0104	18-24	Soil	68038/68100	68054/67992	68051	68345
14-1078	0214-95-0105	0-6	Soil	68038/68100	68054/67992	68051	68345
14-1079	0214-95-0106	0-6	Soil	68038/68100	68054/67992	68051	68345

*Batch numbers

5.22.5 Background Comparison

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.22.4-1.

Inorganics

Cobalt, copper, lead, and mercury were detected at concentrations above background UTLs and were carried forward to the SAL comparison stage (Table 5.22.5-1). The inorganics that were either undetected or less than the background UTLs were not retained as COPCs.

Radionuclides.

Total uranium, uranium-235, and uranium-238 were reported at concentrations above their background UTL and were carried forward to the SAL comparison stage (Table 5.22.5-2).

Isotopic ratios of uranium-234 to uranium-238 by activity (≈1:1) indicate that the uranium detected at PRS 14-006 is natural uranium. However, because the total uranium values are greater than the background UTL, it is uncertain whether DU is present. Therefore, the total uranium values are compared with the SALs for both natural uranium and DU.

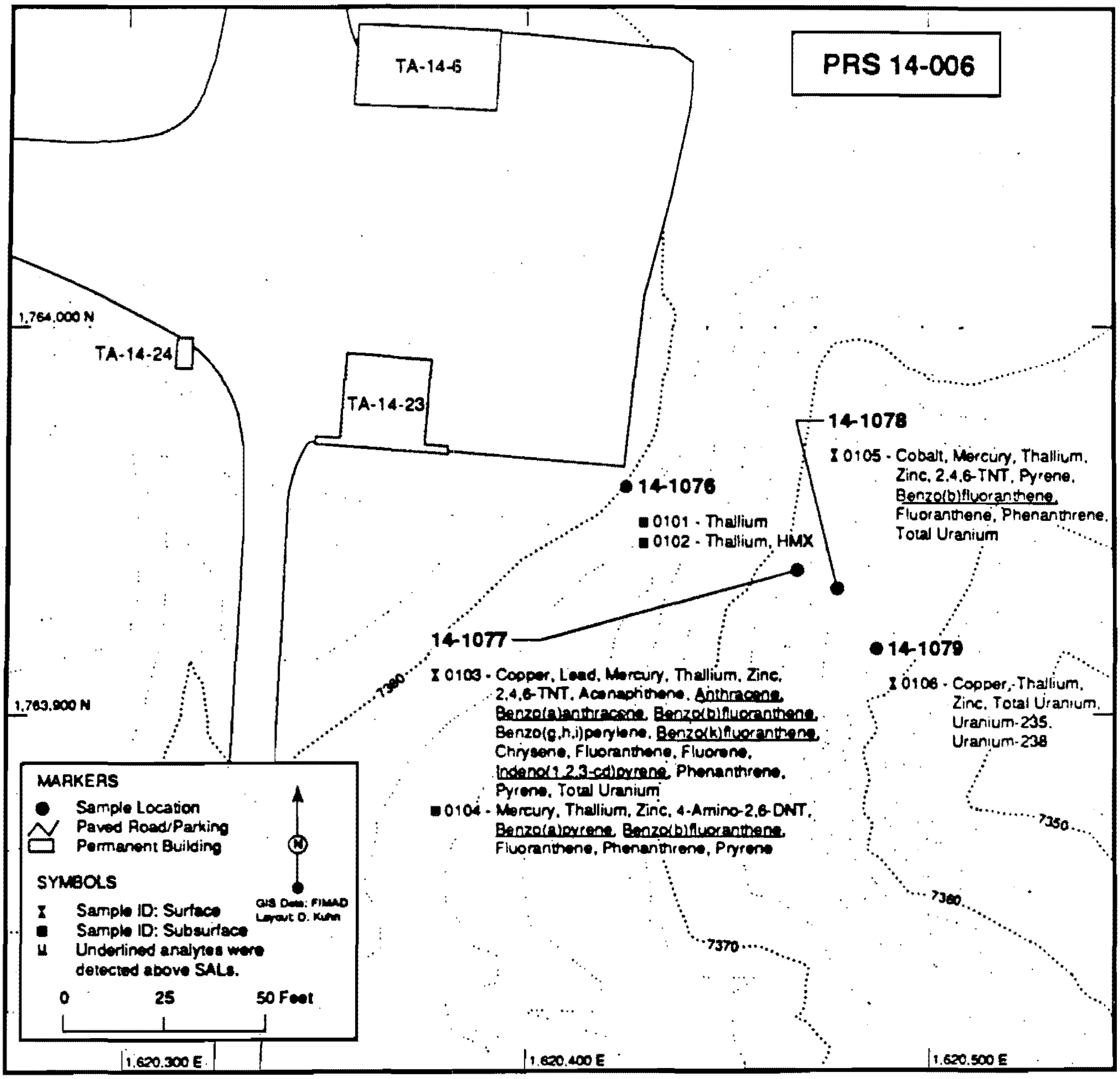


Figure 5.22.4-1 Location of PRS 14-006 samples

TABLE 5.22.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-006

Sample ID	Depth (in)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Thallium (mg/kg)	Total Uranium (mg/kg)	Zinc (mg/kg)
LANL UTL	NA	19.2	30.7	23.3	0.1	1.0	5.45	50.8
SAL	NA	4600	2800	400	23	6.1	230	23000
0214-95-0101	48-48	3.9	9.5	17.5	ND	3.4	3.36	22.7
0214-95-0102	48-48	2.86	9.71	13.9	ND	1.44	3.59	20.3
0214-95-0103	0-6	9.83	74.9	46.5	0.14	1.43	7.31	394
0214-95-0104	18-24	1.58	13.2	13.5	0.11	1.28	3.55	70.4
0214-95-0105	0-6	52.6	19.3	22.8	0.17	1.31	5.57	214
0214-95-0106	0-6	1.98	30.7	17.2	ND	1.59	6.89	75.9

NA = not applicable ND = not detected

TABLE 5.22.5-2
RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-006

Sample ID	Depth (in.)	Total Uranium (mg/kg)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
LANL UTL	NA	5.45	0.08	1.82
SAL	NA	130/29*	10	67
0214-95-0103	0-6	7.31	0.093(U)	1.2[1]
0214-95-0104	0-6	3.55	0.191[1]	2.2[1]
0214-95-0105	0-6	5.57	0.002(U)	1.16[1]
0214-95-0106	0-6	6.89	0.29	2.29

NA = not applicable ND = not detected * SALs for total uranium are for DU (130 mg/kg) and natural (29 mg/kg).

[1] Sample values are below the 3σ; data are nondetects.

5.22.6 Evaluation of Organic Constituents

Eighteen organics were reported as detected in the surface soil and carried forward to the SAL comparison stage (Table 5.22.6-1). The organics that were undetected were not retained as COPCs.

5.22.7 Human Health Assessment

5.22.7.1 Screening Assessment

Seven inorganic analytes had concentrations below their respective SALs and on that basis were subjected to the MCE. No inorganics were detected above background UTLs and below SALs.

Total uranium, uranium-235 and uranium-238 were detected at concentrations below their SALs. Because total uranium and isotopic uranium do not have additive effects, an MCE is not appropriate. Uranium is not retained as a COPC because the reported concentration of uranium, whether expressed as total uranium or isotopic uranium, was below the respective SAL. No other radionuclides had concentrations above background UTL.

Eight organic analytes [acenaphthene, dibenzofuran, fluoranthene, fluorene, HMX, pyrene, RDX, and 2,4,6-trinitrotoluene] were detected below their SALs and on that basis, all except dibenzofuran and RDX, were submitted to the MCE. Dibenzofuran and RDX were estimated in the surface soil at a concentration of 19.1 mg/kg and 0.23 mg/kg, respectively (Table 5.22.6-1). The values are qualified as J because they were below the method detection limits for the analytes. The analytes are not retained as COPCs because the results cannot be accurately distinguished from instrument “noise” levels.

Seven PAHs [anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene] exceeded their respective SALs and on that basis were retained as COPCs. Three analytes [benzo(g,h,i)perylene, phenanthrene, and 4-amino-2,6-dinitrotoluene] had no SALs and on that basis were retained as COPCs. Table 5.22.7-1 shows the noncarcinogenic COPCs and Table 5.22.7-2 shows the carcinogenic COPCs that either exceed SAL or had no SAL. No other organics were detected above SAL.

Multiple Chemical Evaluation

An MCE was performed on 13 analytes in the noncarcinogenic effects category (Table 5.22.7-3). The sum of the maximum normalized concentrations of these analytes is 1.4884, resulting in performance of an MCE on a sample-by-sample basis. The maximum normalized concentration, for sample # 0214-95-0103, totaled 1.2194, which is greater than the decision value of 1, indicating that adverse health effects are likely. Seven analytes that contained more than 0.1 to the total were retained as COPCs (Table 5.22.7-3). A carcinogenic effects analysis was not performed because no analytes below SAL were found in this category.

TABLE 5.22.6-1
PRS 14-006 SOIL CONCENTRATIONS OF ORGANIC ANALYTES WITH VALUES GREATER THAN EQL

Sample ID	Depth (in.)	Acenaphthene (mg/kg)	Anthracene (mg/kg)	Benzo(a) anthracene (mg/kg)	Benzo(a) pyrene (mg/kg)	Benzo(b) fluoranthene (mg/kg)
SAL	NA	360	19	0.61	0.061	0.61
EQL	NA	0.33	0.33	0.33	0.33	0.33
0214-95-0101	48-48	ND	ND	ND	ND	ND
0214-95-0102	48-48	ND	ND	ND	ND	ND
0214-95-0103	0-6	40.5(J)	59.3(J)	118(J)	ND	120(J)
0214-95-0104	18-24	2.06 (J)[1]	3.12 (J)[1]	ND	5	8.75
0214-95-0105	0-6	ND	ND	ND	2.59 (J)[1]	3.72

Sample ID	Depth (in.)	Benzo(g,h,i) perylene (mg/kg)	Benzo(k) fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzofuran (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(1,2,3-cd)pyrene (mg/kg)
SAL	NA	No SAL	6.1	24	260	2600	300	0.61
EQL	NA	0.33	0.33	0.33	0.33	0.33	0.33	0.33
0214-95-0101	48-48	ND	ND	ND	ND	ND	ND	ND
0214-95-0102	48-48	ND	ND	ND	ND	ND	ND	ND
0214-95-0103	0-6	44.1 (J)	71.9 (J)	152 (J)	19.1 (J)	282 (J)	36.9 (J)	50.9 (J)
0214-95-0104	18-24	2.32 (J)[1]	ND	ND	ND	15.8	1.72 (J)[1]	2.85 (J)[1]
0214-95-0105	0-6	ND	ND	ND	ND	7.92	ND	ND

Sample ID	Depth (in.)	Phenanthrene (mg/kg)	Pyrene (mg/kg)	HMX (mg/kg)	RDX (mg/kg)	2,4,6-Trinitrotoluene (mg/kg)	4-Amino-2,6-dinitrotoluene (mg/kg)
SAL	NA	No SAL	2000	3300	4	15	No SAL
EQL	NA	0.33	0.33	.75*	0.75*	.188*	.188*
0214-95-0101	48-48	ND	ND	0.67(J)[1]	0.23(J)[1]	ND	ND
0214-95-0102	48-48	ND	ND	0.8	ND	ND	ND
0214-95-0103	0-6	200 (J)	248 (J)	0.54 (J)	ND	4.75	ND
0214-95-0104	18-24	13.3	12.7	ND	ND	ND	0.27
0214-95-0105	0-6	4.46	6.43	ND	ND	0.34	ND

NA = not applicable ND = not detected

[1] Sample values are considered nondetects because they are less than the MDLs and cannot be distinguished from instrument "noise".

TABLE 5.22.7-1
PRS 14-006 NONCARCINOGENS WITH CONCENTRATIONS IN SOIL THAT EXCEED SALs

Sample ID	Location ID	Depth (in.)	Anthracene (mg/kg)	Phenanthrene (mg/kg)	4-Amino-2,6-dinitrotoluene (mg/kg)
SAL	NA	NA	19	No SAL	No SAL
0214-95-0103	14-1077	0-6	59.3(J)	200(J)	ND
0214-95-0104	14-1077	18-24	3.12(J)	13.3	0.27
0214-95-0105	14-1078	0-6	ND	4.46	ND

TABLE 5.22.7-2
PRS 14-006 CARCINOGENS IN SOIL THAT EXCEED SALs

Sample ID	Location ID	Depth (in.)	Benzo(a) anthracene (mg/kg)	Benzo(a) pyrene (mg/kg)	Benzo(b) fluoranthene (mg/kg)	Benzo(k) fluoranthene (mg/kg)	Benzo(g,h,i) perylene (mg/kg)	Chrysene (mg/kg)	Indeno(1',2',3-cd) pyrene (mg/kg)
SAL	N/A	N/A	0.61	0.061	0.61	6.1	No SAL	24	0.61
0214-95-0103	14-1077	0-6	118(J)	ND	120(J)	71.9(J)	44.1(J)	152(J)	50.9(J)
0214-95-0104	14-1077	18-24	ND	5	8.75	ND	2.32(J)	ND	2.85(J)
0214-95-0105	14-1078	0-6	ND	2.59(J)	3.72	ND	ND	ND	ND

NA = not applicable . ND = not detected

TABLE 5.22.7-3
MCE AT PRS 14-006

NONCARCINOGENIC - SOIL

Analyte	Maximum Normalized Concentrations	
	Maximum	Maximum Sample 0214-95-0103
Cobalt	0.0114	0.0021
Copper	0.0268	0.0268
HMX	0.0002	0.0002
Lead[1]	0.1162	0.1162
Mercury	0.0074	0.0061
Thallium	0.4928	0.2344
Zinc	0.0171	0.0171
Total Uranium	0.0318	0.0318
Acenaphthene	0.1125	0.1125
Fluoranthene	0.1085	0.1085
Fluorene	0.1230	0.1230
Pyrene	0.1240	0.1240
2,4,6-Trinitrotoluene	0.3167	0.3167
Total	1.4884	1.2194

[1] Analytes set in bold are those that are retained as COPCs based on sample-by-sample basis.

5.22.7.2 Risk Assessment

No baseline human health risk assessment was performed for PRS 14-006.

The site-specific preliminary remediation goals (PRG) for lead, thallium, and 2,4,6-trinitrotoluene were calculated to determine if the detected concentration warranted corrective action. Calculation of these PRGs was based on a nonintrusive industrial scenario. The site-specific PRG calculation for carcinogens was based on 1E-06 risk and for noncarcinogens on a hazard index of 1 (see Appendix C). The PRGs for lead (as determined by EPA Region VI) and thallium were calculated to be 1000 mg/kg and 184 mg/kg, respectively. The PRG for 2,4,6-trinitrotoluene was calculated to be 191 mg/kg. The PRGs for acenaphthene, fluoranthene, fluorene, and pyrene were not calculated because they are PAHs and are not retained with the other PAHs that exceeded SALs (Section 5.22.10).

5.22.8 Ecological Assessment

The general landscape condition around this PRS is moderately developed, and the potential for receptors to come in contact with ecological COPCs is high (Table 2.4-1). Therefore, this PRS will be included in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.22.9 Extent of Contamination

Samples were taken at the outfall, 5 ft downgradient and 25 ft down the drainage channel. The reported concentrations of analytes above background decreased with distance from the sump or outfall. The chemicals observed above SALs were all undetected in the sample taken 25 ft from the outfall (sample # 0214-95-0106). The area of potential contamination was effectively bounded by the samples taken.

5.22.10 Conclusions and Recommendations

Seventeen COPCs — 13 PAHs, two HE, and two inorganics — are retained by the screening assessment.

The PAHs are not retained as COPCs because they are most likely derived from the runoff area (i.e., parking lot) adjacent to the sump. The highest concentrations of PAHs were found in surface soil samples at the outfall (sample # 0214-95-0103); these however, markedly decrease in the surface samples collected at distances from the outfall and in the subsurface sample at the outfall. Because the sump drain has been plugged, it cannot be considered to be the source of the contamination. The drainline collects surface runoff from the adjacent parking lot and the asphalt roof, indicating that the source of the PAHs is from non-site-related activity.

Lead and thallium were retained as COPCs from the MCE, but the concentrations are below their site-specific PRGs (1000 mg/kg for lead and 184 mg/kg for thallium); therefore, these analytes are not retained as COPCs because they do not present an unacceptable risk to human health.

The HE retained consisted of 2,4,6-trinitrotoluene (at a concentration of 4.75 mg/kg) and 4-amino-2,6-dinitrotoluene (at a concentration of 0.27 mg/kg) found in only one sample taken at the outfall. The 4-amino-2,6-dinitrotoluene has no SAL but exists at a low level that is close to the limit of detection (0.188 mg/kg). It is not retained as a COPC, however, because of its the low concentration in only one sample. The 2,4,6-trinitrotoluene was detected at a level below its site-specific PRG (191 mg/kg) and therefore is not retained as a COPC. Both compounds pose no unacceptable human health risk at this PRS.

Based on NFA Policy Criterion 4, PRS 14-006 will not be added to the HSWA module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project List of PRSs.

5.23 AOC C-14-003

AOC C-14-003 is the site of a former HE preparation building (TA-14-4). Two samples were collected. No COPCs were retained. As a result of the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.23.1 History

AOC C-14-003 is discussed in detail in Section 5.4 of the RFI Work Plan (LANL 1994, 1156). This building was constructed in October 1944 and removed in March 1952 (LANL 1993, 21-0077). No sign of building remains.

5.23.2 Description

The site of this former HE preparation building is located north of magazine TA-14-22 in the central part of TA-14, within the loop made by the paved road circling the magazine. (The wood frame building was 12 ft wide by 25 ft long by 8 ft high). The site lies in an unpaved area lightly covered with grasses and weeds on the sloping side of the berm from TA-14-22.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.23.3 Previous Investigations

No previous investigations have been reported for this site.

5.23.4 Field Investigation

5.23.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the site and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.23.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.23.4.3 Sample Collection and Submittal for Analysis

The objectives of sampling at AOC C-14-003 were to determine if contamination exists. Two samples were collected: one at the prescribed depth of 0 to 6 in., while the second encountered refusal at 3 in. Figure 5.23.4-1 shows all sample locations, and Table 5.23.4-1 summarizes the sampling conducted at this AOC.

Both samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. The samples were submitted and analyzed by gamma scan for HE, and TAL metals within the prescribed holding times.

TABLE 5.23.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	Rad*	HE*
14-1066	0214-95-0091	0-6	Soil	69184/69437/70088	68994/69000	69174
14-1067	0214-95-0092	0-3	Soil	69184/69437/70088	68994/69000	69174

*Batch numbers

5.23.5 Background Comparisons

Inorganics

No inorganics were detected above background UTLs; therefore, they were not retained as COPCs.

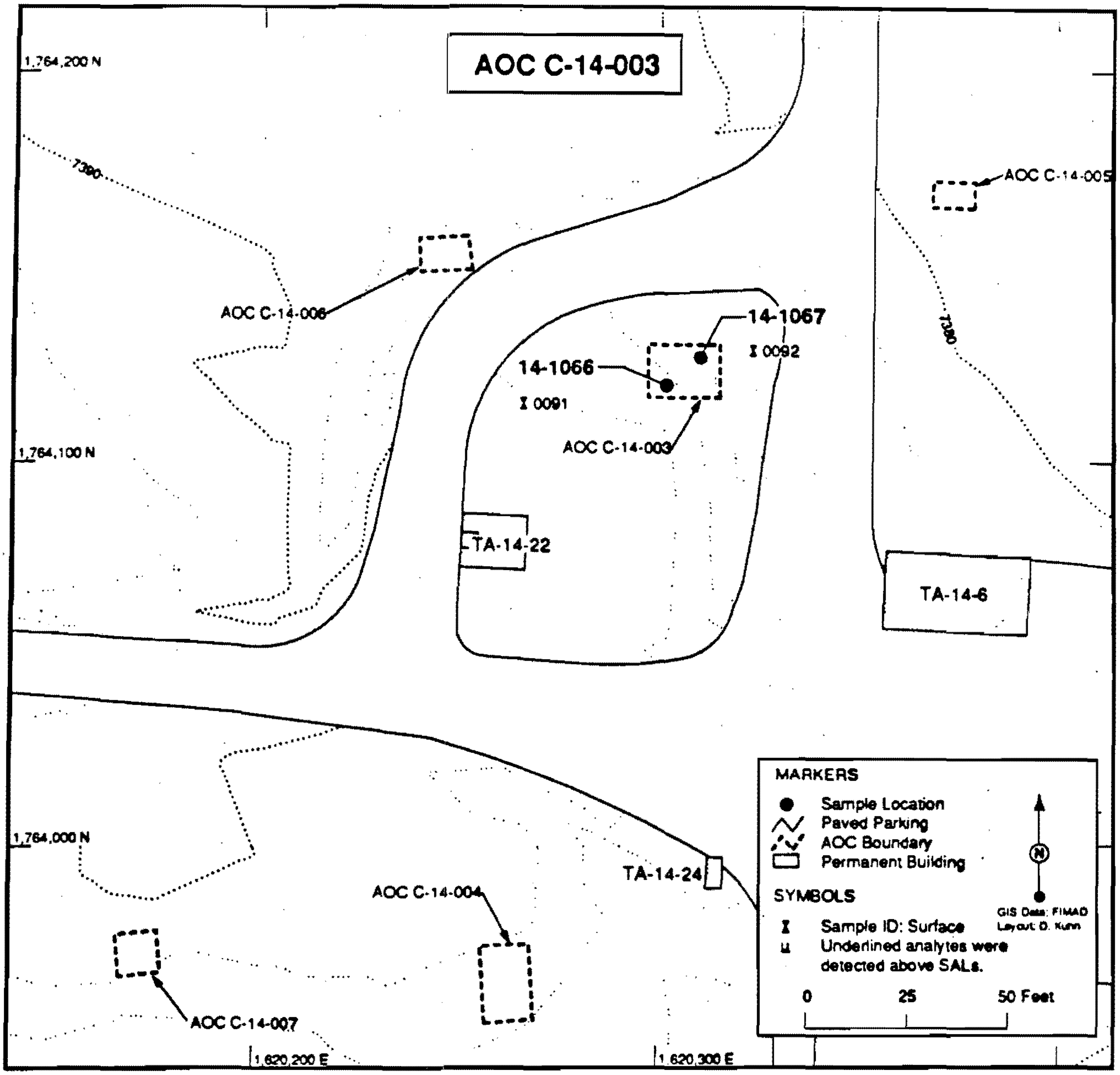


Figure 5.23.4-1 Location of AOC C-14-003 samples

Radionuclides

Uranium-238 was detected in both samples at concentrations above the background UTL of 1.82 pCi/g and was carried forward to the SAL comparison stage. The radionuclides that were either undetected or detected at concentrations below background UTLs were not retained as COPCs.

5.23.6 Evaluation of Organic Constituents

HMX was estimated in one soil sample at a concentration of 0.29 mg/kg. This value was qualified as J because it was below the method detection limit for this analyte. The analyte is not retained as a COPC because the result cannot be accurately distinguished from instrument "noise" levels.

5.23.7 Human Health Assessment

5.23.7.1 Screening Assessment

No inorganics were detected above background UTLs.

Uranium-238 was detected below its SAL of 67 pCi/g. It was not subjected to an MCE because it was the only radionuclide detected and; therefore, was not retained as a COPC. No other radionuclides were detected above background UTLs.

HMX was estimated at a concentration below its SAL of 3300 mg/kg and was not retained as a COPC (see Section 5.7.6). No other organics were detected at this site.

5.23.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this AOC.

5.23.8 Ecological Assessment

The general landscape condition around this AOC is moderately developed, and the potential for receptors to come in contact with ecological COPCs is moderate (Table 2.4-1). Therefore, this AOC will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.23.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.23.10 Conclusions and Recommendations

Based on NFA Policy Criterion 4, this AOC will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.24 AOC C-14-004

AOC C-14-004 is the site of a former electronics shop (TA-14-7) constructed in January 1945 and removed in March 1952 (LANL 1993, 21-0077). Two samples were collected and analyzed for SVOCs.

Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.24.1 History

AOC C-14-004 is discussed in detail in Section 5.4 of the RFI Work Plan (LANL 1994, 1156). This building was built in January 1945 and removed in March 1952 (LANL 1993, 21-0077).

All that remains of the building that housed the shop are the concrete foundation and the concrete stoop at the north end.

5.24.2 Description

The site of this former electronics shop is located 75 ft west of TA-14-23, in the central part of TA-14. The structure was of wood frame construction 15 ft wide by 24 ft long by 9 ft high. The terrain slopes gently to the south and is covered with grasses and a few low shrubs. To the west are oak thickets and pine forest. Runoff is toward the ditch bordering the graveled road serving the firing area.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.24.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.24.4 Field Investigation

5.24.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.24.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent off-site for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.24.4.3 Sample Collection and Submittal for Analysis

The objectives of sampling at AOC C-14-004 were to determine if contamination exists. Two samples were collected. Neither sample was collected at the prescribed depth of 0-6 in., refusal being encountered at 2 in. for both.

Figure 5.24.4-1 shows all sample locations, and Table 5.24.4-1 summarizes the sampling conducted at this AOC. The samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. They were analyzed for SVOCs within the prescribed holding times.

TABLE 5.24.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	SVOC*
14-1068	0214-95-0093	0-2	Soil	68345
14-1069	0214-95-0094	0-2	Soil	68345

*Batch numbers

5.24.5 Background Comparisons

Inorganics

No inorganic compounds were analyzed for at this site.

Radionuclides

No radionuclide compounds were analyzed for at this site.

5.24.6 Evaluation of Organic Constituents

One organic compound, 4-chloro-3-methyl phenol, was detected in the surface soil at a concentration of 5.31 mg/kg and was carried forward to the SAL comparison stage. The organics that were undetected were not retained as COPCs.

The location of the sample with the detected analyte value is shown in Figure 5.24.4-1

5.24.7 Human Health Assessment

5.24.7.1 Screening Assessment

The compound 4-chloro-3-methyl phenol, had no SAL and therefore was retained as a COPC. No other organics were detected.

5.24.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a results of the screening assessment and no unacceptable human health risk exists at this site.

5.24.8 Ecological Assessment

The general landscape condition around this AOC is moderately developed, and potential for receptors to come in contact with ecological COPCs is moderate (Table 2.4-1). Therefore, this AOC will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in this ecological risk assessment.

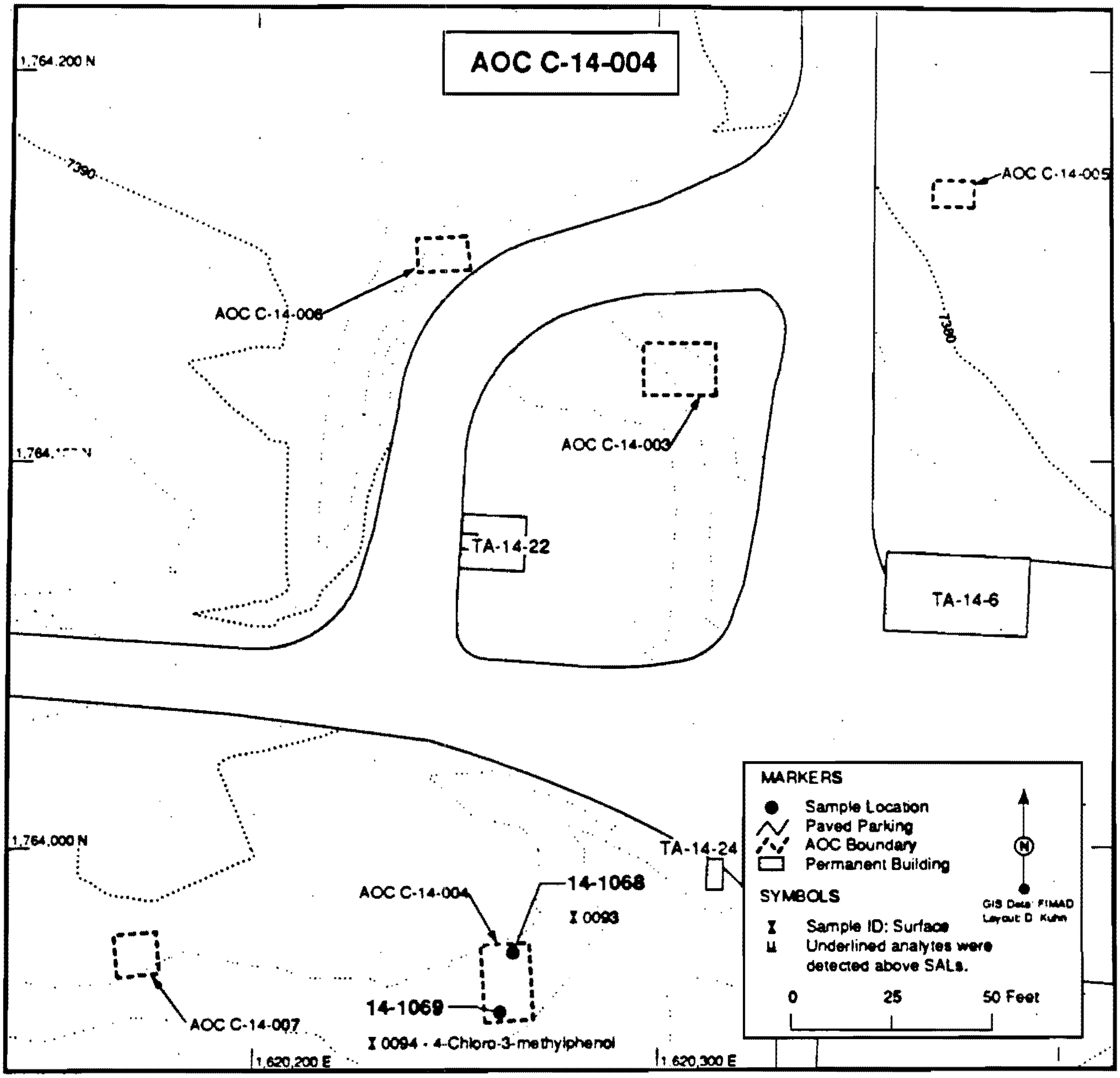


Figure 5.24.4-1 Location of AOC C-14-004 samples

5.24.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.24.10 Conclusions and Recommendations

The organic compound 4-chloro-3-methyl phenol was detected at a low concentration. No toxicity data exists on this compound; therefore, no SAL was calculated. Because of its low concentration and the lack of significant related compounds. This organic was not retained as a COPC. EPA is currently forming a risk assessment working group for reference-dose determination.

Based on NFA Policy Criterion 4, AOC C-14-004 will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.25 AOC C-14-005

AOC C-14-005 is the site of a former storage building. Two samples were collected. No COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.25.1 History

AOC C-14-005 is discussed in detail in Section 5.4 of the RFI Work Plan (LANL 1994, 1156). The storage building was constructed in December 1944 and removed in March 1952 (LANL 1993, 21-0077).

5.25.2 Description

The site of this former storage building is located on the east side of the access road to TA-14, 80 ft north of TA-14-6 in the central part of TA-14. It was of wood frame construction 6 ft wide by 16 ft long by 9 ft high. The area is nearly level, sloping slightly to the north, and is covered with grasses and weeds. Drainage leads into the ditch at the side of the road, then north to the R-Site Road drainage system. With the possible exception of some concrete chips, no sign of the building remains.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.25.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.25.4 Field Investigation

5.25.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the site and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.25.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.25.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-14-005 was to determine the extent, concentration, and depth profiles of the COPCs. Two samples were collected: one at the prescribed depth of 0 to 6 in.; the other from 0 to 5 in. Figure 5.25.4-1 shows all sample locations, and Table 5.25.4-1 summarizes the sampling conducted at this AOC.

The samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. They were analyzed for total uranium, HE, and TAL metals within the prescribed holding times.

TABLE 5.25.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	RAD*	HE*
14-1070	0214-95-0095	0-6	Soil	68038/68100	67992	68051
14-1071	0214-95-0096	0-5	Soil	68038/68100	67992	68051

*Batch numbers

5.25.5 Background Comparisons

Inorganics

Lead, mercury, and thallium were detected at concentrations above background UTLs (Table 5.25.5-1). These were carried forward to the SAL comparison stage. The inorganics that were either undetected or detected at concentrations less than the background UTLs were not retained as COPCs.

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.25.4-1.

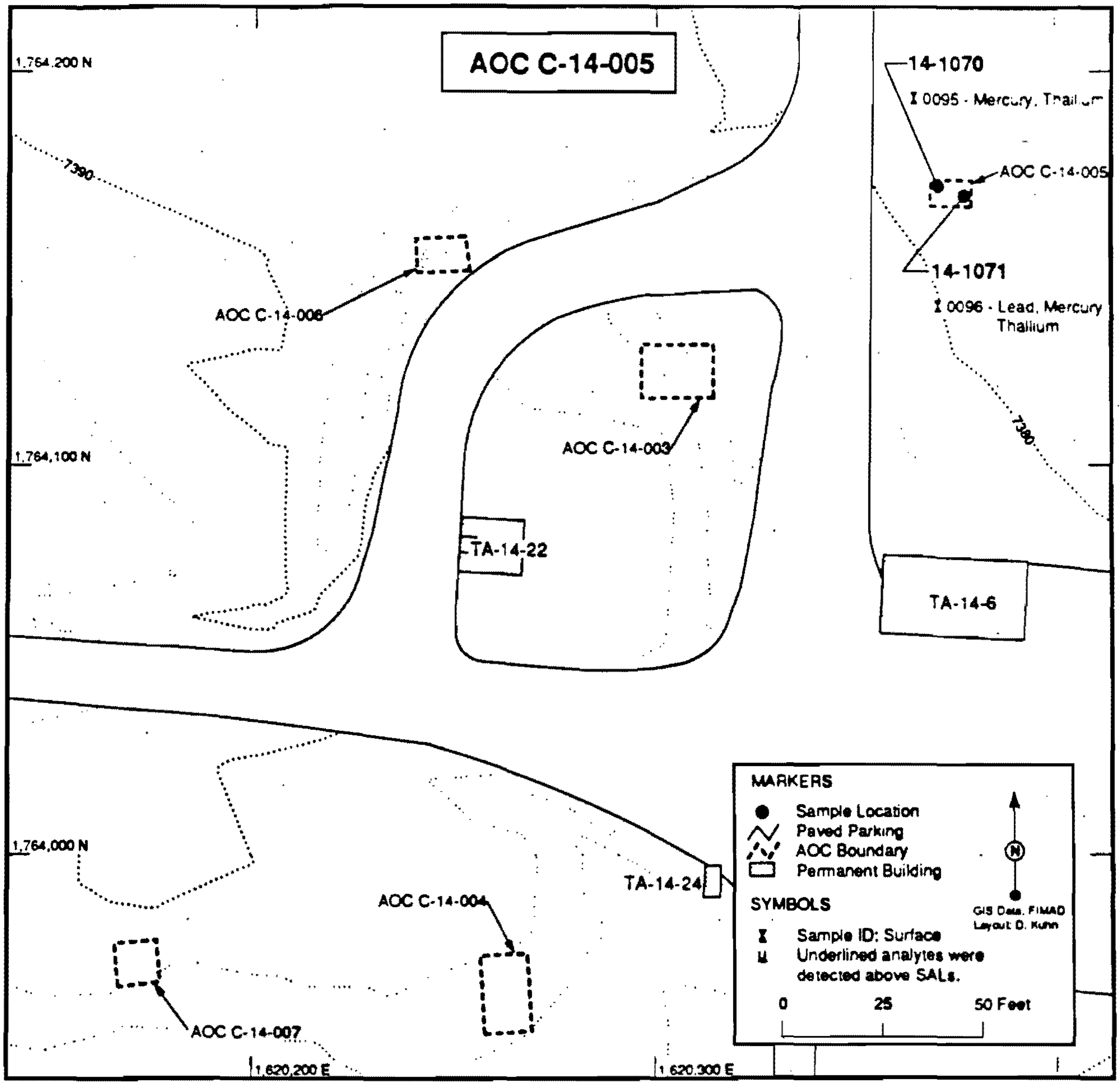


Figure 5.25.4-1 Location of AOC C-14-005 samples

TABLE 5.25.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR AOC C-14-005

Sample ID	Depth (in.)	Lead (mg/kg)	Mercury (mg/kg)	Thallium (mg/kg)
LANL UTL	NA	23.3	0.1	1.0
SAL	NA	400	23	6.1
0214-95-0095	0-6	22.6	3.42	1.64
0214-95-0096	0-5	129	0.23	1.72

NA = not available

Radionuclides

No radionuclide compounds were detected at concentrations above background UTLs; therefore, they were not retained as COPCs.

5.25.6 Evaluation of Organic Constituents

No organics were detected; therefore, they were not retained as COPCs.

5.25.7 Human Health Assessment

5.25.7.1 Screening Assessment

Lead, mercury, and thallium had concentrations below their respective SALs and on that basis were subjected to the MCE.

No other inorganics or radionuclides were detected at concentrations above background UTLs, and no organics were detected.

Multiple Chemical Evaluation

An MCE was performed on three analytes in the noncarcinogenic effects category (Table 5.25.7-1). The sum of the maximum normalized concentrations totaled 0.7532, which was less than the decision value of 1, indicating adverse health effects are unlikely. Lead, mercury, and thallium were therefore not retained as COPCs. Neither a carcinogenic nor a radionuclide effects analysis was performed because no analytes were found in these categories.

TABLE 5.25.7-1
MCE AT AOC C-14-005

NONCARCINOGENIC - SOIL	
Analyte	**Maximum Normalized Concentrations**
Lead	0.3225
Mercury	0.1487
Thallium	0.2820
Total	0.7532

5.25.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this AOC.

5.25.8 Ecological Assessment

The general landscape condition around this AOC is moderately developed, and the potential for receptors to come in contact with ecological COPCs is moderate (Table 2.4-1). Therefore, this AOC will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.25.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.25.10 Conclusions and Recommendations

Based on NFA Policy Criterion 4, this AOC will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.26 AOC C-14-006

AOC C-14-006 is the site of a former magazine, the location of which has been determined from a 1950 Laboratory photograph. Two samples were collected and analyzed for HE and TAL metals; no COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.26.1 History

AOC C-14-006 is discussed in detail in Section 5.4 of the RFI Work Plan (LANL 1994, 1156). The magazine was constructed in January 1945. The wood frame structure, 6 ft wide by 6 ft long by 6 ft high with a soil berm on three sides and the top, was removed in March 1952 (LANL 1993, 21-0077).

5.26.2 Description

The site of AOC C-14-006 is located 60 ft northwest of an existing magazine (TA-14-22) in the central part of TA-14. The site is in a level field with pine forest to the north and west. Drainage is to the northeast into the ditches lining the west side of the paved road.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.26.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.26.4 Field Investigation

5.26.4.1 Results of Field Surveys

Land surveys were conducted both before and after sampling to establish exact sample locations.

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.26.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.26.4.3 Sample Collection and Submittal for Analysis

The objectives of sampling at AOC C-14-006 were to determine if contamination exists. Two samples were collected and submitted to an off-site laboratory in accordance with the RFI Work Plan. The samples were analyzed for HE and TAL metals within the prescribed holding times except for HE, which exceeded the 14-day holding time by 5 days. Figure 5.26.4-1 shows all sample locations, and Table 5.26.4-1 summarizes the sampling conducted at this AOC.

TABLE 5.26.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	HE*
14-1072	0214-95-0097	0-6	Soil	69184/69437/70088	69881
14-1073	0214-95-0098	0-6	Soil	69184/69437/70088	69881

*Batch numbers

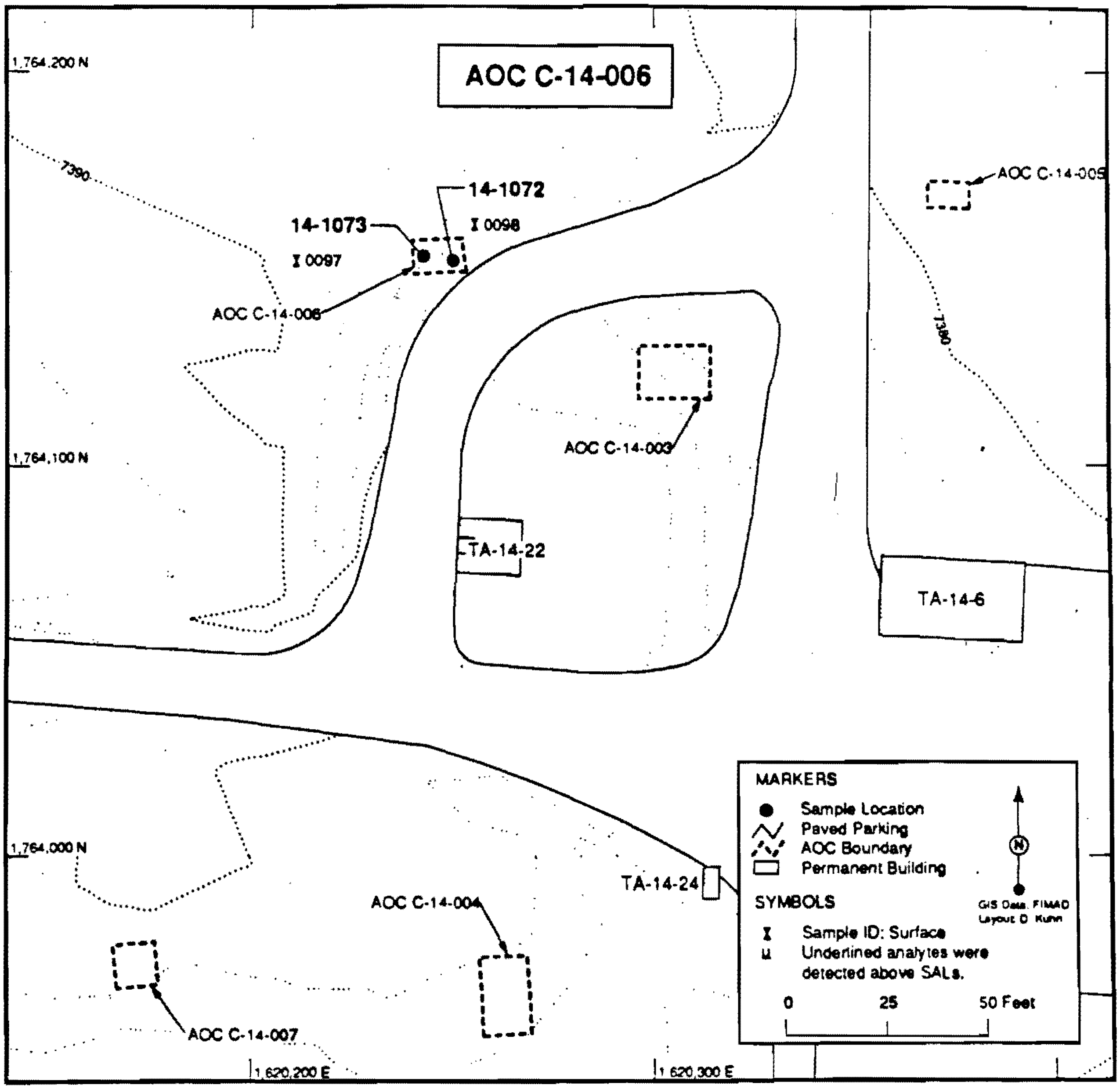


Figure 5.26.4-1 Location of AOC C-14-006 samples

5.26.5 Background Comparisons

Inorganics

No inorganics were detected at concentrations above background UTL; therefore, they were not retained as COPCs.

Radionuclides

No radionuclide compounds were analyzed at this site.

5.26.6 Evaluation of Organic Constituents

No organics were detected; therefore, they were not retained as COPCs.

5.26.7 Human Health Assessment

5.26.7.1 Screening Assessment

No inorganics or radionuclides were detected at concentrations above background UTLs, and no organics were detected.

5.26.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained and no unacceptable human health risk exists.

5.26.8 Ecological Assessment

The general landscape condition around this site is moderately developed, and the potential for receptors to come in contact with ecological COPCs is moderate (Table 2.4-1). Therefore, this AOC will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.26.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.26.10 Conclusions and Recommendations

Based on NFA Policy Criterion 4, AOC C-14-006 will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.27 AOC C-14-007

AOC C-14-007 is the site of a former storage building (TA-14-10). All that remains of the building is a small pile of bricks with mortar attached to their sides; there is no obvious leveling of the site and no other debris. Two samples were collected. No COPCs were retained. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 4.

5.27.1 History

Measurements from photos and old maps provided the location of TA-14-10. The storage building was constructed in January 1945 and removed in March 1952 (LANL 1993, 21-0077).

5.27.2 Description

The site of AOC C-14-007 is located in the central part of TA-14, 160 ft west of TA-14-23, near the rim of the breaks leading south down to Canon de Valle. The building was of wood frame construction, 10 ft wide by 10 ft long by 8 ft high. The area is forested and covered with grasses and pine duff; the building footprint is overgrown by pines and oak brush. The terrain slopes to the south toward a low, rocky cliff.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.27.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.27.4 Field Investigation

5.27.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the site and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.27.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent off-site for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.27.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-14-007 was to determine if contamination exists. Two samples were collected. Neither sample was collected at the prescribed depth, refusal being encountered at 5 in. for both. Figure 5.27.4-1 shows all sample locations, and Table 5.27.4-1 summarizes the sampling conducted at this AOC.

Both samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. The samples were analyzed for total uranium, HE, SVOCs, and TAL metals within the prescribed holding times.

TABLE 5.27.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	RAD*	HE*	SVOC*
14-1074	0214-95-0099	0-5	Soil	68039/68100	67992	68051	68345
14-1075	0214-95-0100	0-5	Soil	68039/68100	67992	68051	68345

*Batch numbers

5.27.5 Background Comparisons

The location of samples with detected analyte values exceeding background UTLs are shown in Figure 5.27.4-1

Inorganics

Lead, thallium, and total uranium were detected at concentrations above background UTLs and were carried forward to the SAL comparison stage (Table 5.27.5-1). The inorganics that were either undetected or detected at concentrations less than the background UTLs were not retained as COPCs.

TABLE 5.27.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR AOC C-14-007

Sample ID	Depth (in.)	Lead (mg/kg)	Thallium (mg/kg)	Total Uranium (mg/kg)
LANL UTL	NA	23.3	1.0	5.45
SAL	NA	400	6.1	230
0214-95-0099	0-5	31.5	1.18	12
0214-95-0100	0-5	16.9	1.1	4.34

NA = not available

Radionuclides

Only total uranium was reported at a concentration above its background UTL and was carried forward to the SAL comparison stage. Because isotopic uranium was not measured at this site, determining whether the uranium is natural or depleted is impossible. Therefore, the total uranium values are compared with the SALs for both natural uranium and DU.

5.27.6 Evaluation of Organic Constituents

One HE, 4-amino-2,6-dinitrotoluene, was detected in the surface soil at a concentration of 0.36 mg/kg and was carried forward to the SAL comparison stage. The organics that were undetected were not retained as COPCs.

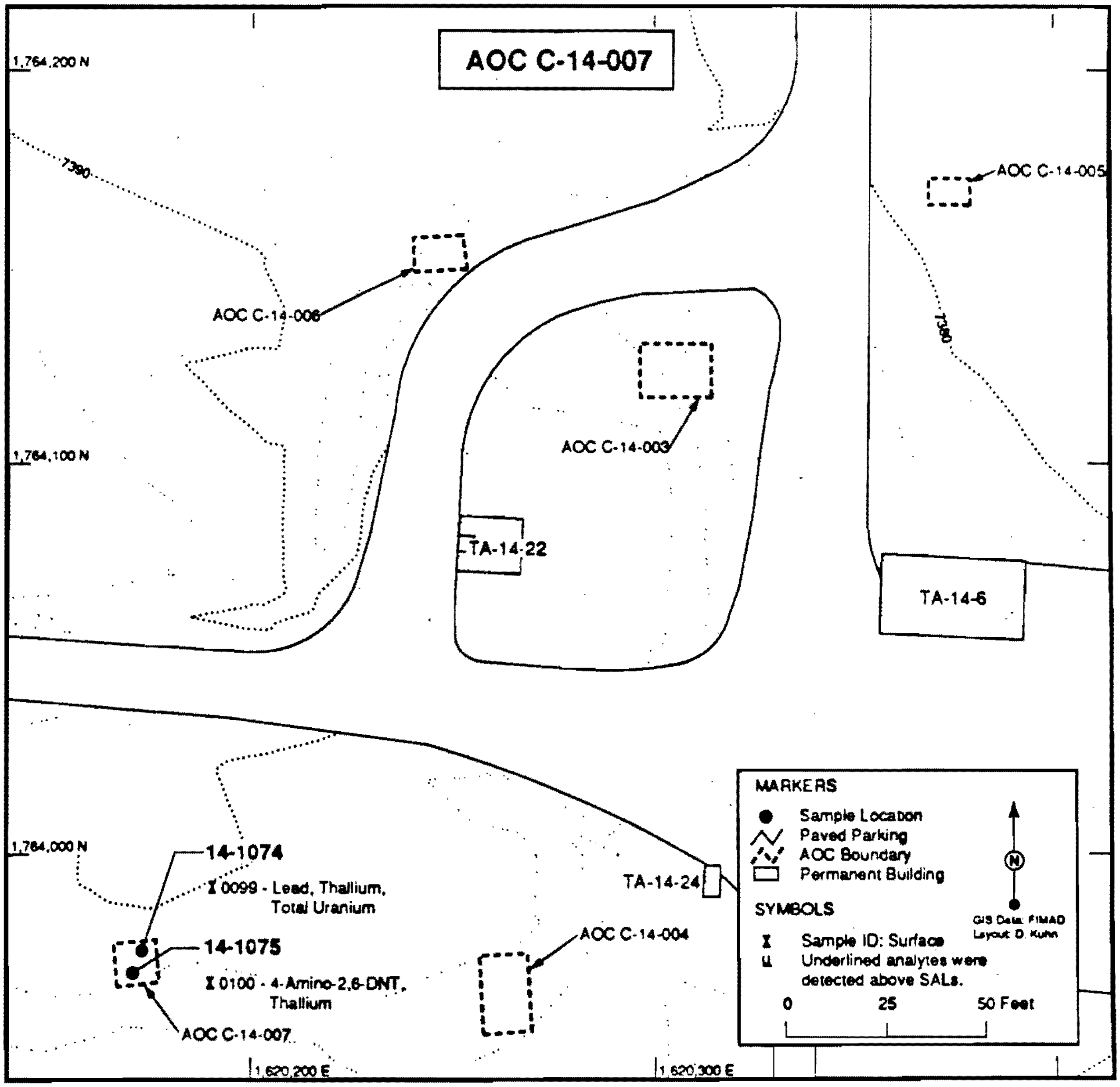


Figure 5.27.4-1 Location of AOC C-14-007 samples

5.27.7 Human Health Assessment

5.27.7.1 Screening Assessment

Lead, thallium, and total uranium were detected at concentrations below their respective SALs and on that basis were subjected to the MCE.

One radionuclide, total uranium, was at detected at a concentration below the SALs for natural and depleted uranium but was not subjected to an MCE for radionuclide effects because it was the only radionuclide detected. Therefore, total uranium was not retained as a COPC.

The organic compound 4-amino-2,6-dinitrotoluene had no SAL and on that basis was retained as a COPC.

No other radionuclides or inorganics were detected above background UTLs, and no other organics were detected.

Multiple Chemical Evaluation

The MCE showed three analytes in the noncarcinogenic effects category (Table 5.27.7-1). The sum of the maximum normalized concentrations totaled 0.3244, which was less than the decision value of 1, indicating adverse health effects are unlikely. Lead, thallium, and total uranium were not retained as COPCs. A carcinogenic effects analysis was not performed because no analytes met the criteria for an MCE.

TABLE 5.27.7-1
MCE AT AOC C-14-007

NONCARCINOGENIC – SOIL	
Analyte	**Maximum Normalized Concentrations**
Lead	0.0788
Thallium	0.1934
Total Uranium	0.0522
Total	0.3244

5.27.7.2 Risk Assessment

No human health risk assessment was performed for AOC C-14-007 because no COPCs were retained and no unacceptable human health risk exists.

5.27.8 Ecological Assessment

The general landscape conditions around this AOC are moderately developed, and the potential for receptors to come in contact with ecological COPCs is moderate (Table 2.2.4-1). Therefore, this AOC will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.27.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.27.10 Conclusions and Recommendations

The only chemical retained as a COPC by the screening assessment is 4-amino-2,6-dinitrotoluene, which was detected in one sample at a level of 0.36 mg/kg. This level is very close to the limit of detection for this chemical. In addition, this compound is a degradation product of TNT, which was not detected at the site. Therefore, 4-amino-2,6-dinitrotoluene is not retained as a COPC because it was detected in only one sample and there were no related compounds present.

Based on Criterion 4, AOC C-14-007 will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs and AOCs.

5.28 Central Area Drainage

The Central Area Drainage samples (called the Aggregate 4 samples in the RFI Work Plan) are located in the central area of TA-14. The four main channels of the drainage all flow into Cañon de Valle. Thirteen samples were taken from these channels. No COPCs were retained. Based on the sampling results and the screening assessment, we recommend NFA for this site under Criterion 4.

5.28.1 History

The Central Area Drainage is discussed in detail in Section 5.4 of the RFI Work Plan (LANL 1994, 1156). The central area of TA-14 has been the site of HE testing since 1950. The area continues to be an active HE testing site.

5.28.2 Description

Four drainages flow from the central area of TA-14. Two flow to the east: one in the upper third of the site and the other in the middle of the site. The third drainage flows from the lower portion of the site to the south; the last, also from the lower portion of the site, flows to the southwest. All of these drainages flow into Cañon de Valle, which contains an intermittent stream.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.28.3 Previous Investigation(s)

No previous investigations have been reported for these drainages. However, in 1988 and 1993 samples were taken in the area that these drainages serve. The indication from the previous sampling is that some PAH contamination and possibly low-level TNT was present in the soils.

5.28.4 Field Investigation

5.28.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the drainage area and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.28.4.2 Results of Field Screening

HE spot tests were carried out at each of the 12 sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. This screening helped determine which samples would be submitted for off-site laboratory analysis based on lead and uranium content.

The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.28.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at the Central Area Drainage was to determine the extent and concentrations of the COPCs. Thirteen surface samples were collected. Refusal was encountered at depths of less than 6 in. at several locations. Figure 5.28.4-1 shows all sample locations, and Table 5.28.4-1 summarizes the sampling conducted at this site.

The samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. They were analyzed for gamma scan (including total uranium), HE, and TAL metals within the prescribed holding times.

TABLE 5.28.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	RAD*	HE*
14-1054	0214-95-0078	0-3	Soil	68039/68100	68054/67991	68051
14-1055	0214-95-0079	0-5	Soil	68039/68100	68054/67991	68051
14-1055	0214-95-0080	0-5	Soil	68039/68100	68054/67991	68051
14-1056	0214-95-0081	0-4	Soil	68039/68100	68054/67991	68051
14-1057	0214-95-0082	0-3	Soil	68039/68100	68054/67991	68051
14-1058	0214-95-0083	0-6	Soil	68039/68100	68054/67991	68051
14-1059	0214-95-0084	0-6	Soil	68129/68102	68054/67991	68170
14-1060	0214-95-0085	0-4	Soil	68129/68102	68054/67991	68170
14-1061	0214-95-0086	0-5	Soil	68129/68102	68054/67991	68170
14-1062	0214-95-0087	0-6	Soil	68129/68102	68054/67991	68170
14-1063	0214-95-0088	0-4	Soil	68038/68100	68054/67992	68051
14-1064	0214-95-0089	0-5	Soil	68038/68100	68054/67992	68051
14-1065	0214-95-0090	0-6	Soil	68038/68100	68054/67992	68051

*Batch numbers

5.28.5 Background Comparisons

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.28.4-1.

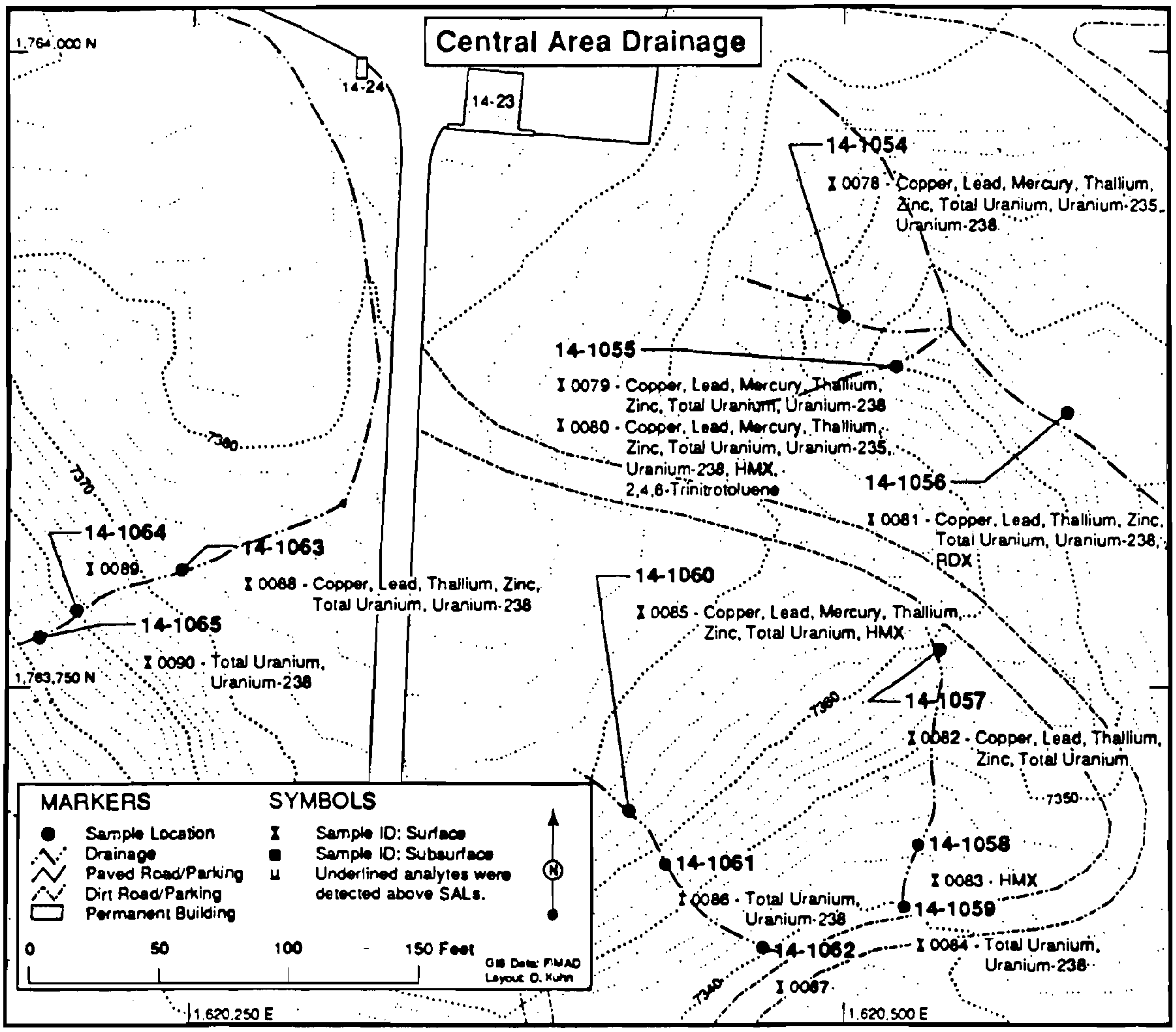


Figure 5.28.4-1 Location of Central Area Drainage samples

Inorganics

Six inorganics were detected above background UTLs and were carried forward to the SAL comparison stage (Table 5.28.5-1). The inorganics that were either undetected or that were detected at concentrations less than the background UTLs were not retained as COPCs.

TABLE 5.28.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR CENTRAL AREA DRAINAGE

Sample ID	Depth (in.)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Thallium (mg/kg)	Total Uranium (mg/kg)	Zinc (mg/kg)
LANL UTL	NA	30.7	23.3	0.1	1.0	5.45	50.8
SAL	NA	2800	400	23	6.1	230	23000
0214-95-0078	0-3	253	24.7	0.06	1.19	9.41	112
0214-95-0079	0-5	21.4	27.6	0.056	1.0	12.6	53
0214-95-0080	0-5	13.9	21.5	0.045	1.01	13.6	39.7
0214-95-0081	0-4	14.8	19.8	ND	1.17	4.51	27.5
0214-95-0082	0-3	4.86	6.58	ND	1.03	3.46	22.9
0214-95-0085	0-4	4.29	8.24	0.24	1.1	3.2	18.9(J)
0214-95-0088	0-4	5.59	34	ND	1.2	7.29	34.2

Radionuclides

Total uranium, uranium-235, and uranium-238 were reported at concentrations above their background UTLs. These analytes were retained as COPCs and were carried forward to the SAL comparison stage (Table 5.28.5-2).

TABLE 5.28.5-2
RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR CENTRAL AREA DRAINAGE

Sample ID	Depth (In.)	Total Uranium (mg/kg)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
LANL UTL	NA	5.45	0.08	1.82
SAL	NA	130/29*	10	67
0214-95-0078	0-3	9.41	0.205	2.43
0214-95-0079	0-5	12.6	0.165[1]	2.38
0214-95-0080	0-5	13.6	0.313	1.93
0214-95-0081	0-3	4.51	0.318[1]	5.5
0214-95-0084	0-4	1.75	0.077[1]	0.951
0214-95-0085	0-4	3.2	0.13[1]	0.802[1]
0214-95-0086	0-5	2.49	ND	1.67
0214-95-0088	0-4	7.29	0.129(U)	3.15
0214-95-0090	0-6	4.59	ND	1.87

NA = not applicable ND = not detected *SALs for total uranium are for DU (130 mg/kg) and natural uranium (29 mg/kg)

[1] Sample values are considered to be nondetects because they are below 3σ level.

Isotopic ratios of uranium-234 to uranium-238 (≈1:1) indicate that the uranium detected at the Central Area Drainage is natural uranium. However, because the total uranium values for some samples are greater than the background UTL, it is uncertain whether DU is present. Therefore, the total uranium values are compared with the SALs for both natural uranium and DU.

5.28.6 Evaluation of Organic Constituents

RDX, HMX, and 2,4,6-trinitrotoluene were detected in the surface soil and were carried forward to the SAL comparison stage (Table 5.28.6-1). Tetryl(methyl-2,4,6-trinitrophenylnitramine) was estimated in one soil sample at a concentration of 0.162 mg/kg. This value was qualified as J because it was below the method detection limit for this analyte. Tetryl is therefore not retained as a COPC because its value cannot be accurately distinguished from instrument "noise" levels. Organics that were undetected were not retained as COPCs.

The location of samples with detected analyte values are shown in Figure 5.28.4-1.

TABLE 5.28.6-1
ORGANICS WITH CONCENTRATIONS GREATER THAN EQL
CENTRAL AREA DRAINAGE

Sample ID	Depth (in.)	RDX (mg/kg)	HMX (mg/kg)	Tetryl (mg/kg)	2,4,6-Trinitrotoluene (mg/kg)
SAL	NA	4	3300	No SAL	15
EQL	NA	0.75*	0.75*	0.375*	0.188*
0214-95-0078	0-3	ND	0.44(J)	ND	ND
0214-95-0079	0-5	ND	26.7(J)	ND	ND
0214-95-0080	0-5	0.24(J)	3.01	ND	0.23
0214-95-0081	0-4	28.8	ND	ND	ND
0214-95-0083	0-6	ND	0.89	ND	ND
0214-95-0085	0-4	ND	9.04	ND	ND
0214-95-0086	0-5	ND	ND	0-162(J)	ND

NA = not applicable; ND = not detected; * Value is MDL

5.28.7 Human Health Assessment

5.28.7.1 Screening Assessment

Copper, lead, mercury, thallium, total uranium, and zinc had concentrations below their respective SALs and were subjected to an MCE. No other inorganic chemicals were detected at concentrations above background UTLs or SALs.

Total uranium, uranium-235, and uranium-238 were detected at concentrations below their SALs. Because total uranium and isotopic uranium do not have additive effects, an MCE is not appropriate. Uranium is not retained as a COPC because it does not exceed its SALs when measured either in total or isotopically. No other radionuclides were detected at concentrations above background UTLs.

HMX and 2,4,6-trinitrotoluene were detected at concentrations below their SALs and were submitted to an MCE, while tetryl(methyl-2,4,6-trinitrophenylnitramine) was not retained as a COPC (See Section

5.28.6). RDX was found to exceed its SAL of 4 mg/kg and is retained as a COPC. No other organics were detected at this site.

Multiple Chemical Evaluation

The MCE showed eight analytes in the noncarcinogenic effects category (Table 5.28.7-1). The sum of the maximum normalized concentrations of these analytes was 0.4645, which was less than the decision value of 1, indicating that adverse health effects are unlikely. Therefore, these analytes were not retained as COPCs. A carcinogenic effects analysis was not performed because no analytes were detected at concentrations below SAL in this category.

TABLE 5.28.7-1
MCE AT CENTRAL AREA DRAINAGE

NONCARCINOGENIC - SOIL	
Analyte	**Maximum Normalized Concentrations**
Copper	0.0904
Lead	0.0850
Mercury	0.0104
Thallium	0.1967
Zinc	0.0049
Total Uranium	0.0591
HMX	0.0027
2,4,6-Trinitrotoluene	0.0153
Total	0.4645

5.28.7.2 Risk Assessment

No human health risk assessment was performed for Central Area Drainage.

The site-specific PRG for RDX was calculated to determine if the detected concentration warranted corrective action. Calculation of this PRG was based on a nonintrusive industrial scenario and a 1E-06 risk-based factor (see Appendix C). The PRG for RDX was calculated to be 52 mg/kg.

5.28.8 Ecological Assessment

The general landscape conditions around the Central Area Drainage are moderately developed, and the potential for receptors to come in contact with ecological COPCs is moderate (Table 2.4-1). Therefore, this site will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.28.9 Extent of Contamination

The purpose of the drainage sampling was to determine the concentrations of COPCs and whether any are migrating from the site. The reported data shows no significant trend toward migration away from the site through any of the drainage channels.

5.28.10 Conclusions and Recommendations

The four drainages of the Central Area Drainage were sampled uniformly. The screening assessment evaluated the detected concentrations in each drainage and compared the results across the whole area. The results showed an elevated level of RDX, a carcinogen, at 28.8 mg/kg in one sample (# 0214-95-0081). This concentration is a factor of 7.2 greater than its SAL of 4 mg/kg. However, because the concentration for RDX is below its site-specific PRG of 52 mg/kg by a factor of 1.8, RDX was not retained as a COPC. No other analytes were above their SALs in any of the four drainages.

Based on NFA Criterion 4, the Central Area Drainage will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.29 PRS 14-007

PRS 14-007 is a septic tank (TA-14-19) in the central section of TA-14. Seven samples were collected. No COPCs were retained Based on the sample results and screening assessment, we recommend NFA for this site NFA Policy Criterion 4.

5.29.1 History

PRS 14-007 is discussed in detail in Section 5.5 of the RFI Work Plan (LANL 1994, 1156). The septic tank served the bathroom facilities in TA-14-6 since 1944. When TA-14-6 was converted into a darkroom, the darkroom chemicals were probably disposed of into this septic tank. The septic tank was disconnected from TA-14-6 in 1992 when the Laboratory Sanitary Waste System was installed.

5.29.2 Description

The 640-gal. reinforced concrete septic tank, 4 ft wide by 7 ft long by 6 ft deep, is connected to an overflow drainline that runs northeast 130 ft before ending in a ditch.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.29.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.29.4 Field Investigation

5.29.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.29.4.2 Results of Field Screening

HE spot tests were carried out at each of the six soil sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.29.4.3 Sample Collection and Submittal for Analysis

The objectives of sampling at PRS 14-007 were to determine the extent, concentration, and depth profiles of the COPCs. Seven samples were collected: 3 surface samples, 3 subsurface samples, and 2 liquid samples from the septic tank. Figure 5.29.4-1 shows all sample locations and Table 5.29.4-1 shows the sampling at this PRS.

The samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. The samples were analyzed by gamma scans for HE, SVOCs, cyanide, and TAL metals, most within the prescribed holding times; the SVOC and HE samples of the tank contents exceeded their recommended holding times. A second sample was collected from the septic tank and submitted for HE analysis.

TABLE 5.29.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	RAD*	HE*	SVOC*	Total Cyanide*
14-1080	0214-95-0107	54-60	Soil	68637/69092	68392	68678	68694	68395
14-1081	0214-95-0108	54-60	Soil	68637/69092	68392	68678	68694	68395
14-1082	0214-95-0109	NA	Water	69043/69045	69264	NA	68663	68651
14-1082	0214-95-0110	NA	Water	NA	NA	69172	NA	68395
14-1083	0214-95-0111	0-6	Soil	68637/69092	68392	68678	68694	68395
14-1083	0214-95-0112	18-24	Soil	68637/69092	68392	68678	68694	68395
14-1085	0214-95-0113	0-6	Soil	68637/69092	68392	68678	68694	68395
14-1086	0214-95-0114	0-6	Soil	68637/69092	68392	68678	68694	68395

NA = not analyzed
*Batch numbers

5.29.5 Background Comparisons

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.29.4-1.

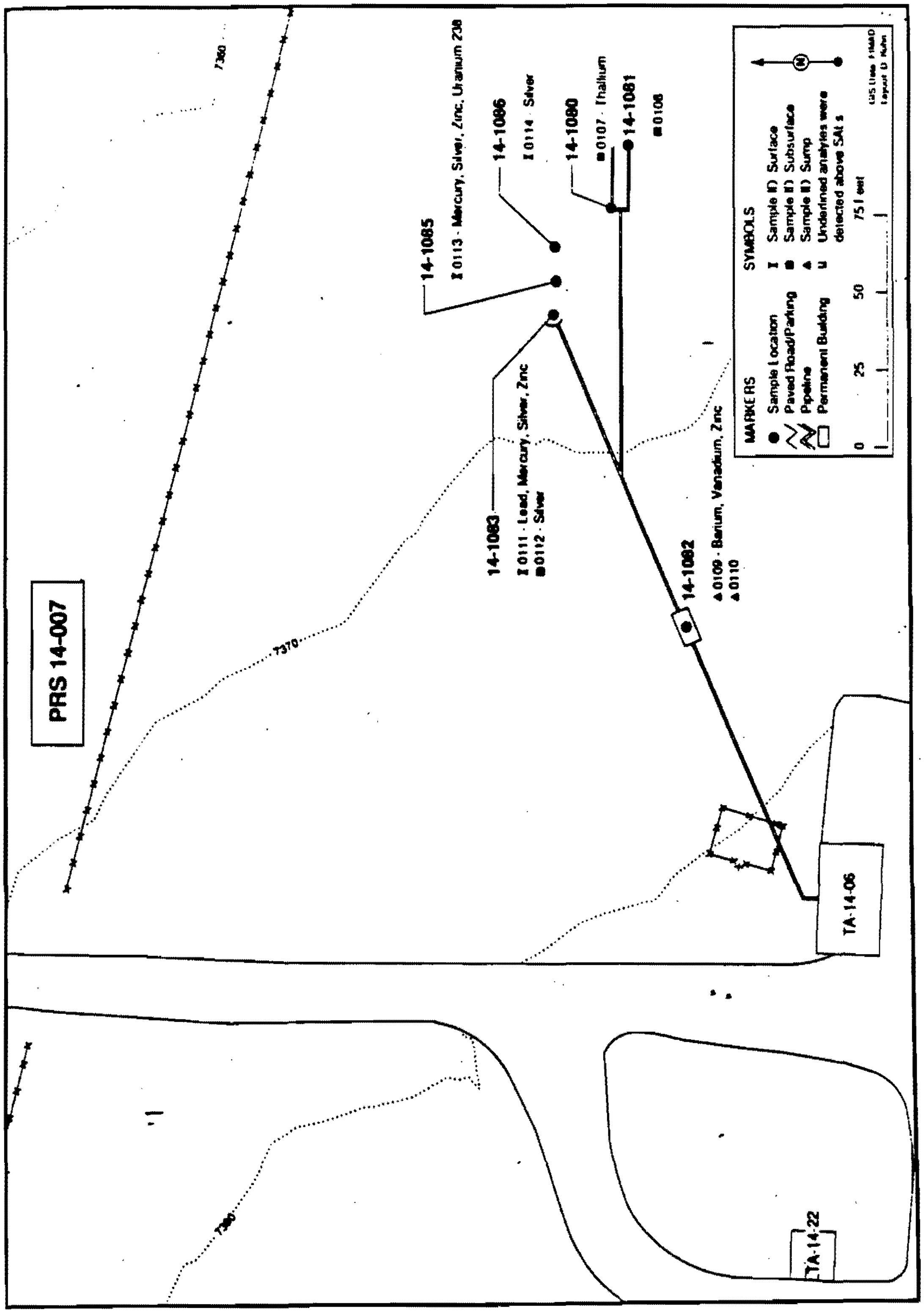


Figure 5.29.4-1 Location of PRS 14-007 samples

Inorganics

Two separate screening assessments were performed, one for the septic tank contents and another for the drainfield. Barium, vanadium, and zinc were detected in the septic tank (Table 5.29.5-1) and carried forward to the SAL comparison stage. In addition, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, and selenium were detected as estimated values (Table 5.29.5-1). These values were qualified as J and not retained as COPCs because they were below the method detection limits for the analytes. The analytes are not retained as COPCs because the results cannot be accurately distinguished from instrument "noise" levels.

Lead, mercury, silver, thallium, and zinc were detected at concentrations above background UTLs in the drainfield and were carried forward to the SAL comparison stage (Table 5.29.5-1). Cyanide (total) was estimated in several samples and was qualified as J because it was below the method detection limit for this analyte (Table 5.29.5-1). The analyte is not retained as a COPC because the results cannot be accurately distinguished from instrument "noise" levels. The inorganics that were either undetected or detected at concentrations less than background UTLs were also not retained as COPCs.

Radionuclides

Uranium-235 and uranium-238 were detected in the drainfield at concentrations above their background UTLs and were carried forward to the SAL comparison stage (Table 5.29.5-2).

5.29.6 Evaluation of Organic Constituents

No organics were detected and therefore they were not retained as COPCs.

5.29.7 Human Health Assessment

5.29.7.1 Screening Assessment

All of the inorganics in the septic tank were detected at concentrations below their respective SALs and were not retained as COPCs. These analytes were not submitted to an MCE because the septic tank does not provide a complete exposure pathway that could result in a risk to human health. In addition, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, and selenium were not retained as COPCs (Section 5.29.5).

Lead, mercury, silver, thallium, and zinc were detected in the drainfield at concentrations below their respective SALs and were submitted to an MCE. Cyanide was not submitted to the MCE and was not retained as a COPC (Section 5.29.5).

Radionuclides (uranium-235 and uranium-238) in the drainfield soils had concentrations below their respective SALs and were carried forward to the MCE. No other radionuclides were above background UTLs.

No organics were detected at this site.

Multiple Chemical Evaluation

The MCE showed five analytes in the noncarcinogenic effects category for the drainfield (Table 5.29.7-1). The sum of the maximum normalized concentrations of these analytes was 0.6048, which was less than the decision value of 1, indicating that no adverse health effects are likely. Therefore, these analytes were

TABLE 5.29.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-007

DRAINFIELD (SOIL)

Sample ID	Depth (in.)	Lead (mg/kg)	Mercury (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Total Cyanide (mg/kg)	Zinc (mg/kg)
LANL UTL	NA	23.3	0.1	1.61	1.0	NA	50.8
SAL	NA	400	23	380	6.1	1300	23000
0214-95-0107	54-60	10.3	0.014(J)	ND	1.12	ND	31.3
0214-95-0108	54-60	11	0.02(J)[1]	ND	0.98	27.6	0.33(J)
0214-95-0111	0-6	33	1.67	97.1	0.51	0.2(J)[1]	243
0214-95-0112	18-24	14	0.062	9.34	0.94	ND	38.3
0214-95-0113	0-6	18.1	0.28	30.2	ND	0.28(J)[1]	176
0214-95-0114	0-6	14	0.052	6.98	0.76	0.086(J)[1]	28

SEPTIC TANK (LIQUID)

Sample ID	Depth (in.)	Arsenic (μg/L)	Barium (μg/L)	Cadmium (μg/L)	Chromium (μg/L)	Copper (μg/L)	Lead (μg/L)
LANL UTL	NA	NA	NA	NA	NA	NA	NA
SAL	NA	50	1000	5	50	1300	50
0214-95-0109	0	5.9(J)[1]	20.2	0.35(J)[1]	1.65(J)[1]	0.77(J)[1]	1.58(J)[1]

Sample ID	Depth (in.)	Manganese (μg/L)	Mercury (μg/L)	Nickel (μg/L)	Selenium (μg/L)	Vanadium (μg/L)	Zinc (μg/L)
LANL UTL	NA	NA	NA	NA	NA	NA	NA
SAL	NA	180	2	100	50	260	11000
0214-95-0109	0	9.99(J)[1]	0.065(J)[1]	1.58	2.12	15.7	207

[1] Sample values are below the 3σ; data are nondetects.

NA = not available ND = not detected

not retained as COPCs. A carcinogenic effects analysis was not performed because no analytes were found in this category.

Uranium-235 and uranium-238 were evaluated for radionuclide effects in the drainfield (Table 5.29.7-1). The sum of the maximum normalized concentrations was less than 1 (0.1037), indicating that unacceptable human health risk is unlikely. These two isotopes were therefore not retained as COPCs.

TABLE 5.29.5-2
RADIONUCLIDES WITH SOIL CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-007

Sample ID	Depth (in.)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
LANL UTL	NA	0.08	1.82
SAL	NA	10	67
0214-95-0107	54-60	0.171	1.81[1]
0214-95-0108	54-60	0.3	2.51[1]
0214-95-0111	0-6	0.4	3.38[1]
0214-95-0112	18-24	0.114(U)	2.49[1]
0214-95-0113	0-6	0.26	4.27
0214-95-0114	0-6	0.235[1]	2.41[1]

NA = not applicable

[1] Sample values are considered nondetects because of blank contamination (sample values less than five times the blank value).

TABLE 5.29.7-1
MCE FOR AT PRS 14-007

NONCARCINOGENIC – SOIL	
Analyte	**Maximum Normalized Concentrations**
Lead	0.0825
Mercury	0.0726
Silver	0.2555
Thallium	0.1836
Zinc	0.0106
Total	0.6048

RADIONUCLIDE – SOIL	
Analyte	**Maximum Normalized Concentrations**
Uranium-235	0.0400
Uranium-238	0.0637
Total	0.1037

5.29.7.2 Risk Assessment

No human health risk assessment was performed for PRS 14-007 because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.29.8 Ecological Assessment

The general landscape conditions around this PRS are moderately developed, and the potential for receptors to come in contact with ecological COPCs is high (Table 2.4-1). Therefore, this PRS will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.29.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.29.10 Conclusions and Recommendations

Based on NFA Criterion 4, PRS 14-007 will not be added to the HSWA module of the Laboratory RCRA operating permit, and is proposed for removal from the ER Project List of PRSs.

5.30 PRS 14-004(a)

PRS 14-004(a) is an active, satellite storage area located next to Building TA-14-22. The site is deferred from further action until decommissioning.

5.31 PRS 14-004(b)

PRS 14-004(b) is an active storage area located next to TA-14-23 that contains a 55-gal. barrel that received ash from the open burn unit PRS 14-005. It is deferred until decommissioning.

This open burn unit is operating under Interim Status RCRA Part B, Rev. 4.1, dated November 1989, granted by EPA Region VI. This permit includes the storage barrel, PRS 14-004(b), on the west side of the Control Room Building TA-14-23. The open bum unit is also permitted by the State of New Mexico Air Quality section and lists the unit as a 30 Gallon Waste Combustor Unit under 20 New Mexico Administrative Code (NMAC) 2.60 (ESA 1996).

5.32 PRS 14-002(c)

PRS 14-002(c) is an unused two-room building (TA-14-5) covered by a dirt berm on the east and west sides. Neither the presence of contamination inside the building, a medium in which significant contamination could reside, nor a mechanism by which contaminants could escape to the environment have been shown to be present. Based on the HE spot test and radiological field screening, we recommend this site for NFA under Criterion 4.

5.32.1 History

PRS 14-002(c) is discussed in detail in Section 5.6 of the RFI Work Plan (LANL 1994, 1156). The structure was built in 1944 as a control building for relatively small explosive tests, which were conducted on two firing pads located 20-30 feet away from the building's south end. The building served as a storage facility from 1961 to 1965, after which it was used until the 1970s to temporarily store pressurized tanks of toxic cyanogen gas.

5.32.2 Description

PRS 14-002(c) is a wood frame building, 11 ft by 18 ft by 10 ft high, covered by a dirt berm on the east and west sides. A 5-ft diameter metal sphere used for HE combustion tests is still in its steel frame outside the south end of the building.

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.32.3 Previous Investigation(s)

According to the 1990 SWMU Report (LANL 1990, 0145), records indicate the building was contaminated by HE; however, whether the contamination was inside or outside was not specified.

5.32.4 Field Investigation

This PRS was sampled only by radiological field screening and HE spot tests because no environmental media was present inside the building. No indication of any contamination was detected. Figure 5.32.4-1 shows the location of the building.

5.32.5 Conclusions and Recommendations

The lack of soil or debris at PRS 14-002(c) prevented planned sampling, but it also not retained a source medium in which contamination could reside. In addition, no contamination was found on the building's inside surfaces. The use of the building as a control and instrumentation bunker rather than a HE-handling facility reduces the likelihood of contaminants ever having been present inside. The HE contamination mentioned in the SWMU Report most likely referred to outside surfaces, which would have received blast fragments. Based on Criterion 4, a Class III permit modification is requested to remove PRS 14-002(c) from the HSWA module of the Laboratory RCRA permit.

5.33 PRS 14-002(d,e)

PRSs 14-002 (d,e) are two inactive firing pads situated on a graveled area adjacent to the south end of TA-14-5. Four samples were collected. No COPCs were retained. Based on the sampling and screening assessment, we recommend this PRS for NFA under NFA Policy Criterion 4.

5.33.1 History

PRSs 14-002(d,e) are discussed in detail in Section 5.6 of the RFI Work Plan (LANL 1994, 1156). The firing pads were used for small-scale explosive tests from 1944 to the mid-1950s. Materials used in some of the tests included uranium and beryllium.

5.33.2 Description

This PRS consists of two inactive firing pads that were located on a flat, semicircular, gravel-covered area about 100 ft in diameter. No visible traces of the firing pads remain on this flat area.

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

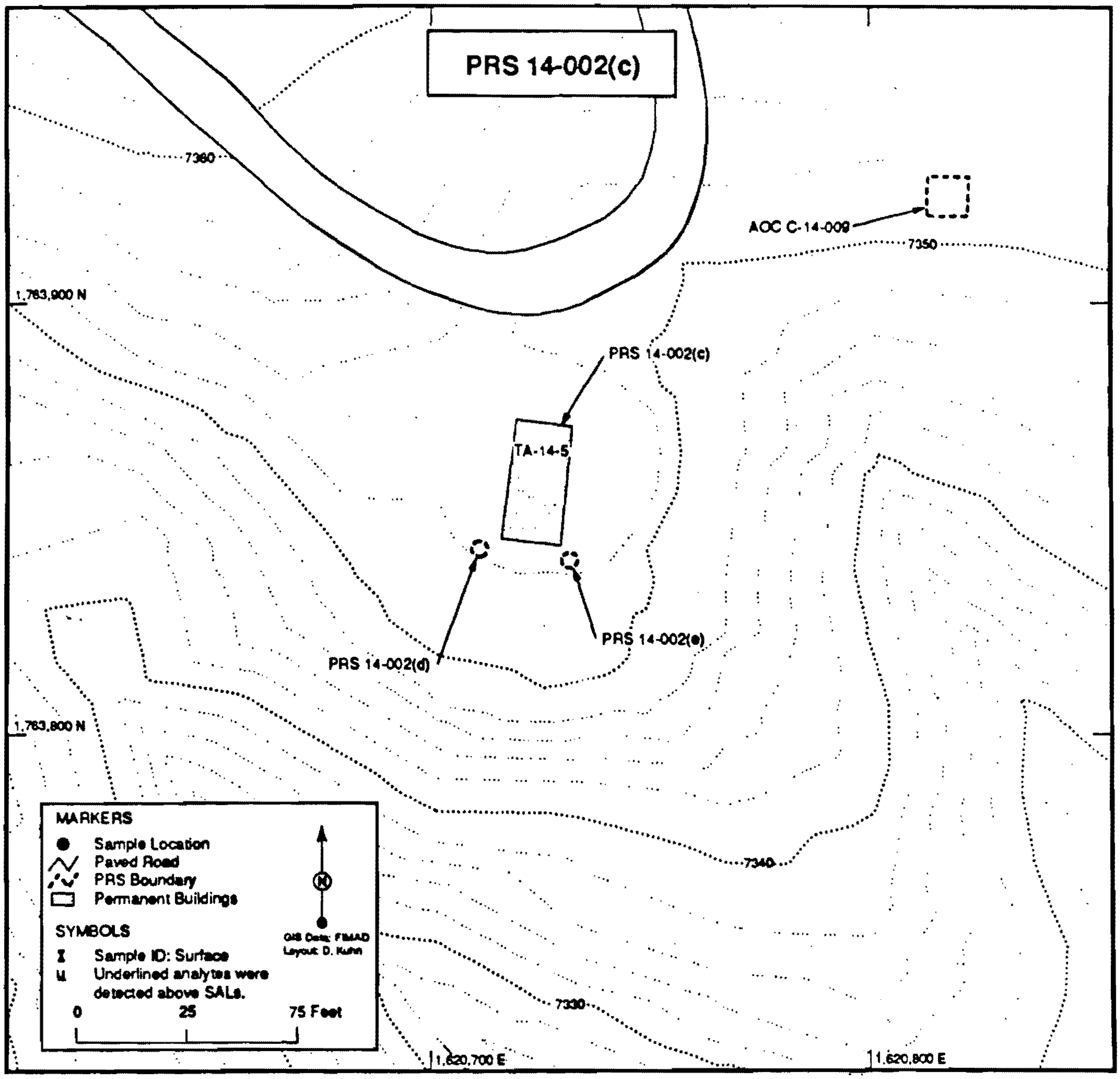


Figure 5.32.4-1 Location of PRS 14-002(c) samples

5.33.3 Previous Investigation(s)

No previous investigation of contamination of the firing pads is known. The adjacent equipment boxes were declared free of radioactive contamination but showed some HE contamination when they were checked in 1957.

5.33.4 Field Investigation

Samples were not taken as originally planned at the locations of the firing pads because no actual firing pads remain. Instead, samples were collected from the building's dirt berm at two points facing each firing pad (four total), because these areas would have directly received blast fragments. Any contaminants leaching from the firing pad locations on the flat area could be intercepted by the four samples collected in the gully that receives drainage from the flat area; these are discussed in Section 5.34.

5.33.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.33.4.2 Results of Field Screening

HE spot tests were carried out at each of the four sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.33.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 14-002(d,e) was to determine if contamination was present. Five samples (including one replicate) were collected from the berm at the prescribed depths. Figure 5.33.4-1 shows all sample locations, and Table 5.33.4-1 summarizes the sampling conducted at this PRS.

All samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. They were analyzed by gamma scan and for total uranium, HE, and TAL metals within the prescribed holding times.

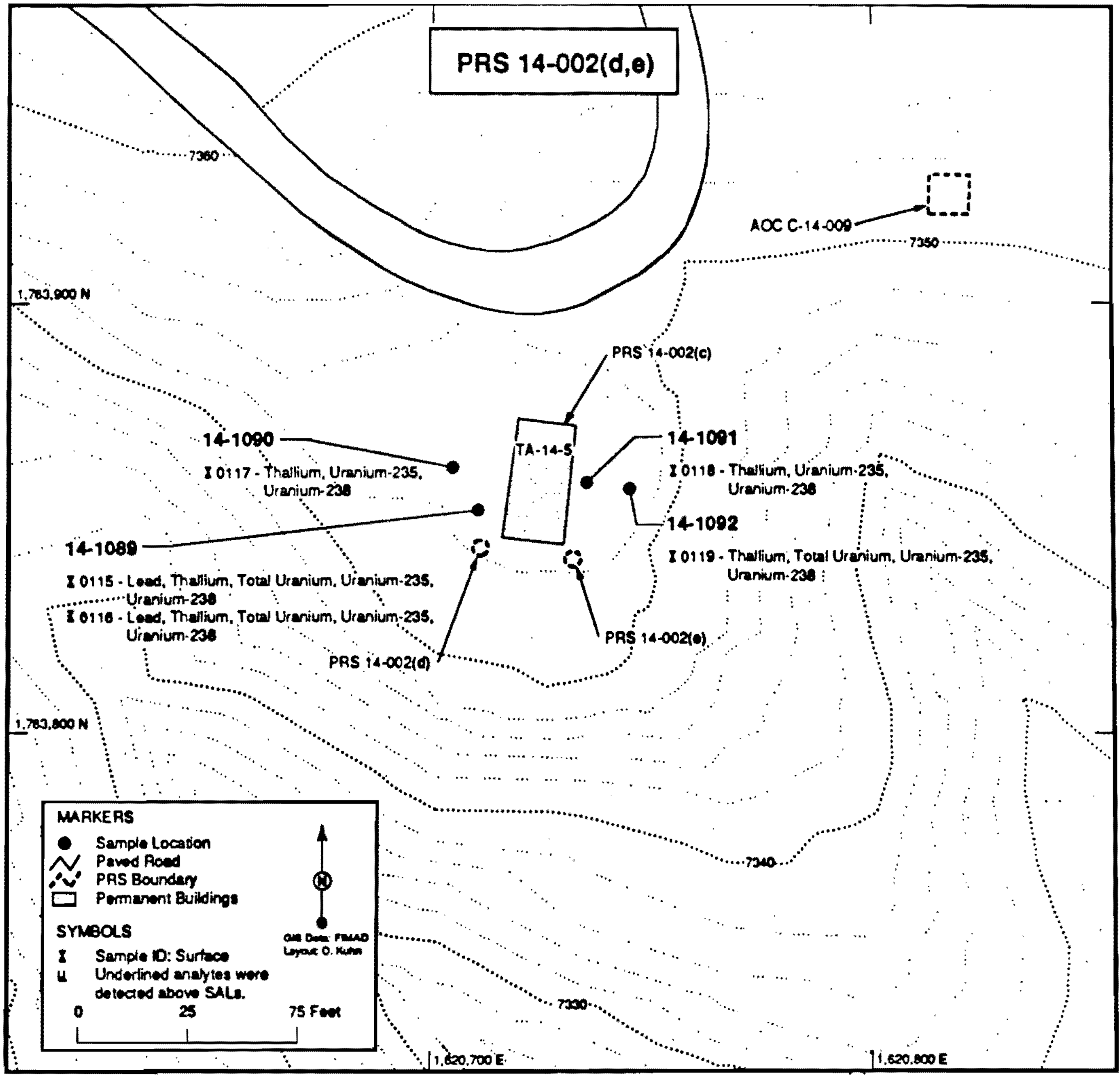


Figure 5.33.4-1 Location of PRSs 14-002(d,e) samples

TABLE 5.33.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	RAD*	HE*
14-1089	0214-95-0115	0-6	Soil	68129/68102/68906	68169/68277	68170
14-1089	0214-95-0116	0-6	Soil	68129/68102/68906	68169/68277	68170
14-1090	0214-95-0117	0-6	Soil	68129/68102/68906	68169/68277	68170
14-1091	0214-95-0118	0-6	Soil	68129/68102/68906	68169/68277	68170
14-1092	0214-95-0119	0-6	Soil	68129/68102/68906	68169/68277	68170

*Batch numbers

5.33.5 Background Comparisons

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.33.4-1.

Inorganics

Lead, thallium, and total uranium were detected at concentrations above background UTLs and were carried forward to the SAL comparison stage (Table 5.33.5-1). The inorganics that were either undetected or detected at concentrations less than the background UTLs were not retained as COPCs.

TABLE 5.33.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-002(d,e)

Sample ID	Depth (in.)	Lead (mg/kg)	Thallium (mg/kg)	Total Uranium (mg/kg)
LANL UTL	NA	23.3	1.0	5.45
SAL	NA	400	6.1	230
0214-95-0115	0-6	37.7	1.62	6.51
0214-95-0116	0-6	41.4	1.59	6.53
0214-95-0117	0-6	14.4	1.73	5.3
0214-95-0118	0-6	15.4	1.55	2.73
0214-95-0119	0-6	21.1	1.76	6.68

NA = not applicable

Radionuclides

Total uranium, uranium-235, and uranium-238 were reported at concentrations above their background UTL. These analytes were retained as COPCs and were carried forward to the SAL comparison stage (5.33.5-2).

Isotopic ratios of uranium-234 to uranium-238 (≈1:1 to 1:4) for these samples indicate that the uranium detected at this site is natural uranium. In addition, the total uranium values for two samples are greater than the background UTL. Therefore, it is uncertain whether DU is present, so the total uranium values are compared with the SALs for both natural uranium and DU.

TABLE 5.33.5-2
RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR PRS 14-002(d,e)

Sample ID	Depth (in.)	Total Uranium (mg/kg)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
LANL UTL	NA	5.45	0.08	1.82
SAL	NA	130/29*	10	67
0214-95-0115	0-6	6.51	0.24	4.02
0214-95-0116	0-6	6.53	0.4	4.37
0214-95-0117	0-6	5.3	0.35	5.92
0214-95-0118	0-6	2.73	0.05(U)	2.26
0214-95-0119	0-6	6.68	0.29	3.83

ND = not detected; NA - not applicable

* SALs for total uranium are for DU (130 mg/kg) and natural uranium (29mg/kg)

5.33.6 Evaluation of Organic Constituents

No organics were detected; therefore, they were not retained as COPCs.

5.33.7 Human Health Assessment

5.33.7.1 Screening Assessment

Lead, thallium, and total uranium had concentrations below their respective SALs and on that basis were subjected to the MCE. No other inorganics chemicals were detected at concentrations above background UTLs or SALs.

Total uranium, uranium-235, and uranium-238 were detected to be below their SALs and were not retained as COPCs. They were not submitted to an MCE for radionuclide effects because total and isotopic uranium do not have additive effects. No other radionuclide chemicals were detected above background UTLs or SALs.

Multiple Chemical Evaluation

An MCE was performed for three analytes in the noncarcinogenic effects category (Table 5.33.7-1). The sum of the maximum normalized concentrations of these analytes was 0.4117, which was less than the decision value of 1, indicating that adverse health effects are unlikely. Therefore, these analytes were not retained as COPCs. No evaluation of carcinogenic effects was performed because no analytes were found in this category.

TABLE 5.33.7-1
MCE FOR PRS 14-002(d,e)

NONCARCINOGENIC - SOIL	
Analyte	Maximum Normalized Concentrations
Lead	0.0942
Thallium	0.2885
Total Uranium	0.0290
Total	0.4117

5.33.7.2 Risk Assessment

No human health risk assessment was performed for PRSs 14-002(d,e) because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.33.8 Ecological Assessment

The general landscape conditions around this PRS are moderately developed, and the potential for receptors to come in contact with ecological COPCs is high (Table 2.2.4-1). Therefore, this PRS will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.33.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.33.10 Conclusions and Recommendations

Based on Criterion 4, PRSs 14-002(d,e) will not be added to the HSWA module of the Laboratory RCRA operating permit, and is proposed for removal from the ER Project List of PRSs

5.34 Firing Pad Drainage

The Firing Pad Drainage (called Aggregate 6 Drainage in the RFI Work Plan) is located south of the firing pad (see 5.33). Four samples were collected. No COPCs were retained. Based on the sampling results and the screening assessment, we recommend this site for NFA under Criterion 4.

5.34.1 History

The Firing Area Drainage is discussed in detail in Section 5.6 of the RFI Work Plan (LANL 1994, 1156). Three massive concrete blocks are located at the edge of the gully that lies 50 ft south of TA-14-5. These blocks may have once protected the south face of TA-14-5 from blast. Any contaminants embedded in the concrete by the firing activities at PRSs 14-002(d,e) could have leached into this gully.

5.34.2 Description

Drainage from the flat area at TA-14-5 enters the gully. The drainage flows south and intersects the easternmost drainage channel of the Central Area Drainage. It then continues to the Cañon de Valle.

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.34.3 Previous Investigation(s)

No previous investigations were performed at this site.

5.34.4 Field Investigation

5.34.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the site and to help establish health and safety conditions for on-site workers No readings greater than site-specific background were reported.

5.34.4.2 Results of Field Screening

HE spot tests were carried out at each of the four sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.34.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at the Firing Pad Drainage was to determine if contamination exists. Four samples were collected at the prescribed depth of 0 to 6 in. Figure 5.34.4-1 shows all sample locations, and Table 5.34.4-1 summarizes the sampling conducted at this area.

The samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. They were analyzed by gamma scan and for total uranium content, HE, and TAL metals within the prescribed holding times.

TABLE 5.34.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	RAD*	HE*
14-1099	0214-95-0127	0-6	Soil	69122/69352	68994/69000	69174
14-1100	0214-95-0128	0-6	Soil	69122/69352	68994/69000	69174
14-1101	0214-95-0129	0-6	Soil	69122/69352	68994/69000	69174
14-1102	0214-95-0130	0-6	Soil	69122/69352	68994/69000	69174

*Batch numbers

5.34.5 Background Comparisons

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.34.4-1.

Inorganics

Five inorganics were detected at concentrations above background UTLs and carried forward to the SAL comparison stage (Table 5.34.5-1). The inorganics that were either undetected or with concentrations less than the background UTLs were not retained as COPCs.

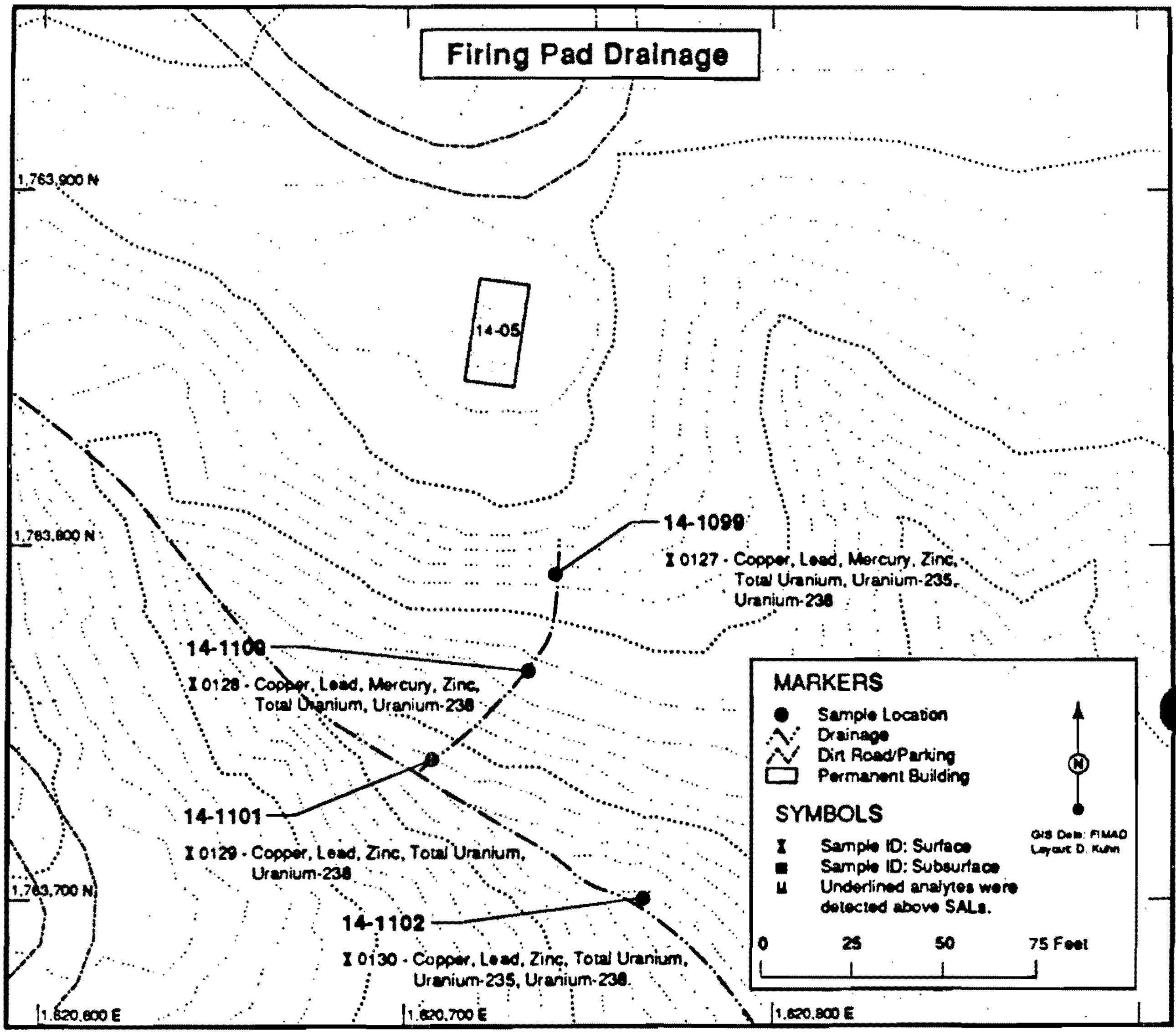


Figure 5.34.4-1 Location of Firing Pad Drainage samples

TABLE 5.34.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR FIRING PAD DRAINAGE

Sample ID	Depth (in.)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Total Uranium (mg/kg)	Zinc (mg/kg)
LANL UTL	NA	30.7	23.3	0.1	5.45	50.8
SAL	NA	2800	400	23	230	23000
0214-95-0127	0-6	448	115	0.041	6.92	58.6
0214-95-0128	0-6	67.7	85.1	0.62	2.95	105
0214-95-0129	0-6	79.4	290	ND	13.2	57.9
0214-95-0130	0-6	12.9	48.4	ND	3.37	70.6

NA = not applicable ND = not detected

Radionuclides

Total uranium, uranium-235, and uranium-238 were detected at concentrations above their background UTLs. These analytes were retained as COPCs and were carried forward to the SAL comparison stage (Table No. 5.34.5-2).

Isotopic ratios of uranium-234 to uranium-238 (≈1:1 to 1:4) for these samples indicate that the uranium detected at this site may be natural uranium. However, because the total uranium values for some samples are greater than the background UTL, it is uncertain whether DU is present. Therefore, the total uranium values are compared with the SALs for both natural uranium and DU.

TABLE 5.34.5-2
RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR FIRING PAD DRAINAGE

Sample ID	Depth (in.)	Total Uranium (mg/kg)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
LANL UTL	NA	5.45	0.08	1.82
SAL	NA	130/29*	10	67
0214-95-0127	0-6	6.92	0.289	4.35
0214-95-0128	0-6	2.95	0.172(U)	2.82
0214-95-0129	0-6	13.2	0.195(U)	2.91
0214-95-0130	0-6	3.37	1.27	9.45

NA = not applicable ND = not detected *SALs for DU (130 mg/kg) and natural uranium (29 mg/kg).

5.34.6 Evaluation of Organic Constituents

HMX was detected in the surface soil at a concentration of 1.44 mg/kg and was carried forward to the SAL comparison stage. The organics that were undetected were not retained as COPCs.

5.34.7 Human Health Assessment

5.34.7.1 Screening Assessment

Copper, lead, mercury, total uranium, and zinc had concentrations below their respective SALs and were subjected to the MCE. No other inorganic chemicals were detected at concentrations above background UTLs.

Total uranium, uranium-235, and uranium-238 had concentrations below their respective SALs and were not retained as COPCs. An MCE for radionuclide effects was not performed because total uranium and isotopic uranium does not have additive effects. No other radionuclides were detected at concentrations above background UTLs.

HMX was detected at a concentration less than its SAL of 3300 mg/kg and was subjected to an MCE. No other organic chemicals were detected.

Multiple Chemical Evaluation

The MCE showed six analytes in the noncarcinogenic effects category (Table 5.34.7-1). The sum of the maximum normalized concentrations totaled 0.9744, which was less than the decision value of 1, indicating adverse health effects are unlikely. These analytes were not retained as COPCs.

An MCE for carcinogenic effects was not performed because no analytes were found in this category.

TABLE 5.34.7-1
MCE AT FIRING PAD DRAINAGE

NONCARCINOGENIC - SOIL	
Analyte	**Maximum Normalized Concentrations**
Copper	0.1600
Lead	0.7250
Mercury	0.0270
Zinc	0.0046
Total Uranium	0.0574
HMX	0.0004
Total	0.9744

5.34.7.2 Risk Assessment

No human health risk assessment was performed for the Firing Pad Drainage samples because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this site.

5.34.8 Ecological Assessment

The general landscape conditions around the Firing Pad Drainage are moderately developed, and the potential for receptors to come in contact with ecological COPCs is high (Table 2.4-1). Therefore, this site will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.34.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.34.10 Conclusions and Recommendations

Based on Criterion 4, the Firing Pad Drainage will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.35 PRS 14-003

PRS 14-003 was a former burn area. Based on the sample results and screening assessment, concentrations of metals were detected above their SALs and retained as COPCs, indicating an unacceptable risk to human health. Consequently, a VCA plan is recommended for this site to be submitted to the DOE on April 22, 1996.. All specific results, conclusions, and recommendations will be included in the plan.

5.36 AOC C-14-001

AOC C-14-001 is the site of a former magazine (TA-14-1) located at the west end of TA-14. Three samples were collected. No COPCs were retained. Based on the sampling results and the screening assessment, we recommend this site for NFA under Criterion 4.

5.36.1 History

AOC C-14-001 is discussed in detail in Section 5.6 of the RFI Work Plan. The magazine was built in October 1944 and served TA-14 firing sites. It was burned down in February 1963.

5.36.2 Description

AOC C-14-001 was a wood bunker, 9 ft by 11 ft by 8 ft high, covered by a dirt berm on three sides and on top; only traces of the berm remain. The site is 50 ft from the edge of low cliffs that descend into Cañon de Valle to the south. Because of the mesa's inclined surface, drainage is northward away from the rim of the canyon. The old road looping around the magazine and the piles of paving debris serve to limit any drainage from the AOC.

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.36.3 Previous Investigations

The magazine was reported to be contaminated with HE in 1959 (DOE 1987, 0264).

5.36.4 Field Investigation

5.36.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.36.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered at this PRS that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.36.4.3 Sample Collection and Submittal for Analysis

The objectives of sampling at AOC C-14-001 were to determine if contamination exists. Three samples (including one replicate) were collected. One sample was collected at the prescribed depth of 6 to 12 in.; refusal was encountered at 11 in. for the other two. Figure 5.36.4-1 shows all sample locations, and Table 5.36.4-1 summarizes the sampling at this AOC.

The samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. They were analyzed for HE and TAL metals within the prescribed holding times.

TABLE 5.36.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	HE*
14-1095	0214-95-0122	6-11	Soil	69184/69437/70088	69881
14-1095	0214-95-0123	6-11	Soil	69184/69437/70088	69881
14-1096	0214-95-0124	6-12	Soil	69591/69437	69881

*Batch numbers

5.36.5 Background Comparisons

Inorganics

Copper, lead, and zinc were detected at concentrations above background UTLs and were carried forward to the SAL comparison stage (Table 5.36.5-1). The inorganics that were either undetected or detected at concentrations less than the background UTLs were not retained as COPCs.

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.36.4-1.

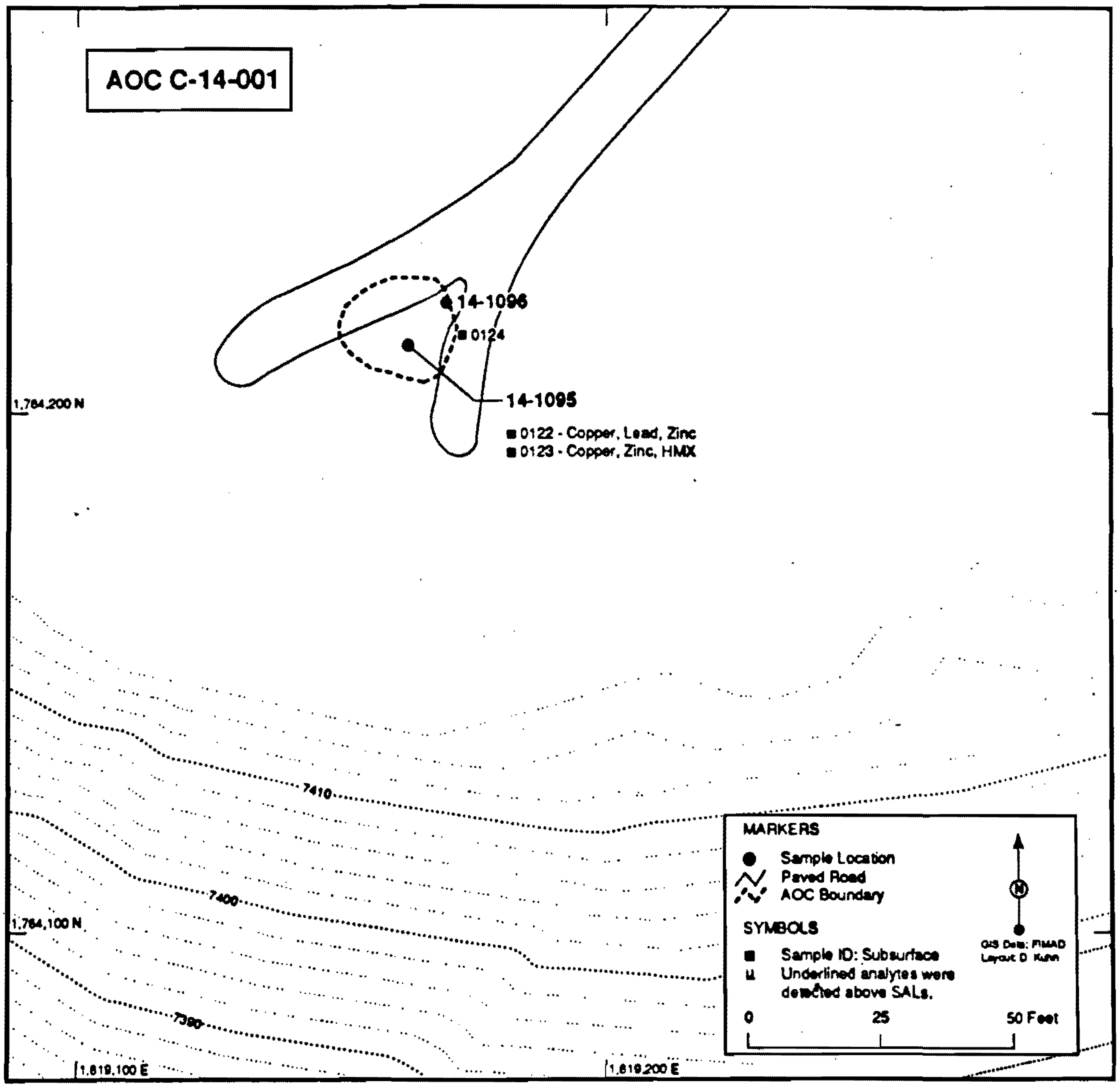


Figure 5.36.4-1 Location of AOC C-14-001 samples

TABLE 5.36.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTL FOR AOC C-14-001

Sample ID	Depth (in.)	Copper (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)
LANL UTL	NA	30.7	23.3	50.8
SAL	NA	2800	400	23000
0214-95-0122	6-11	104	23.9	57.3
0214-95-0123	6-11	306	22.6	54.6

NA = not applicable

Radionuclides

No radionuclides were analyzed at this site.

5.36.6 Evaluation of Organic Constituents

HMX was detected in the surface soil at a concentration of 0.86 mg/kg and was carried forward to the SAL comparison stage. Any organics that were undetected were not retained as COPCs.

The location of samples with detected analyte values are shown in Figure 5.36.4-1.

5.36.7 Human Health Assessment

5.36.7.1 Screening Assessment

Copper, lead and zinc were detected at concentrations below their respective SALs and on that basis were subjected to an MCE. HMX was detected at a concentration less than its SAL of 3300 mg/kg and was also subjected to the MCE. No other inorganics were detected at concentrations above background UTLs , and no organics other than HMX were detected.

Multiple Chemical Evaluation

The MCE showed four analytes in the noncarcinogenic effects category (Table 5.36.7-1). The sum of the maximum normalized concentrations totaled 0.1719, which was less than the decision value of 1, indicating adverse health effects are unlikely. These analytes were not retained as COPCs. A carcinogenic effects analysis was not performed because no analytes were found in this category.

TABLE 5.36.7-1
MCE AOC C-14-001

NONCARCINOGENIC - SOIL	
Analyte	**Maximum Normalized Concentrations**
Copper	0.1093
Lead	0.0598
Zinc	0.0025
HMX	0.0003
Total	0.1719

5.36.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this AOC.

5.36.8 Ecological Assessment

The general landscape conditions around this AOC are moderately developed, and the potential for receptors to come in contact with ecological COPCs is moderate (Table 2.4-1). Therefore, this AOC will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.36.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.36.10 Conclusions and Recommendations

Based on Criterion 4, AOC C-14-002 will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

5.37 AOC C-14-009

AOC C-14-009 is the site of a former magazine (TA-14-13) located near the east end of TA-14. Two samples were collected. No COPCs were retained. Based on the sampling results and the screening assessment, we recommend this site for NFA under Criterion 4.

5.37.1 History

AOC C-14-009 is discussed in detail in Section 5.6 of the RFI Work Plan (LANL 1994, 1156). Built in January 1945, the magazine was used to temporarily store explosives for use at the two firing pads at TA-14-5, which was about 50 ft away. It was used until the firing pads were inactivated in the mid-1950s and was burned in February 1960.

5.37.2 Description

This 3-ft by 4-ft by 3-ft wood frame magazine was covered on three sides and on top by a dirt berm. All that remains of the magazine are a shallow depression (about 6 ft in diameter) where the magazine was located and a few charred pieces of wood surrounded by slight remnants of the dirt berm.

A description of the geology, hydrogeology, soils and wildlife habitats is presented in Chapter 2.

5.37.3 Previous Investigation(s)

TA-14-13 was reported to be contaminated with HE in 1959 (DOE 1987, 0264).

5.37.4 Field Investigation

5.37.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before to sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No readings greater than site-specific background were reported.

5.37.4.2 Results of Field Screening

HE spot tests were carried out at each of the two sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at each sample location consisted of screening the actual soil being sampled. No readings were encountered that would have required special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.37.4.3 Sample Collection and Submittal for Analysis

The objective of sampling was to determine if contamination exits. Two samples were collected, one each from 8 in. to 14 in. and from 7 in. to 13 in. Figure 5.37.4-1 shows all sample locations, and Table 5.27.4-1 summarizes the sampling conducted at this AOC.

Both samples were submitted to an off-site laboratory in accordance with the RFI Work Plan. The samples were analyzed for HE and TAL metals within the prescribed holding times.

TABLE 5.37.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	HE*
14-1097	0214-95-0125	8-14	Soil	69122/69352/69998	69881
14-1098	0214-95-0126	7-13	Soil	69122/69352/69998	69881

*Batch numbers

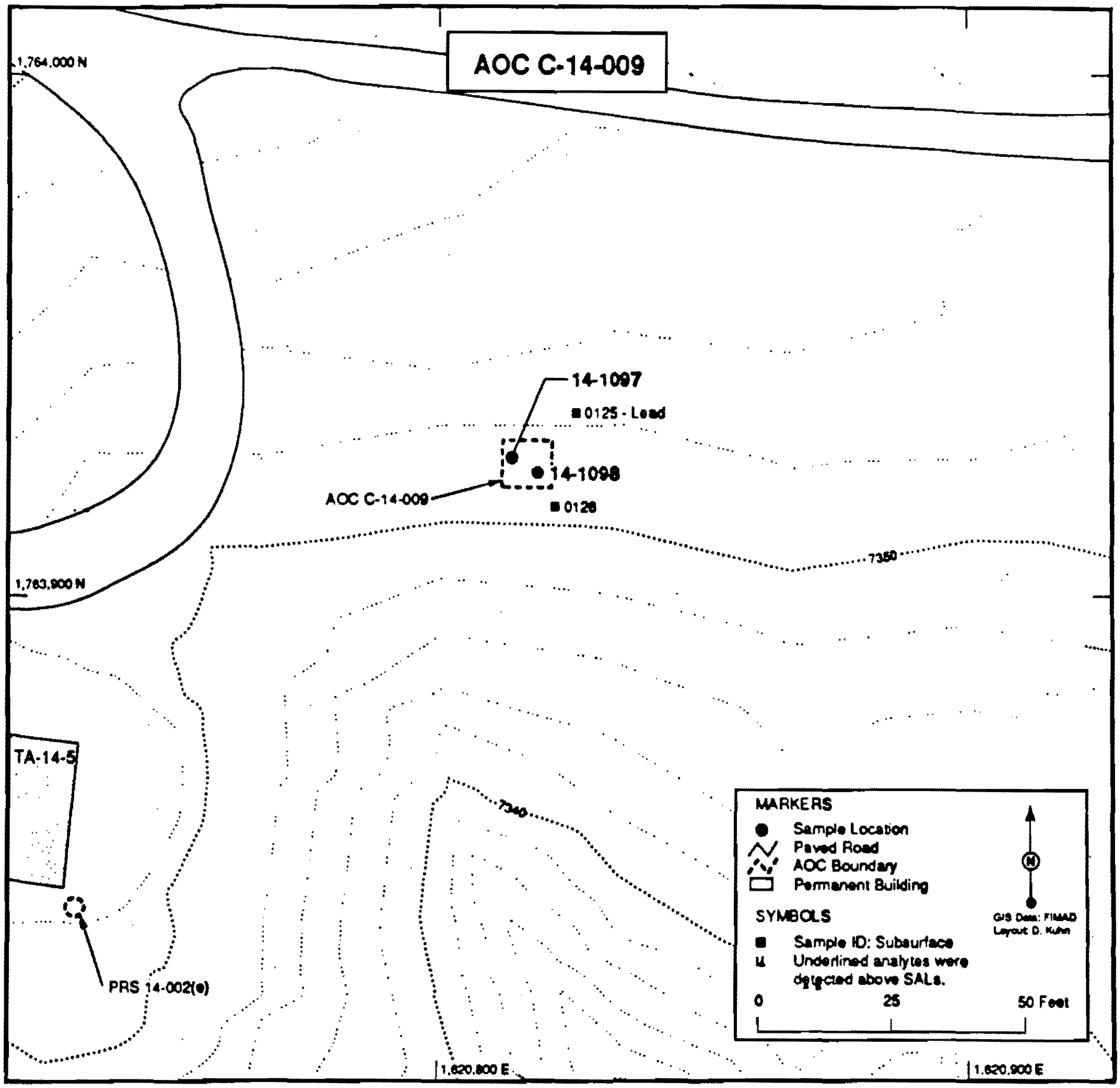


Figure 5.37.4-1 Location of AOC C-14-009 samples

5.37.5 Background Comparisons

Lead, was detected at a concentration (28.8 mg/kg) above the background UTL of 23.3 mg/kg and was carried forward to the SAL comparison stage. The inorganics that were either undetected or detected at concentrations less than the background UTLs were not retained as COPCs.

The location of samples with analyte values exceeding background UTLs are shown in Figure 5.37.4-1

Radionuclides

No radionuclides were analyzed for this site.

5.37.6 Evaluation of Organic Constituents

No HE compounds were detected; therefore, they were not retained as COPCs.

5.37.7 Human Health Assessment

5.37.7.1 Screening Assessment

Lead was below its SAL (400 mg/kg), an MCE for additive effects was not applicable; therefore, lead was not retained as a COPC.

No other inorganics were present at concentrations above background UTLs, and no organics were detected.

5.37.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this AOC.

5.37.8 Ecological Assessment

The general landscape condition around this AOC is moderately developed, and there is high potential for receptors to come in contact with ecological COPCs (Table 2.4-1). Therefore, this AOC will be included in the ecological risk assessment to be conducted when that approach has been approved by state and federal regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.37.9 Extent of Contamination

No COPCs are retained; therefore this section is not applicable.

5.37.10 Conclusions, and Recommendations

Based on Criterion 4, AOC C-14-009 will not be added to the HSWA module of the Laboratory RCRA permit and is proposed for removal from the ER Project List of PRSs.

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APPENDIX A ANALYTICAL DATA

All analytical data are available on FIMAD. If FIMAD is not accessible, data will be provided upon request. A hard copy of the data is available from the RPF under the title "RFI Report for Potential Release Sites and Areas of Concern at TA-14 and TA-12/67".

APPENDIX B DATA QUALITY EVALUATION TABLES

TABLE B-1
DATA QUALITY EVALUATION FOR TA-12 SAMPLES

Suite	Batch Number	Comments
Inorganics	69591 (five samples)[1]	Cadmium (five samples)[2], antimony (five samples), and selenium (one sample) were J qualified and reported as detected although the sample value was between the estimated quantitation limit (EQL) and the method detection limit. The analyte is considered to be undetected because the result cannot be accurately distinguished from instrument "noise" levels. As a result, the data usability for the analyte is affected and the value is not used in the screening assessment.
	69704 (eight samples)	Antimony (eight samples) and cadmium (seven samples) and beryllium (one sample) same as above.
	70012 (eight samples)	Mercury (six samples) same as above.
	70268 (five samples)	Mercury (five samples) same as above.
	69591 (five samples)	Antimony, arsenic, beryllium, cadmium, chromium, thallium, and vanadium (five samples)had laboratory control samples outside of acceptable limits. Data are UJ or J qualified, but data usability not affected. Data are valid because the recoveries were biased high.
	69704 (eight samples)	Antimony and barium (eight samples) same as above. Data are valid because the recovery for barium was biased high and the recovery for antimony was <1% below the lower limit.
	69591 (five samples)	Barium, beryllium, cadmium, chromium, cobalt, manganese, nickel, and zinc (five samples) were detected in the laboratory blank. Sample values were greater than 5X the blank values and are considered to be valid; data usability unaffected.
	69704 (eight samples)	Barium, beryllium, chromium, manganese, nickel, selenium, and zinc (eight samples) same as above.
	70012 (eight samples)	Mercury (eight samples) same as above.
	70268 (five samples)	Mercury (five samples) same as above.
SVOC	69786 (two sample)	Bis(chloroisopropyl)ether was detected in the laboratory blank for two samples. Sample concentrations were less than 5X the blank value, indicating that its presence is due to contamination. Data usability affected and data are not used in the screening assessment.
	69895 (one sample)	2-Chlorophenol, 4-nitrophenol, N-nitrosodipropylamine, pentachlorophenol, and phenol (one sample) had the laboratory control sample outside of acceptable limits. Data are qualified as UJ, but data usability is unaffected. Data are valid because recoveries were within reasonable limits (>50<75%) and the compounds should have been detected if present.

[1] Number in parenthesis is the total number of samples in each batch.

[2] Number in parenthesis is the number of samples per analyte that had a QA/QC problem.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-12 SAMPLES
(Continued)

Suite	Batch Number	Comments
SVOC	69786 (two samples)[1]	2-Chlorophenol, 4-nitrophenol, acenaphthene, and phenol (two samples)[2] same as above. Data are valid because recoveries were within reasonable limits (>50<75%) and the compounds should have been detected if present.
HE	69881 (five samples)	HMX (one sample) is J qualified and reported as detected although the sample value was between the estimated quantitation limit (EQL) and the method detection limit. The analyte is considered to be undetected because the result cannot be accurately distinguished from instrument "noise" levels. As a result, the data usability for the analyte is affected and the value is not used in the screening assessment.
	70436 (two samples)	All high explosives (two samples) were extracted after the recommended 14-day holding time. The samples exceeded the recommended holding time by 2-7 days and were considered valid estimated values (i.e., qualified UJ or J). The data usability was unaffected because no degradation products were detected.
	70703 (six samples)	All high explosives (six samples) same as above. Data are valid because no degradation products were detected.
	70436 (two samples)	2,4,6-Trinitrotoluene, 2,4-dinitrotoluene, 2-amino-4,6-dinitrotoluene, HMX, m-dinitrobenzene, m-,o-,p-nitrotoluenes, nitrobenzene, RDX, and TETRYL (two samples) had laboratory control sample outside of acceptable limits. Data are qualified as UJ, but data usability is unaffected. Data are valid because recoveries were within reasonable limits (>50<75%) and the compounds should have been detected if present.
	70703 (six samples)	2,4-Dinitrotoluene, HMX, nitrobenzene, and o-nitrotoluene (six samples) same as above. Data are valid because recoveries were <3% below the lower limit.
		All high explosives (one sample) had matrix spike recoveries that were outside of acceptable limits. Data are qualified as UJ, but data usability is unaffected. Data are valid because the recoveries were biased high.
Radionuclide	69743 (eight samples)	Uranium-235 and uranium-238 (eight samples) were detected in the laboratory blank. Sample concentrations were less than 5X the blank value, indicating presence is due to contamination. Data usability was affected and data are not used in the screening assessment.
	69318 (one sample)	Detected concentration of uranium-238 in one sample was less than 3 σ and is considered to be a nondetect. Data usability was affected and data are not used in the screening assessment.

[1] Number in parenthesis is the total number of samples in each batch.

[2] Number in parenthesis is the number of samples per analyte that had a QA/QC problem.

TABLE B-2
DATA QUALITY EVALUATION FOR TA-14 SAMPLES

Suite	Batch Number	Comments
Inorganics	69184 (seven samples)[1]	Antimony (five samples)[2], cadmium (seven samples), arsenic, beryllium, chromium, cobalt, nickel, and thallium (one sample) are J qualified and reported as detected although the sample values are between the estimated quantitation limits (EQL) and the method detection limits. The analytes are considered to be undetected because the results cannot be accurately distinguished from instrument "noise" levels. As a result, the data usability for the analytes is affected and the values are not used in the screening assessment.
	69092 (six samples)	Mercury (two samples) same as above.
	68039 (nine samples)	Antimony (six samples), cadmium and silver (two samples), beryllium, selenium, and thallium (one sample) same as above.
	68100 (twenty samples)	Mercury (eleven samples) same as above.
	68129 (nine samples)	Antimony (nine samples), cadmium (four samples), selenium (two samples), arsenic, beryllium, cobalt, nickel, and thallium(one sample each) same as above.
	68102 (eight samples)	Mercury (five samples) same as above.
	68038 (ten samples)	Antimony (ten samples), beryllium and selenium (two samples), cadmium and cobalt (one sample each) same as above.
	69437 (seven samples)	Mercury (two samples) same as above.
	68637 (six samples)	Antimony (six samples), selenium (three samples), cadmium (two samples), beryllium and thallium (one sample each), and same as above.
	68395 (seven samples)	Total cyanide (four samples) same as above.
	69043 (one sample)	Arsenic, cadmium, chromium, copper, lead, manganese, nickel, and selenium (one sample each) same as above.
	69045 (one sample)	Mercury (one sample) same as above.
	69122 (six samples)	Antimony (six samples), cadmium (six samples), and selenium (one sample) same as above.
	69591 (one sample)	Thallium and cadmium (one sample) same as above.
	69352 (six samples)	Mercury (four samples) same as above.
	70088 (eight samples)	Chromium (eight samples) had a laboratory control sample outside of acceptable limits. Data qualified as J, but usability was unaffected. Data are valid because the recoveries were biased high.

[1] Number in parenthesis is the total number of samples in each batch.

[2] Number in parenthesis is the number of samples per analyte that had a QA/QC problem.

TABLE B-2
DATA QUALITY EVALUATION FOR TA-14 SAMPLES
(Continued)

Suite	Batch Number	Comments
Inorganics (continued)	68129 (nine samples)[1]	Antimony and zinc (nine samples)[2] same as above. Data are valid because the recoveries were within reasonable limits (>50<80%) and the analytes were detected below background UTLs.
	68395 (seven samples)	Total cyanide (six samples) same as above. Data are valid because the recoveries were biased high.
	69591 (one sample)	Antimony, arsenic, beryllium, cadmium, chromium, and vanadium (one sample) same as above. Data are valid because the recoveries were biased high.
	69184 (seven samples)	Arsenic, barium, cobalt, nickel, selenium, silver, thallium, and vanadium (one sample) had matrix spike/matrix spike duplicates outside of acceptable limits. Data are J qualified and usability was unaffected. Data are valid because the recoveries were biased high.
	68039 (nine samples)	Antimony, barium, and lead (one sample) same as above. Data are valid because even if the value were corrected for the low recovery, the sample value would be below the SALs.
	68129 (nine samples)	Manganese (one sample) same as above. Data are valid because even if the value were corrected for the low recovery, the sample value would be below the background UTL.
	68038 (ten samples)	Barium and manganese (one sample) same as above. Data for barium are valid because the recovery is within reasonable limits (>50<75%) and the analyte was detected below background UTL. The data for manganese were valid because the spike level was too low, i.e., less than the concentration present in the sample, and the recovery could not be distinguished from the sample value.
	68637 (six samples)	Barium and zinc (one sample) same as above. Data are valid because the recoveries are within reasonable limits (>50<75%) and the analytes were detected below background UTL.
	69184 (seven samples)	Barium, beryllium, cadmium, copper, manganese, nickel, vanadium, and zinc (seven samples) were detected in the laboratory blank. Sample values were greater than 5X the blank values and are considered to be valid; data usability unaffected.
	70088 (eight samples)	Chromium (seven samples) same as above.
	68039 (nine samples)	Barium, cadmium, chromium, copper, manganese, selenium, and zinc (ten samples) same as above.
	68129 (nine samples)	Barium, cadmium, chromium, lead, manganese, nickel, vanadium and zinc (nine samples) same as above.
	68038 (ten samples)	Barium, chromium, cobalt, lead, selenium, and zinc (ten samples) same as above.
	68637 (six samples)	Barium, cadmium, chromium, cobalt, lead, manganese, vanadium, and zinc (six samples) same as above.

[1] Number in parenthesis is the total number of samples in each batch.

[2] Number in parenthesis is the number of samples per analyte that had a QA/QC problem.

TABLE B-2
DATA QUALITY EVALUATION FOR TA-14 SAMPLES
(Continued)

Suite	Batch Number	Comments
Inorganics	69043 (one sample)[1]	Cadmium, copper, lead, manganese, nickel, selenium, and zinc (one sample)[2] were detected in the laboratory blank. Sample values were greater than 5X the blank values and are considered to be valid; data usability unaffected.
	69122 (six samples)	Barium, beryllium, cadmium, chromium, copper, lead, manganese, nickel, and zinc (six samples) same as above.
	69437 (seven samples)	Mercury (seven samples) same as above.
	69045 (one sample)	Mercury (one sample) was detected in the laboratory blank. Sample value was less than 5X the blank values and is considered to be due to contamination. Data usability was affected and the data are not used in the screening assessment.
SVOC	69207 (one sample)	Flouranthene and pyrene (one sample) are J qualified and reported as detected although the sample values are between the estimated quantitation limits (EQL) and the method detection limits. The analytes are considered to be undetected because the results cannot be accurately distinguished from instrument "noise" levels. As a result, the data usability for the analytes is affected and the values are not used in the screening assessment.
	68347 (one sample)	Benzo(a)anthracene and benzo(b)fluoranthene (one sample) same as above
	68345 (eleven samples)	Dibenzofuran, acenaphthylene, anthracene, benzo(g,h,i) perylene, fluorene, indeno(1,2,3-cd)pyrene, and benzo(a) pyrene (one sample each) same as above.
		4-Nitrophenol (eleven samples) had a laboratory control sample outside of acceptable limits. Data qualified as UJ, but usability was unaffected. Data are valid because the recovery was within reasonable limits (>50<75%) and the compounds should have been detected if present.
	69207 (one sample)	2-Chlorophenol, 4-nitrophenol, and phenol same as above. Data are valid because the recoveries were within reasonable limits (>50<75%) and the compounds should have been detected if present.
	68347 (one sample)	Acenaphthylene and naphthalene (one sample) same as above. Data are valid because the recoveries were <5% below the lower limit.
	68694 (six samples)	2-Chlorophenol, 4-nitrophenol, pentachlorophenol, and phenol (six samples) same as above. Data are valid because the recoveries were within reasonable limits (>50<75%) and the compounds should have been detected if present.
	68663 (one sample)	2-Chlorophenol, 2,4-dinitrotoluene, 4-nitrophenol, and phenol (one sample) same as above. Data are valid because although recoveries were as low as 30%, if the detection limits were raised by a factor of 3, the they would still be below SALs.

[1] Number in parenthesis is the total number of samples in each batch.

[2] Number in parenthesis is the number of samples per analyte that had a QA/QC problem.

TABLE B-2
DATA QUALITY EVALUATION FOR TA-14 SAMPLES
(Continued)

Suite	Batch Number	Comments
SVOC	68345 (eleven samples)[1]	All SVOCs for one sample had surrogate recoveries outside of the acceptable limits. Data were qualified UJ or J, but usability was unaffected. Data are valid because the spike levels are too low to compensate for the sample dilution.
	68694 (six samples)	All SVOCs for one sample same as above. Data are valid because the recovery for one surrogate is biased high.
	68347 (one sample)	PAHs for one sample had matrix spike recoveries outside of acceptable limits. Data qualified as UJ or J, but usability was unaffected. Data are valid because the spike level was too low, i.e., less than the concentration present in the sample, and the recovery could not be distinguished from the sample value.
	68345 (eleven samples)	All SVOCs for one sample same as above. Data are valid because the spike levels are too low to compensate for the sample dilution.
	68694 (six samples)	All SVOCs for one sample same as above. Data are valid because the recovery for one surrogate is biased high.
	68663 (one sample)	The 7-day recommended extraction holding time for all semivolatile organics in one sample was exceeded by 4 days, resulting in the data being qualified UJ. These estimated values are considered valid and the usability unaffected because the holding time was not grossly exceeded.
HE	68051 (twenty samples)	HMX (four samples)[2] and RDX (two samples) are J qualified and reported as detected although the sample values are between the estimated quantitation limits (EQL) and the method detection limits. The analytes are considered to be undetected because the results cannot be accurately distinguished from instrument "noise" levels. As a result, the data usability for the analytes is affected and the values are not used in the screening assessment.
	68170 (nine samples)	HMX, RDX, and TETRYL (one sample each) same as above.
	69174 ((nine samples)	HMX (one sample) same as above.
		2-Amino-4,6-dinitrotoluene,4-amino-2,6-dinitrotoluene, nitrobenzene, and o-,p-nitrotoluenes (nine samples) had a laboratory control sample outside of acceptable limits. Data qualified as UJ, but usability was unaffected. Data are valid because the recoveries were <5% below the limit.
	68051 (twenty samples)	Nitrobenzene and p-nitrotoluene (twenty samples) same as above. Data are valid because the recoveries were <1% below the limit.
	68170 (nine samples)	TETRYL (nine samples) same as above. Data are valid because recovery is at the lower limit.
	68678 (six samples)	TETRYL (five samples) same as above. Data are valid because the recovery was within reasonable limits (>40<75%) and the analyte should have been detected if present.

[1] Number in parenthesis is the total number of samples in each batch.

[2] Number in parenthesis is the number of samples per analyte that had a QA/QC problem.

TABLE B-2
DATA QUALITY EVALUATION FOR TA-14 SAMPLES (Continued)

Suite	Batch Number	Comments
HE	69172 (one sample)[1]	All HE (one sample)[2] same as above. Data are valid because the recoveries were within reasonable limits (>50<75%) and the analytes should have been detected if present.
	69881 (five samples)	All HE for two samples were extracted after the recommended 14-day holding time. The samples exceeded the recommended holding time by 5 days and were considered valid estimated values (i.e., qualified UJ) and their data usability was unaffected. Data are valid because no degradation products were detected.
Radionuclide	68392 (five samples)	Uranium-238 (three samples) was detected in the laboratory blank. Sample concentrations were less than 5X the blank value, indicating presence is due to contamination. Data usability affected and data are not used in the screening assessment.
	68994 (seven samples)	Uranium-238 (one sample) same as above.
	68392 (five samples)	Uranium-238 (one sample) was detected in the laboratory blank. Sample concentrations were greater than 5X the blank value and are considered to be valid. Data usability is unaffected.
	68994 (seven samples)	Uranium-238 (two samples) same as above.
	68994 (seven samples)	Detected concentrations of uranium-235 (one sample) and uranium-238 (five samples) were less than 3 σ and are considered to be nondetects. Data usability is affected and data are not used in the screening assessment.
	68054 (twenty samples)	Uranium-235 (five samples) and uranium-238 (twelve samples) same as above.
	68392 (five samples)	Uranium-235 (two samples) same as above.
	68169 (five samples)	Uranium-235 (one sample) same as above.

[1] Number in parenthesis is the total number of samples in each batch.

[2] Number in parenthesis is the number of samples per analyte that had a QA/QC problem.

APPENDIX C METHODOLOGIES FOR DEVELOPING SITE-SPECIFIC PRELIMINARY REMEDIATION GOALS

APPENDIX C
METHODOLOGIES FOR DEVELOPING SITE-SPECIFIC PRELIMINARY REMEDIATION GOALS

1.0 APPROACH TO PRG DEVELOPMENT

Preliminary remediation goals (PRG) were calculated for several analytes from the PRSs investigated for this report to determine if these analytes posed an unacceptable risk to human health. Risk-based cleanup levels were calculated for those chemicals that failed the screening assessment comparison to background concentrations and SALs, including the analysis of multiple chemicals as documented in this RFI Report for these two sites.

2.0 PRG EQUATIONS

Site-specific PRGs have been calculated using the modified U.S. Environmental Protection Agency (EPA) equations and Los Alamos National Laboratory (Laboratory) site-specific input parameters presented in this appendix. These are based on a healthy working adult under a continued laboratory operations land-use scenario.

Under the EPA nonintrusive industrial land-use scenario, risk resulting from exposure to chemicals in soil is assumed to result from direct ingestion and inhalation of particulates from soil. EPA default parameters are based on the type of industrial exposure activities expected after cleanup and the physical properties of the COPCs. One set of circumstances includes parameters such as exposure frequency and duration, which are adjusted to reflect a maintenance worker vs. a construction worker (or surface vs. subsurface contamination scenarios), depending on the type of continued laboratory operations activity expected (i.e., intrusive or nonintrusive, respectively). For PRS 14-006 and Aggregate 4, no intrusive work (i.e., digging to place/replace sewer lines or to construct buildings) is expected, therefore, intrusive default parameters were eliminated for this scenario

Calculation of PRGs are consistent with Risk Assessment Guidance for Superfund (RAGS) Part B (EPA 1991a, 0302) and also considers updates to the RAGS Part B equations (EPA 1991, 1994). The PRGs were developed using 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).

Equations 1 and 2 were used to calculate a spreadsheet of PRGs (for carcinogenic and noncarcinogenic chemicals, respectively) under the nonintrusive industrial exposure scenario (ingestion and inhalation). The equations for each class of chemicals are similar but use different site-specific input parameters. The methodologies calculates a soil concentration for carcinogens from a target cancer risk of 10^{-6} (i.e., 1 in 1,000,000). PRGs for noncarcinogenic chemicals are calculated for a child from a target hazard quotient of 1. The equations for soil combine across all pathways for direct exposure.

3.0 PRS 14-006 AND CENTRAL AREA DRAINAGE

3.1 Land Use

The anticipated future use of both PRS 14-006 and the Central Area Drainage is primarily industrial/commercial in a continued Laboratory operation.

3.2 Cleanup of PRS 14-006

Three COPCs — lead, thallium, and 2,4,6-trinitrotoluene — failed the screening assessment at PRS 14-006 and were carried forward for further evaluation based on comparison with site-specific PRGs. Calculation of site-specific PRGs was based on the Laboratory's expected land use. Table C-1 was used to calculate the cleanup levels, and Table C-2 shows the site specific PRGs per COPC.

3.2.1 Lead

Under the industrial/commercial exposure scenario, a pregnant female adult worker is the reasonable maximum exposed individual whereas for a recreational exposure scenario a child is considered the most sensitive individual (reasonable maximum exposed individual).

The PRG for lead in soil of 1,000 ppm has been adopted by the Laboratory for an industrial exposure scenario based on information obtained from EPA Region VI (EPA 1995). This soil PRG considers the fetal effects when a pregnant worker is exposed.

3.2.2 Thallium

The PRG for thallium (184 mg/kg) were calculated using Equation 2 for noncarcinogenic effects. No carcinogenic effect is observed due to thallium.

3.2.3 Organics

The organic 2,4,6-trinitrotoluene can exert both noncarcinogenic and carcinogenic health effects. Thus, the PRG for the industrial exposure scenario was calculated to provide the most health-conservative cleanup levels. In calculating the PRGs, a comparison was used between the noncarcinogenic and carcinogenic PRGs for the particular chemical. The value producing the most conservative effect (i.e., lower of the two PRGs) was used in this report and a reference to the equation that resulted in the more conservative value is cited.

The PRGs for 2,4,6-trinitrotoluene (191 mg/kg) was calculated using Equation 1 for carcinogenic effects and Equation 2 for noncarcinogenic effects (1020 mg/kg).

3.3 Cleanup of Central Area Drainage

One organic, RDX, failed the screening assessment at Central Area Drainage and was carried forward for further evaluation based on comparison with its site-specific PRGs. Calculation of site-specific PRGs was based on the Laboratory's expected land use.

3.3.1 Organics

The PRGs for RDX (52 mg/kg) was calculated using Equation 1 for carcinogenic effects and Equation 2 for noncarcinogenic effects (6190 mg/kg).

4.0 MULTIPLE-CHEMICAL PRG ANALYSIS

When two or more COPCs are present at a site at concentrations at or below their respective PRGs, a multiple-chemical PRG risk analysis is conducted for carcinogenic risk and noncarcinogenic health hazard. The multiple-chemical PRG risk analysis is estimated by adding together the fractional contributions (i.e., site-specific concentration / PRG) of each chemical. For carcinogenic cancer risk estimates, the fractional contribution of each is added together and multiplied by 10^{-6} target cancer risk:

$$Multiple\ PRG\ Risk = [(conc_x / PRG_x) + (conc_y / PRG_y) + (conc_z / PRG_z)] \times 10^{-6}$$

If the multiple chemical PRG risk is at or below the target value of 10^{-6}, the site will be considered to not present a carcinogenic risk.

For noncarcinogenic hazard estimates, the fractional contribution of each will be added together and compared with a target hazard index of 1:

$$PRG\ Hazard\ Index = [(conc_x / PRG_x) + (conc_y / PRG_y) + (conc_z / PRG_z)]$$

If the PRG hazard index is at or below the target hazard index of 1, then the site will be considered to not pose a toxic effect.

Equation 1: Direct Exposures to Carcinogenic Constituents in Industrial Soil

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

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 1991b)

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

EF_o = Exposure Frequency - occupational (d/y)
Considered to be 250 d/y (EPA 1991a)

ED_o = Exposure duration - occupational (years)
Considered to be 25 years (EPA 1991b)

IRS_o = Soil ingestion - occupational (mg/day)
Considered to be 50 mg/day (EPA 1991b)

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

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

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

VF_s = Volatilization factor for soil (mg/kg)
Considered to be zero for chemicals with MW> 200 g/mole and Henry's Law Constant <1 x <10^{-5} atm-m^3/mole

PEF = Particulate emission factor (mg/kg)
Considered to be $1.11 \times 10^{+7}$ (m^3/kg) (LANL 1993)

Equation 2: Direct Exposures to Noncarcinogenic Constituents in Industrial Soil

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

Where:

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

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

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

ED_o = Exposure duration - occupational (years)
Considered to be 25 years (EPA 1991b)

EF_o = Exposure Frequency - occupational (d/y)
Considered to be 250 d/y (EPA 1991a)

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 1991b)

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

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

VF_s = Volatilization factor for soil (mg/kg)
Considered to be zero for chemicals with MW> 200 g/mole and Henry's Law Constant $<1 \times <10^{-5}$ atm-m^3/mole

PEF = Particulate emission factor (mg/kg)
Considered to be $1.11 \times 10^{+7}$ (m^3/kg) (LANL 1993)

TABLE C-1
SPREADSHEET FOR CALCULATING PRGS FOR COMMERCIAL/INDUSTRIAL SOIL EXPOSURE

Chemical	Oral Reference Dose (RfD) (mg/kg/day)	Oral Absorption Factor	Inhalation RfD (mg/kg/day)	Inhalation Slope Factor $(mg/kg/day)^{-1}$
PRS 14-006				
Lead	See Section 4.1.1 for Lead Discussion			
Thallium	9E-05	1	NA	NA
2,4,6-Trinitrotoluene	5E-04	1	NA	NA
Central Area Drainage				
RDX	3E-03	1	NA	NA

NA = not available

TABLE C-2
PRG SUMMARY TABLE

Chemical	Nonintrusive Industrial Soil Scenario (mg/kg)		
	Noncancer PRG	Cancer PRG	PRG (lower of two)
Lead	1.0E+03	NA	1.0E+03
Thallium	1.84E+02	NA	1.84E+02
2,4,6-Trinitrotoluene	1.02E+03	1.91E+02	1.91E+02
RDX	6.19E+03	5.20E+01	5.20E+01

NA = not available

REFERENCES

EPA (US Environmental Protection Agency), January 1992. "Dermal Exposure Assessment: Principles and Applications," Interim Report, EPA/600/8-91/011B, Office of Research and Development, Washington, DC. (EPA 1992, 1012)

EPA (US Environmental Protection Agency), December 1991a. "Risk Assessment Guidance for Superfund, Volume I—Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals)," Interim, EPA/540/R-92/003, Publication 9285.7-01B, Office of Research and Development, Washington, DC. (EPA 1991, 0302)

EPA (US Environmental Protection Agency), March 25, 1991b. '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 Emergency and Remedial Response, Toxics Integration Branch, Washington, DC. (EPA 1991, 0746)

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 1994a)

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)

APPENDIX D CORRELATION BETWEEN FIELD AND LABORATORY METHODS FOR URANIUM AND LEAD

APPENDIX D
CORRELATION BETWEEN FIELD AND LABORATORY METHODS FOR URANIUM AND LEAD

Field screening methods were used during the field sampling program at former Operable Unit 1085 to help determine which samples would be sent to the laboratory for analyses (also referred to as biased sampling). Samples from the field were processed in a portable trailer using x-ray fluorescence (XRF) techniques for lead and uranium. As described in the RFI Work Plan for Operable Unit 1085 (LANL 1994, 1156), the intent was to bias the fixed laboratory analyses toward high concentrations. Samples with high field-screening values were sent for fixed laboratory analyses.

The screening analysis performed by XRF is a surface technique that measures the elements of interest in only the outermost few millimeters of the soil grains. The fixed laboratory analysis methods, in contrast, utilize a strong acid-leaching procedure, followed by either atomic absorption/emission or inductively coupled plasma emission. The fixed laboratory analysis measures more of a "total" concentration of analyte than the screening methods. Thus, while the two analytical techniques are not identical, they are similar enough to be used in conjunction with one another. The use of field instruments is justified as a cost-savings technique and yields real-time results. In addition, when the field screening measurements correlate well with the fixed laboratory analyses, the field information from samples not submitted to the laboratory can be used in a qualitative manner to characterize the extent of contamination over the sites.

The attached scatter plots of the field screening measurements relative to the analytical laboratory results show the correlations between the two measurement methods (See Fig. D-1 shows Pb and Fig. D-2 shows U). Included on the plots are the results of positive (non-zero or negative) instrument readings. A single plot is shown for all the combined results from all the potential release sites (PRSs). Because of the wide range of the data, the results are plotted on a log-log scale. The values used to produce the plots are presented in Appendix E.

The results show positive a correlation between the measurements. There is a large amount of scatter about the points because of the differences in factors such as the nature of the analytical techniques, matrix effects, and nonheterogenity in the samples. However, these results give confidence that the higher concentrations of metals in samples picked for fixed laboratory analysis were confirmed. This result, in turn, lends credence to the use of field screening for biasing the samples sent for fixed laboratory analysis.

In addition to the correlations between XRF and fixed laboratory analysis, a performance evaluation (PE) sample of certified reference material was analyzed repeatedly during the field sampling season as a check of the accuracy of the XRF equipment. Table D-1 lists the results.

For lead, 27 measurements of the US Geological Survey soil reference material yielded a mean of 589 ppm and a standard deviation of 42 ppm; the certified value was 690 ppm, standard deviation 60 ppm. For uranium, 27 measurements yielded a mean of 7.9 ppm, standard deviation 8.8 ppm, while the certified value was 2.9 ppm, standard deviation 0.06 ppm. From these results, the XRF measurements appear precise (relative standard deviation 7.1%) but low by approximately 100 ppm. A statistical T-test using the certified reference value as the "accepted value" reveals that there is a determinate (low) error with the XRF for lead. For uranium, the negative values for some analyses suggest that the PE sample concentration is at the lower limit of the useful analytical range of the XRF instrument, and no quantitative conclusions can be drawn. Reference to the uranium correlation figure shows a good correlation above 10 ppm uranium, suggesting that the XRF is appropriate for field screening of uranium in soil.

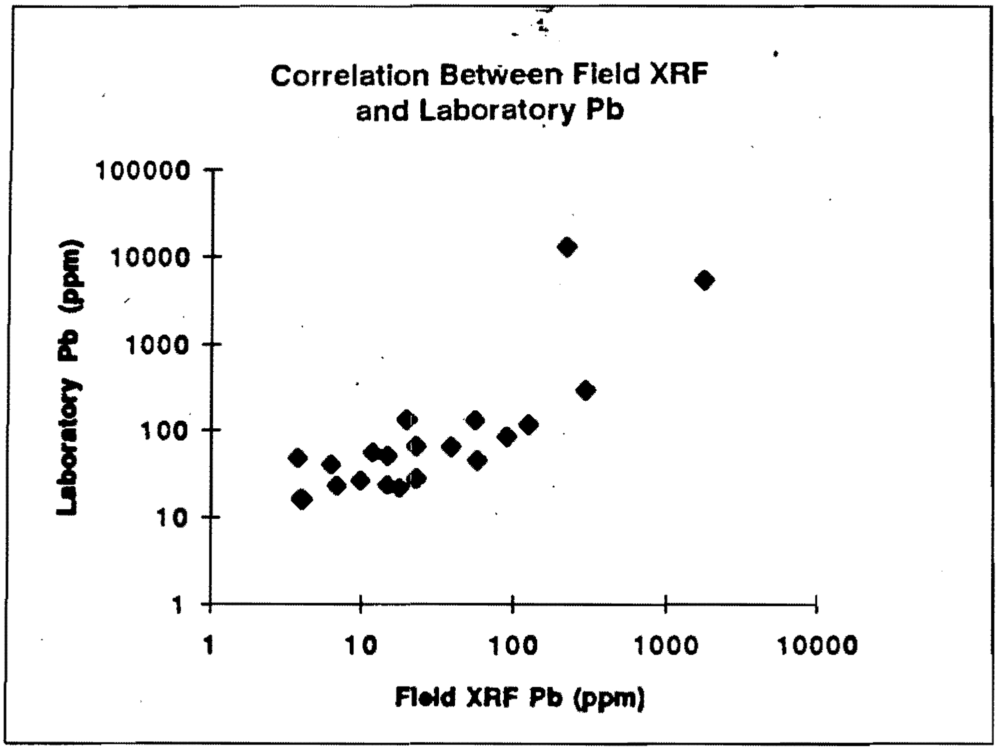

Figure D-1 Correlation Between Field XRF and Laboratory Pb

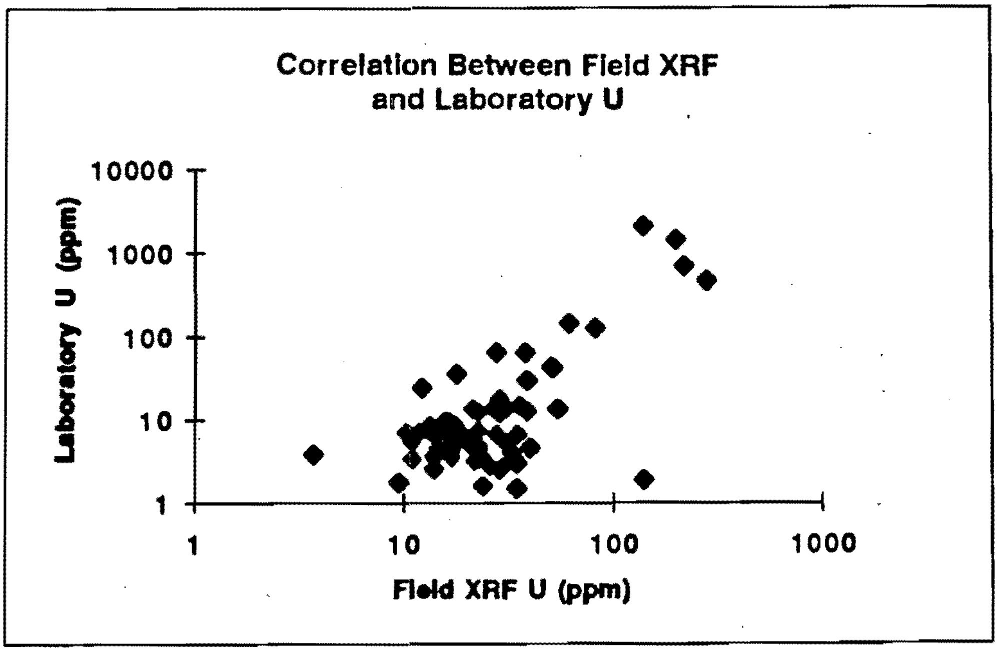

Figure D-2 Correlation Between Field XRF and Laboratory U

TABLE D-1
ACCURACY DETERMINATION FOR FIELD XRF
1995 TA-12/67 AND TA-14

Date of Analysis	Pb (ppm)	U (ppm)	Fe (ppm)
6-19-95	629	13.1	
6-19-95	588	12.7	
6-20-95	590	21	
6-20-95	593	6.6	
6-21-95	570	17.5	
6-22-95	652	13.4	
6-26-95	595	-9.4	
6-27-95	620	17	16910
6-27-95	560	6.6	15420
6-27-95	588	14	18000
6-28-95	611	6.7	17040
6-28-95	559	-8	17310
6-30-95	594	-0.5	16830
7-3-95	641	18	17620
7-5-95	646	23	16400
7-10-95	648	7.2	16700
7-10-95	504	-3.3	16160
7-11-95	585	12	17120
7-12-95	569	-2.3	16830
7-12-95	606	14.5	16020
7-13-95	568	14	16270
7-14-95	591	8.1	16150
7-17-95	572	-6.4	16650
7-18-95	614	4.7	17050
7-19-95	575	4.4	16010
1-10-96	590	5.6	16900
1-10-96	458	2.4	13600
Experimental Mean	**589**	**7.9**	**16550**
Standard Devation	**42**	**8.8**	**919**
Certified Value *	**690**	**2.9**	**18600**
Certified Standard Deviation	**60**	**0.06**	**600**

* USGS Reference Material GXR-2, Soil, Park City, Utah

APPENDIX E FIELD SCREENING DATA FOR TA-12/67 AND TA-14

Screening Data for TA 12/67 and TA 14

PRS or AOC	Sample #	Depth (inches)	XRF Data		Ludlum 2210 Rad Data (cpm)	Analytical Data	
			Pb (ppm)	U (ppm)		Pb (ppm)	U (ppm)
12-001(a)	0212-95-0001	0 - 1	-45	12.2	1602	22.1	24.4
12-001(a)	0212-95-0002	0 - 0.75	-78	18	1482	23.3	35.5
12-001(a)	0212-95-0003	0 - 6	-59	11	2436	14.8	5.47
12-001(a)	0212-95-0004	0 - 6	-3.6	23	2436	14.6	4.51
12-001(a)	0212-95-0005	0 - 6	-25	27	2251	Not submitted for analytical	
12-001(a)	0212-95-0006	0 - 4	-27	27	2533	Not submitted for analytical	
12-001(a)	0212-95-0007	0 - 4	-0.08	23	2296	17.3	12.3
12-001(a)	0212-95-0008	0 - 6	-40	43	2475	Not submitted for analytical	
12-001(b)	0212-95-0009	0 - 6	-39	16	2747	Not submitted for analytical	
12-001(b)	0212-95-0010	18 - 24	-45	20	2769	Not submitted for analytical	
12-001(b)	0212-95-0011	0 - 6	-8.8	278	2815	11.2	459
12-001(b)	0212-95-0012	18 - 24	-27	51	2953	9.1	42.8
12-001(b)	0212-95-0013	0 - 6	-17	31	2581	21.8	13.6
12-001(b)	0212-95-0015	0 - 4	-43	30	2386	Not submitted for analytical	
12-001(b)	0212-95-0016	0 - 6	-21	12	2390	Not submitted for analytical	
12-001(b)	0212-95-0017	0 - 5	-20	26	2326	Not submitted for analytical	
12-001(b)	0212-95-0018	0 - 3	-61	23	2376	10.7	4.83
12-001(b)	0212-95-0019	0 - 6	-0.3	33	2327	Not submitted for analytical	
C-12-001	0212-95-0020	0 - 5	-17	23	2492	33.2	3.39
C-12-001	0212-95-0021	0 - 6	26	26	2324	Not submitted for analytical	
C-12-002	0212-95-0022	0 - 6	-35	26	2403	13.8	2.79
C-12-002	0212-95-0023	0 - 6	-47	33	2298	Not submitted for analytical	
C-12-003	0212-95-0024	0 - 6	-9.7	7.1	2419	11.1	NA
C-12-003	0212-95-0025	0 - 3	-39	36	2287	Not submitted for analytical	
C-12-004	0212-95-0026	0 - 6	-11	28	2189	Not submitted for analytical	
C-12-004	0212-95-0027	0 - 6	21	20	2157	Not submitted for analytical	
C-12-005	0212-95-0028	0 - 6	-13	3.8	2400	13.9	3.8
C-12-005	0212-95-0029	0 - 6	-20	24	2429	14.1	3.43
12-004(a)	0212-95-0030	0 - 4	-12	23	2605	13.6	*
12-004(a)	0212-95-0031	0 - 6	-23	22	2424	Not submitted for analytical	
12-004(a)	0212-95-0032	0 - 6	-49	18	2424	Not submitted for analytical	
12-004(a)	0212-95-0033	0 - 6	-64	3.2	2238	Not submitted for analytical	
12-004(a)	0212-95-0034	0 - 6	-47	35	2981	9.4	*
12-004(a)	0212-95-0035	0 - 6	-55	27	2618	10.8	*
12-004(a)	0212-95-0036	0 - 0.5	-43	22	2577	Not submitted for analytical	
12-004(a)	0212-95-0037	0 - 6	-33	37	2768	10.2	*
12-004(a)	0212-95-0038	0 - 6	-21	17	2543	Not submitted for analytical	
12-004(a)	0212-95-0039	0 - 6	-35	21	2352	Not submitted for analytical	
12-004(a)	0212-95-0040	0 - 6	-24	11.7	2607	Not submitted for analytical	
12-004(a)	0212-95-0041	0 - 3	-1.1	15	2794	8.6	*
12-004(a)	0212-95-0042	0 - 5	-39	32	2608	Not submitted for analytical	
12-004(a)	0212-95-0043	0 - 6	-69	20	2638	Not submitted for analytical	
12-004(a)	0212-95-0044	0 - 6	-35	24	2647	6.2	*

Screening Data for TA 12/67 and TA 14

PRS or AOC	Sample #	Depth (inches)	XRF Data		Ludlum 2210 Rad Data (cpm)	Analytical Data	
			Pb (ppm)	U (ppm)		Pb (ppm)	U (ppm)
12-004(b)	0212-95-0045	0 - 6	-6.9	20	2515	33.8	*
12-004(b)	0212-95-0046	24 - 30	-30	18	2159	13.8	*
14-010	0214-95-0048	14 - 20	4.1	36	2541	15.7	14.5
14-010	0214-95-0049	0 - 4	12	200	2689	54.2	1370
14-010	0214-95-0050	0 - 6	-18	218	2640	26.6	681
14-010	0214-95-0051	0 - 6	-26	17.9	2620	25.4	8.56
14-010	0214-95-0052	0 - 6	-50	11.9	2623	2.4	6.97
14-001(f)	0214-95-0053	0 - 1	-18	13.4	1886	11.7	8.54
14-001(f)	0214-95-0054	0 - 4	39	15.7	1880	63.9	9.53
14-001(f)	0214-95-0055	43 - 47	20	61	2167	131.0	141
14-002(a)	0214-95-0058	0 - 6	-15	140	2236	9.0	2010
14-009	0214-95-0066	0 - 6	-35	62	2782	8.7	NA
14-009	0214-95-0067	12 - 18	-19	41	2805	5.0	NA
14-009	0214-95-0068	0 - 6	6.5	94	2042	39.3	NA
14-009	0214-95-0069	12 - 18	4.2	16	1872	15.5	NA
14-009	0214-95-0070	0 - 6	-0.6	38	2484	36.8	64
14-009	0214-95-0071	0 - 5	15	39	2654	49.9	29.9
14-009	0214-95-0072	0 - 5	23	82	3750	27.1	123
14-009	0214-95-0073	0 - 6	-23	62	3064	89.3	*
14-009	0214-95-0074	0 - 5	10	57	2992	25.7	*
14-009	0214-95-0075	0 - 6	-18	24	3256	13.7	*
14-004(c)	0214-95-0076	0 - 6	23	22.2	2097	64.5	*
14-004(b)	0214-95-0077	0 - 4	59	21.5	2044	44.5	13.4
Aggregate 4	0214-95-0078	0 - 3	-5.6	16.6	1280	24.7	9.41
Aggregate 4	0214-95-0079	0 - 5	-18	39	1444	27.6	12.6
Aggregate 4	0214-95-0080	0 - 5	18	27	1444	21.5	13.6
Aggregate 4	0214-95-0081	0 - 4	-47	14.6	1282	19.8	4.51
Aggregate 4	0214-95-0082	0 - 3	-65	23.6	1277	6.6	3.46
Aggregate 4	0214-95-0083	0 - 6	-56	140.1	1308	5.6	1.88
Aggregate 4	0214-95-0084	0 - 6	-31	9.5	2331	9.8	1.75
Aggregate 4	0214-95-0085	0 - 4	-30	22	2567	8.2	3.2
Aggregate 4	0214-95-0086	0 - 5	-8.3	29	3301	9.0	2.49
Aggregate 4	0214-95-0087	0 - 6	-42	24.3	2358	6.3	1.58
Aggregate 4	0214-95-0088	0 - 4	-0.3	15	2237	34.0	7.29
Aggregate 4	0214-95-0089	0 - 5	-29	35	3074	4.2	1.47
Aggregate 4	0214-95-0090	0 - 6	-21	40.1	2475	13.0	4.59
C-14-003	0214-95-0091	0 - 6	-23	-5.8	2015	7.6	*
C-14-003	0214-95-0092	0 - 3	-29	29	2166	10.0	17.4
C-14-004	0214-95-0093	0 - 2	-30	34	2106	Not submitted for analytical	
C-14-004	0214-95-0094	0 - 2	-0.2	23	2125	Not submitted for analytical	
C-14-005	0214-95-0095	0 - 6	7.1	21	2123	22.6	4.94
C-14-005	0214-95-0096	0 - 5	57	33	2089	129.0	3.99
C-14-006	0214-95-0097	0 - 6	-30	24	2258	13.0	NA

Screening Data for TA 12/67 and TA 14

PRS or AOC	Sample #	Depth (inches)	XRF Data		Ludlum 2210 Rad Data (cpm)	Analytical Data	
			Pb (ppm)	U (ppm)		Pb (ppm)	U (ppm)
C-14-006	0214-95-0098	0 - 6	-21	24	2261	9.8	NA
C-14-007	0214-95-0099	0 - 5	-24	29	2207	31.5	12
C-14-007	0214-95-0100	0 - 5	-24	17.1	2076	16.9	4.34
C-14-008	0214-95-0056	0 -6	-31	17	3036	10.3	*
C-14-008	0214-95-0057	0 -6	-7.1	16	2966	12.4	*
14-006	0214-95-0101	48 - 48	-47	34	1844	17.5	3.36
14-006	0214-95-0102	48 - 48	-17	14	1617	13.9	3.59
14-006	0214-95-0103	0 - 6	3.9	22.8	2000	46.5	7.31
14-006	0214-95-0104	18 - 24	-42	17.1	2208	13.5	3.55
14-006	0214-95-0105	0 - 6	15	17.3	2060	22.8	5.57
14-006	0214-95-0106	0 - 6	-21	10.4	2570	17.2	6.89
14-007	0214-95-0107	54 - 60	-54	21.1	2627	10.3	*
14-007	0214-95-0108	54 - 60	-38	32	2663	11.0	*
14-007	0214-95-0111	0 - 6	-21	23	2473	33.0	*
14-007	0214-95-0112	18 - 24	-17	31	2684	14.0	*
14-007	0214-95-0113	0 - 6	-40	15.9	2426	18.1	*
14-007	0214-95-0114	0 - 6	-32	26	2376	14.0	*
14-002(d,e)	0214-95-0115	0 - 6	-12	35	2581	37.7	6.51
14-002(d,e)	0214-95-0116	0 - 6	-11	14	2581	41.4	6.53
14-002(d,e)	0214-95-0117	0 - 6	-39	31	2448	14.4	5.3
14-002(d,e)	0214-95-0118	0 - 6	-35	30	2407	15.4	2.73
14-002(d,e)	0214-95-0119	0 - 6	-29	28	2523	21.1	6.68
14-003	0214-95-0120	6 - 12	1804	28	2506	5380.0	64.2
14-003	0214-95-0121	6 - 12	224	14	2537	13100.0	2.58
C-14-001	0214-95-0122	6 - 11	-26	16	2554	23.9	NA
C-14-001	0214-95-0123	6 - 11	-34	7.7	2554	22.6	NA
C-14-001	0214-95-0124	6 - 12	-66	33	2557	11.5	NA
C-14-009	0214-95-0125	8 - 14	-8.7	25	2376	28.8	NA
C-14-009	0214-95-0126	7 - 13	-33	18.6	2257	11.7	NA
Aggregate 6	0214-95-0127	0 - 6	127	19	2427	115.0	6.92
Aggregate 6	0214-95-0128	0 - 6	92	35	2715	85.1	2.95
Aggregate 6	0214-95-0129	0 - 6	301	54	3042	290.0	13.2
Aggregate 6	0214-95-0130	0 - 6	-15	11.1	2680	48.4	3.37

* Not submitted for Total Uranium Analysis

APPENDIX F GROUND PENETRATING RADAR SURVEY OF SWMU 14-010 (TA-14-2) DRAINLINE

APPENDIX F

GROUND PENETRATING RADAR SURVEY OF SWMU 14-010 (TA-14-2) DRAINLINE

INTRODUCTION

SWMU 14-010 is a decommissioned explosive waste sump. The concrete waste sump was located south of and adjacent to TA-14-2. In the past, it may have contained HEs and toxic chemicals. A subsurface drainline from the sump extended beneath the parking lot in a general southward direction.

In March 1995, ICF Kaiser conducted a ground penetrating radar (GPR) survey on the asphalt parking lot south of the sump and in the brush area adjacent to the parking lot. The objective of the GPR survey was to assess the location of the drainline and its endpoint. The information was used to locate samples along the trend of the drainline.

GPR SURVEY

A Geophysical Survey Systems (GSSI) SIR-2 GPR system and a 500 MegaHertz antenna were utilized for the survey. A surveyors tape was located on the ground surface for lateral control along each GPR traverse. Hard copy printouts of the data were produced after each traverse and were inspected in the field to locate each subsequent traverse and mark the approximate location of the drainline. The drainline was marked with paint on asphalt surfaces.

Several GPR traverses were conducted south of the sump near Building 14-39. Hyperbolic reflections typical of subsurface utilities were detected in the GPR records near the sump. These were interpreted to be caused by the drainline. The drainline was traced southward from the sump to the edge of the asphalt parking lot.

The drainline continued to be detected in a small drainage on the southeast side of the asphalt. It was traced southeastward into the brush until it could no longer be detected. The endpoint was marked with plastic surveyors flagging.

The interpreted drainline extended approximately 50 feet southeastward off the edge of the asphalt pavement. It was located beneath the drainage in that vicinity which exhibited a 15 to 20 degree incline. The endpoint of the drainline occurred approximately where the drainage opened into a flat area. Four samples were obtained along the drainline from the edge of the asphalt pavement. Two samples were obtained over the drainline, one was obtained at the endpoint, and one was obtained approximately 25 feet downgradient of the endpoint.