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Date: June 27, 1996
Refer to: EM/ER:96-351

Mr. Benito Garcia
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: SUBMITTAL OF THE RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT FOR POTENTIAL RELEASE SITES (PRSs) IN TECHNICAL AREA (TA) 0

Dear Mr. Garcia:

Enclosed is a copy of the Los Alamos National Laboratory's RFI Report concerning PRSs 0-030(eN), (eS) , and (f) in TA-0. The report documents the field work performed as detailed in the approved RFI Work Plan for Operable Unit 1071 and the results of the sampling.

Please contact Garry Allen at (505) 667-6080 or Bonnie Koch at (505) 665-7202, if you have any questions.

Sincerely,

Jorg Jansen, Program Manager
LANL/ER Project

Sincerely,

for Theodore J. Taylor, Program Manager
DOE/LAAO

JJ/TT/bp

Enclosures: RFI Report for PRSs at TA-0
Certification

6858

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1 / 1071 / 0

RFI Report for Potential Release Sites

0-030(eN,eS,f)

Septic Systems

Field Unit 1

Environmental Restoration Project

June 1996

A Department of Energy
Environmental Cleanup Program

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Los Alamos
NATIONAL LABORATORY

LA-UR-96-2135

EXECUTIVE SUMMARY

This report presents the results of the Phase I Resource Conservative and Recovery Act (RCRA) Facility Investigation (RFI) of two potential release sites (PRSs), Technical Area (TA) 0, Group 0-030(e,f), from sanitary septic systems at Los Alamos National Laboratory (the Laboratory or LANL). PRSs 0-030(e,f) are described in detail in the RFI Work Plan for Operable Unit 1071 (LANL 1992, 0781). Although radiological constituents are not regulated under RCRA, this investigation included both hazardous (as defined by RCRA) and radiological constituents. A brief description of PRS Group 0-3 and the PRSs addressed in this report is provided below; a more detailed description can be found in Sections 5.1 and 5.2 of this report.

The 13 abandoned septic systems that compose PRS Group 0-3 are located within the Los Alamos townsite. These septic systems were installed during the early 1940s, and most remained in use until the Central Wastewater Treatment Plant was completed in late 1947 (LANL 1990, 0145). The septic tanks in this PRS group handled sanitary waste from the original townsite, and in a few cases, from early Laboratory operations at TA-1. However, because engineering drawings of these tanks are incomplete, it is not possible to document all of the buildings served by each tank (Francis and Sullivan 1995, 05-0207).

PRS 030(e) consists of three tanks: two tanks, known collectively as Septic Tank #4 (located on private property north of Canyon Road at the old Boy Scout Lodge), and Septic Tank #4A (located on private property south of Canyon Road at the Chapel Apartments) (The Zia Company 1947, 05-0132). In this report, Septic Tank #4 is referred to as PRS 0-030(e) North and Septic Tank #4A is referred to as PRS 0-030(e) South. PRS 0-030(f) consists of two tanks, known collectively at Septic Tank #5 (located on private property south of Canyon Road and north of Rose Street near the United Church). All of these septic tanks served residences and may have been connected to TA-1, according to engineering drawings prepared in 1943 (US Engineer Office 1943, 05-0161; US Engineer Office 1943, 05-0169).

Phase I site investigations at PRSs 0-030(e,f) took place in 1994. The primary purpose of Phase I sampling at these PRSs was to confirm the presence of the septic tanks and determine the presence or absence of potential contamination. Sampling procedures, and any variations from the planned procedures are described in Sections 5.1.4 and 5.2.4 of this report. Data analysis was conducted according to the general methodologies described in Section 3.0 of this report and as discussed in Sections 5.1.5 through 5.1.7 and Sections 5.2.5 through 5.2.7 of this report. Finally, the results of the quality assurance/quality control (QA/QC) activities are discussed in Section 4.0 of this report. Although a few data points were qualified based on QA/QC problems, none of the data were adjusted before being used in the subsequent data analysis steps.

Based on the results of the human health screening assessments (found in Subsections 5.1.7.1 and 5.2.7.1 of this report), PRSs 0-030(e,f) are recommended for no further action (NFA) on the basis of NFA Criterion 4 (which states that the PRS has been characterized in accordance with current state and federal regulations, and that chemicals of potential concern (COPCs) are not present in concentrations that would pose an unacceptable risk). A summary of the proposed actions for these PRSs is presented in Table ES-1

TABLE ES-1

SUMMARY OF PROPOSED ACTIONS

		PROPOSED ACTION			
PRS	**HSWA**	**NFA CRITERION[a]**	**FURTHER ACTION**	**RATIONALE**	**SECTION NUMBER**
0-030(e)	No	4	N/A[b]	Screening assessment revealed no threat to human health	5.1
0-030(f)	No	4	N/A	Screening assessment revealed no threat to human health	5.2

[a] Reference and appropriate NFA criteria (See Project Consistency Team Policy Number 015, No Further Action Criteria).
[b] N/A = Not applicable.

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1.0 INTRODUCTION

This report presents the results of the Phase I Resource Conservative and Recovery Act (RCRA) Facility Investigation (RFI) of two potential release sites (PRSs) at Technical Area (TA) 0, Group 0-030(e,f), from sanitary septic systems at Los Alamos National Laboratory (the Laboratory or LANL). These PRSs are located on private and Los Alamos County properties. Included in this report are data assessment, analysis approach, and site-specific results, conclusions, and recommendations for these PRSs.

1.1 General Site History

The 13 abandoned septic systems that compose PRS Group 0-3 are located within the Los Alamos townsite (Fig. 1.1-1 and Fig. 1.1-2). These septic systems were installed during the early 1940s, and most remained in use until the Central Wastewater Treatment Plant was completed in late 1947 (LANL 1990, 0145). The septic tanks in this PRS group handled sanitary waste from the original townsite, and in a few cases, from early Laboratory operations at TA-1. However, because engineering drawings of these tanks are incomplete, it is not possible to document all of the buildings served by each tank (Francis and Sullivan 1995, 05-0207).

PRS 030(e) consists of three tanks: two tanks, known collectively as Septic Tank #4 (located on private property north of Canyon Road at the old Boy Scout Lodge), and Septic Tank #4A (located on private property south of Canyon Road at the Chapel Apartments) (The Zia Company 1947, 05-0132). In this report, Septic Tank #4 is referred to as PRS 0-030(e) North and Septic Tank #4A is referred to as PRS 0-030(e) South. PRS 0-030(f) consists of two tanks, known collectively at Septic Tank #5 (located on private property south of Canyon Road and north of Rose Street near the United Church). All of these septic tanks served residences and may have been connected to TA-1 according to engineering drawings prepared in 1943 (US Engineer Office 1943, 05-0161; US Engineer Office 1943, 05-0169).

1.2 RFI Overview

The primary objective of the Phase I investigation was to determine if any contaminant releases had occurred from PRSs 0-030(e,f). Data collected during this investigation were used to evaluate potential health risks associated with any identified releases to ensure that the property is suitable for unrestricted use.

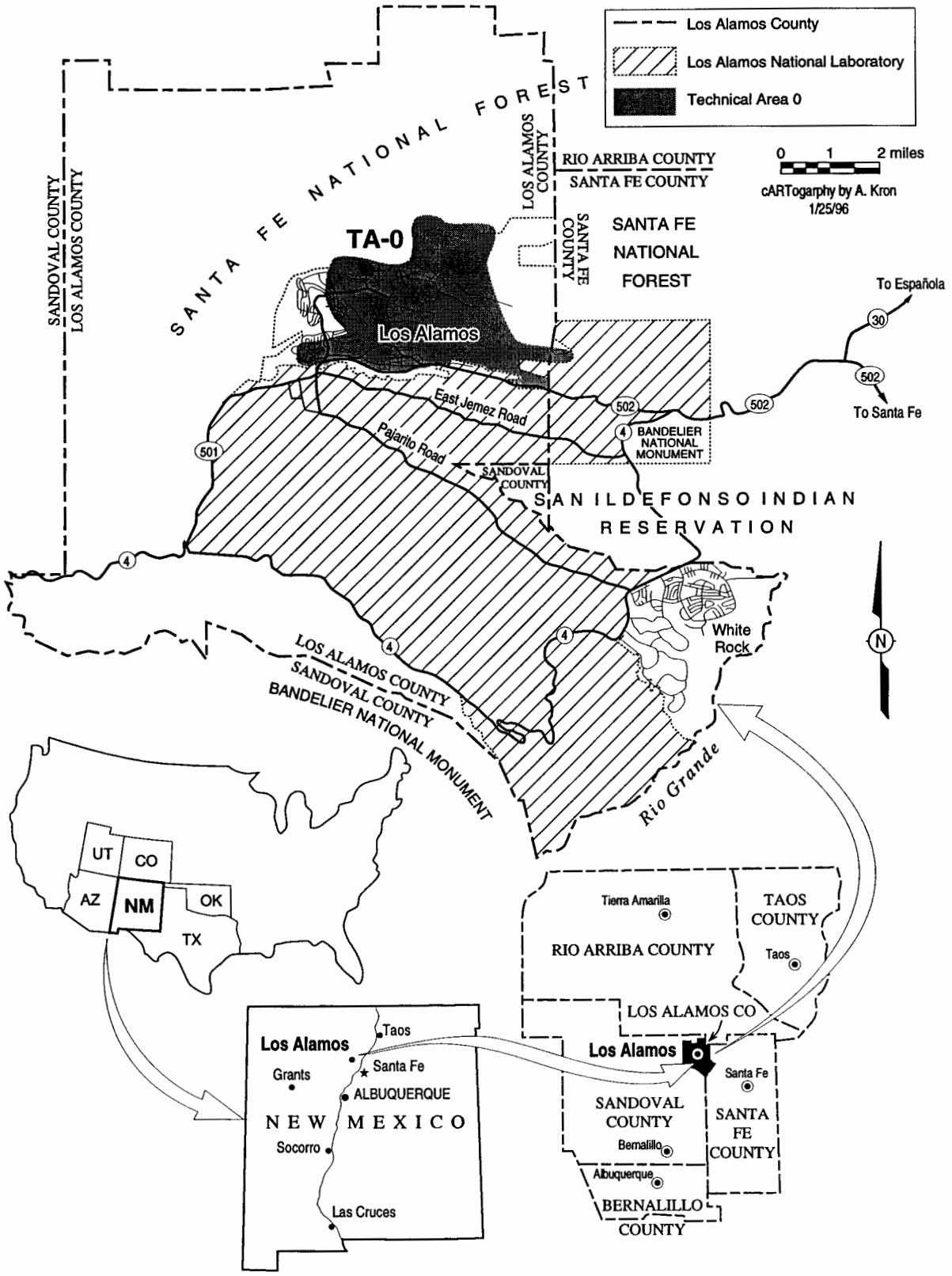

Fig. 1.1-1. Location map of TA-0 within Los Alamos National Laboratory, Los Alamos County, New Mexico.

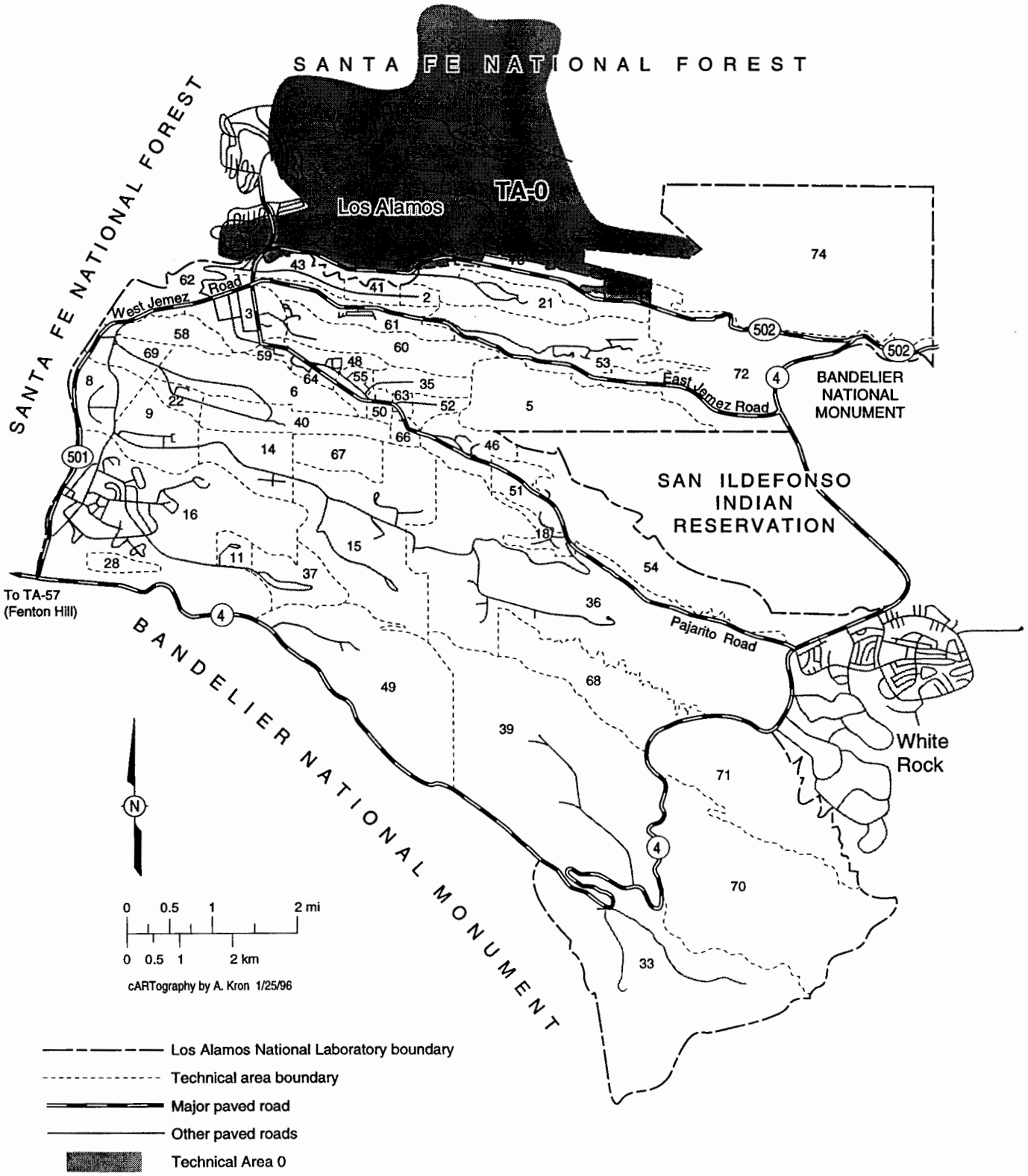

Fig. 1.1-2. Location of TA-0 with respect to Laboratory technical areas and surrounding landholdings.

1.3 Field Activities

PRS 0-030(e)

Site investigation activities were conducted to characterize the former septic tanks at PRS 0-030(e) North, located on private property north of Canyon Road at the old Boy Scout Lodge, and PRS 0-030(e) South, located on private property south of Canyon Road at the Chapel Apartments. Investigation of these septic tanks was conducted during the 1994 calendar year as part of the Operable Unit (OU) 1071 RCRA Facility Investigation Work Plan activities under the Laboratory's Environmental Restoration (ER) Project (LANL1992, 0781). The objectives of these RFI investigations were to determine whether the tanks still existed at these sites, the location and geometry of the septic tanks (if still present), and the presence or absence of contaminants resulting from historical septic tank use.

Site investigation activities included historical data searches and reviews, personal interviews, site surveys, geophysical, and geodetic surveys of the suspect septic tank locations. A review of the historical use of the tanks indicates that the tanks did not service, and therefore did not receive, any contaminated materials from any Laboratory buildings within TA-1.

Comparison of present day topography at PRS 0-030(e) North with 1943 engineering drawings suggested that the two tanks had been at least partially removed before construction of the Boy Scout Lodge, which is located approximately 30 ft north of the septic tanks. A geophysical survey was conducted to confirm the presence of the septic tanks and, if found, to provide a more precise determination of the location and geometry of the septic tank system.

Exploratory boreholes were hand-augered at the two PRS 0-030(e) septic tanks to determine the presence or absence of the tanks and any associated contamination. Samples were screened for chemical and gross radiological contamination with hand-held meters. A total of four subsurface soil samples were collected and analyzed for 12target analyte list (TAL) metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), radionuclides (isotopic plutonium, total uranium, americium-241, and gamma spectrometry), and gross alpha, beta, and gamma screening by the mobile radiological analytical laboratory (MRAL). The outlet pipe for PRS 0-030(e) North could not be located during field investigation activities; therefore, no surface soil samples were collected from that location.

Comparison of the 1943 engineering drawings, which did not show a septic tank for PRS 0-030(e) South, and the 1947 Zia Company Post Plans, which did show this septic tank,

suggests that the septic tank was installed sometime between 1943 and 1947. A geophysical survey was conducted in the area of the suspected location to confirm the presence of the septic tank and, if found, to provide a more accurate location and configuration of the system. A geophysical survey was also used to trace the outlet pipe from the outfall area back to the estimated location of the septic tank.

Exploratory trenches were excavated and boreholes were hand-augered and drilled at the PRS 0-030(e) South site to determine the presence or absence of the tanks and any associated contamination. Samples were screened for chemical and gross radiological contamination with hand-held meters. Samples were collected during most field activities but were not submitted for analysis because evidence from the field investigation suggested that the septic tank had been removed (this was confirmed after reviewing the drawings for the Chapel Apartments). Surface soil samples were collected in the outfall area for the PRS 0-030(e) South septic tank and were analyzed for 12 TAL metals, VOCs, SVOCs, pesticides, PCBs, and radionuclides. All applicable Laboratory ER Standard Operating Procedures (SOPs) were followed unless otherwise noted in Section 5.0 of this RFI report.

PRS 0-030(f)

Site investigation activities were conducted for characterization of the former LANL septic tanks in PRS 0-030(f), located on private property south of Canyon Road and north of Rose Street, slightly northeast of the United Church School building. Investigation of the two tanks located at this PRS was conducted during the 1994 calendar year as part of the RFI activities under the LANL ER Project (LANL 1992, 0781). The objective of this RFI investigation was to determine the location and geometry of the two septic tanks, and to determine the presence or absence of contaminants within and surrounding the septic systems.

Site investigation activities included historical data searches and reviews, personal interviews, site surveys, and geodetic surveys of suspected septic tank locations. A review of the historical use of the two tanks at this PRS indicates that the tanks did not service Laboratory buildings within TA-1 and therefore did not receive any contaminated materials. A geophysical survey was conducted in the vicinity of suspected septic tank locations to confirm the presence of the septic tanks and to provide a more precise location and geometry of the septic tank systems.

Six boreholes were drilled in an attempt to characterize the septic tank contents. A total of four of the boreholes were drilled into the interior of the two septic tanks, and three of the boreholes were sampled. Two boreholes were drilled and sampled at locations immediately surrounding the two septic tanks. A total of 14 samples were collected for septic tank characterization.

Samples were screened for chemical and gross radiological contamination with hand-held field instruments. Samples were analyzed for radionuclides (isotopic plutonium, total uranium, and americium-241), VOCs, SVOCs, pesticides, PCBs, and 12 TAL metals. All applicable LANL ER SOPs were followed, unless otherwise noted in Section 5.0 of this RFI report.

2.0 ENVIRONMENTAL SETTING

The environmental setting of the Laboratory is described in Section 2.4 of the Installation Work Plan (IWP) for Environmental Restoration (LANL 1995, 1164). A detailed discussion of the environmental setting for TA-0, including climate, geology, hydrology, and a conceptual hydrogeologic model, is presented in the IWP and summarized below (LANL 1995, 1275).

2.1 Climate

The Los Alamos area of northcentral New Mexico is classified as a semiarid, temperate mountain climate. Annual precipitation in the area normally reaches about 18 in., 40% of which occurs as brief, intense thunderstorms during July and August. Winter snowfall averages about 51 in. annually. In summer months, maximum daily temperatures in the Los Alamos area are usually below 90°F, dropping into the 50s at night. Winter temperatures typically range from 30°F to 50°F during the day, and from 15°F to 25°F at night, occasionally dropping to 0°F or below. Winds in Los Alamos often vary greatly with the time of day and location, due in large part to the complex terrain. Wind speeds are less than 2.5 m/s (5.5 mph) about 40% of the time and greater than 5 m/s (11 mph) about 20% of the time. The predominant wind direction is from the south-southwest (LANL 1993, 1017).

2.2 Geology

2.2.1 Geologic Setting

A detailed discussion of the geology of the entire Los Alamos area can be found in Section 2.5.1.3 of the IWP (LANL 1995, 1164). A summary of that material, emphasizing conditions expected near PRSs 0-030(e,f), is presented below.

Los Alamos townsite is located on the Pajarito Plateau. PRSs 0-030(e,f) are located on East Mesa at an elevation of 7 308 ft. East Mesa is bounded on the south by Los Alamos Canyon and on the north by Pueblo Canyon. Bedrock at the site is Bandelier Tuff, composed of air-fall and ash-flow deposits of silicic volcanic rock from eruptions 1.5–1.2 million years ago. For mesa-top sites, about 1 200 ft of unsaturated tuff and volcaniclastic sediments separate the surface from the main aquifer discussed in Section 2.3.2.

2.2.2 Soils

A detailed discussion of the soils in the Los Alamos area can be found in Section 2.5.1.3 of the IWP (LANL 1995, 1164). A summary of that material specific to PRS 0-030(e,f) is presented below.

The soil at PRS 0-030(e,f) is composed of moderately well-developed B and C horizons developed on Bandelier Tuff, a compacted fallout and ash-flow deposit of silicic volancic rock (Fig. 2.2.1-1), or on thin units of alluvium or colluvium. Soils belong to either the Carjo or Pogna soil series (Nyhan et al. 1978, 0161). Carjo soils consist of moderately deep, well-drained, and moderately developed soils that form an A-Bt-C horizon sequence. Soil textures can range from clay loam to fine sandy loams. The Pogna soils consists of shallow, well-drained, and weakly developed soils that comprise an A-C horizon sequence. The texture of Pogna soil is usually fine sandy loams. The substrate underlying these may range from Bandelier Tuff to alluvium/colluvium interstratifed with poorly developed to well-developed buried soils.

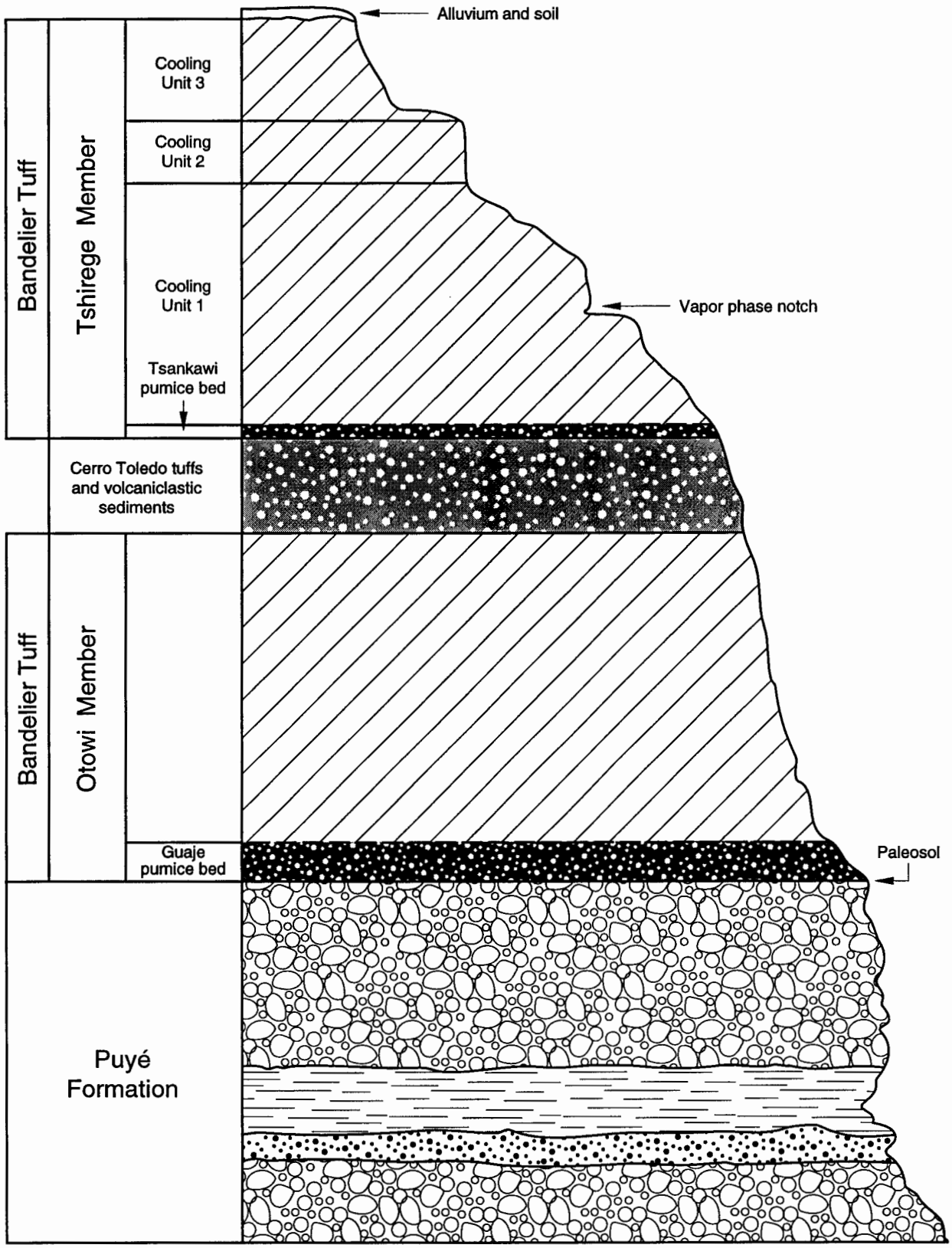

Fig. 2.2.1-1. Stratigraphy of TA-0.

2.3 Hydrology

The hydrology of the Pajarito Plateau is summarized in Section 2.5.2 of the IWP (LANL 1995, 1164). Site-specific conditions are summarized below.

2.3.1 Surface Water

PRSs 0-030(e,f) are located in the townsite near the north edge of the mesa (Fig. 2.3.1-1). Surface drainage on this part of the mesa is to the north into Pueblo Canyon or one of its tributaries. The north-facing canyon wall descends rather steeply from the mesa into the adjacent canyons. The septic tanks had an outfall which drained into a shallow channel that flows into the steep canyon wall slope from the mesa surface and into a tributary to Acid Canyon.

The outfall for PRS 0-030(e) North has not been located, but it should have discharged into Acid Canyon. Because the outfall was not located, no samples were taken related to this outfall drainage.

The runoff for PRS 0-030(e) South was concentrated along a shallow channel that descends from the outfall into the drainage channel of Pueblo Canyon. Along this channel were a number of small sediment catchment areas that were selected for sampling for contaminants from this outfall.

The outfall for septic tank 0-030(f) has not been located, but it should have discharged directly onto the north slope of Acid Canyon and ultimately into Pueblo Canyon. Because this outfall was not located, no samples were taken related to this outfall drainage.

2.3.2 Ground Water

Because the outfall drainage was entirely surface runoff and was concentrated along the drainage to Pueblo Canyon, it is likely that most of the runoff reached the axial channel in the canyon and did not pond along the slope long enough to infiltrate the underlying tuff. Thus, there is no likelihood of any outfall discharge reaching the main aquifer over 1 000 ft below the mesa surface.

2.4 Biological Surveys

Comprehensive plant and animal inventories are required by the Federal Endangered Species Act of 1973; the New Mexico Wildlife Conservation Act; Executive Order 11990, Protection of Wetlands; Executive Order 11988, Floodplain Management; 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).

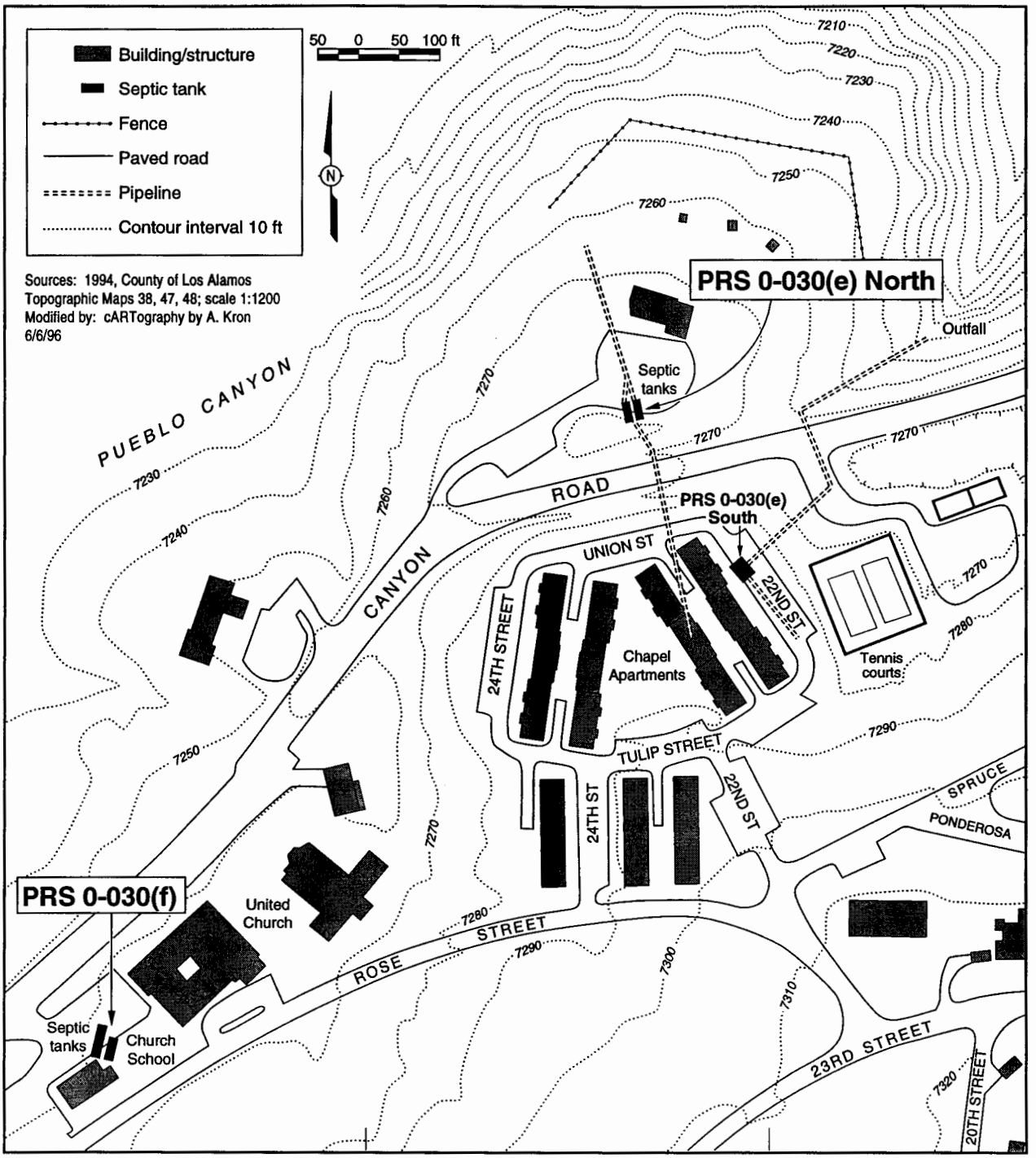

Fig. 2.3.1-1. Topographic map of PRSs in this RFI report.

2.5 Cultural Surveys

The Natural Historic Preservation Act requires a cultural resource survey. However, a survey was not conducted in the area of PRSs 0-030(e,f) because the site is an urban area and a survey would not be relevant.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSES

The decision approach used for PRSs 0-030(e,f) 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 to signify 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 (SALs) for human health impacts, and performing human health risk assessments when necessary. The following sections provide overviews of the methods used to complete these quantitative steps. Further details can be found in the guidance document, Technical Approach to RFI Reports (LANL in preparation, 1281).

3.1 Sample Analysis

All samples requiring chemical and radiological analysis and chain-of-custody documentation are submitted to the Sample Management Office (SMO) and MRAL for analysis.

3.1.1 Analytical Methods

All samples were analyzed for RCRA analytes using Environmental Protection Agency (EPA) SW-846 methods or the equivalent. Radionuclide analyses were performed using Laboratory-approved methods.

3.1.2 Data Validation

Data verification and validation procedures are used to determine whether data packages have been generated according to specifications 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 (a datum) 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 analytical precision or bias constraints.

Routine validation is the comparison of quality indicators (such as surrogate recovery, measurements of method blanks, holding times, and 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 of the data (e.g., precision and bias) that directly affect the decisions to be based on the data. The same data set may undergo different focused validations for different decisions.

3.2 Background Comparisons

Once the data validation process is complete and the site data are finalized, the next step in the process is to compare site data with available background data. The results of a focused data validation should exclude any contaminant that is identified as an artifact of 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 chemicals of potential concern (COPCs) or eliminated from further consideration. Background data are available from two sources: (1) 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; Longmire et al. 1995, 1266); and, (2) background concentrations of radioactive chemicals associated with global fallout from atmospheric nuclear testing (e.g., plutonium, cesium, strontium, and tritium) reported in LANL Environmental Surveillance reports (Purtymun et al. 1987, 0211; ESG 1988, 0408; ESG 1989, 0308; Environmental Protection Group 1990, 0497; Environmental Protection Group 1992, 0740).

Comparisons between site data and background data are initially performed by comparing each observed concentration datum to a chemical-specific background screening value. Background screening values are upper tolerance limits (UTLs) or maximums estimated from background data. Details of statistical methods used to generate background screening values from the background data sets and suggestions for statistical methods for comparing site and background concentration distributions are presented in the guidance document, Statistical Comparisons to Background, Part I (Environmental Restoration Project Assessments Council 1995, 1298). Further statistical comparisons between site and background data might be performed when background screening values are exceeded.

If a chemical has a reported concentration that exceeds its background screening value 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 human health assessment. If a chemical does not have a reported concentration that exceeds the background screening value, then it is removed from further consideration.

The ER Project has developed background screening values for the most commonly sampled chemicals and the most commonly analyzed media. For chemicals and media not included in the LANL background data (or in the Facility for Information Management, Analysis, and Display [FIMAD]), UTLs will be developed by the Decision Support Council as needed.

3.3 Evaluation of Organic Constituents

Background data are not available for organic chemicals. The preliminary evaluation of organic chemicals considers detected chemicals and chemicals that were analyzed for but not detected in any sample. The purpose of this step is to determine if 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 (EQLs) 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 a chemical has a reported concentration that exceeds its reporting limits, then that chemical is generally carried forward to the human health assessment process. If a chemical does not have a reported concentration that exceeds its reporting limits, then it is generally removed

from further consideration. Exceptions to these general rules may be made if site-specific process knowledge so indicates. A chemical that is detected may be removed from further consideration if it can be determined that its presence is not due to Laboratory operations, and a chemical that is not detected in any sample may be carried through the decision process if it is expected to be present at the site based on historical operations.

3.4 Human Health Assessment

3.4.1 Risk Due to Background

Background risks can result from inorganics that are naturally occurring at a site. Calculating background risks using the same methodology as site-risk estimates provides a frame of reference for risk levels calculated at a site. This information provides a basis for determining risk-based remediation goals, which in some circumstances may be set at target risks comparable with background rather than default values (i.e., cancer risk of $1E^{-6}$ or hazard index of 1). Background risks can also affect decisions at sites that have constituents for which there are thresholds of toxicity. For some inorganics, background intakes may be near a toxicity threshold such that incremental intakes associated with contamination may be unacceptable.

Background risks calculated here use the same exposure assumptions by which SALs are calculated. For soil exposure, the pathways include incidental soil ingestion, inhalation of resuspended dust, and dermal contact with soil. Background soil data represent several soil horizons from geographically diverse locations. Background risks are estimated for both a median concentration and the background screening value (UTL or maximum concentration) from the entire background data set to present the range of potential risk associated with different soil constituent concentrations found in and around Los Alamos (Longmire et al. 1995, 1142). The background risks based on the LANL SAL residential exposure model are provided in Table 3.4.1-1.

Risks due to background are presented for both noncarcinogenic and carcinogenic outcomes. The potential for adverse noncarcinogenic health effects is estimated by a hazard quotient. Intakes leading to a hazard quotient up to 1 are not associated with adverse health effects. None of the median background concentrations result in hazard quotients greater than 1. The hazard quotient of the background screening value for manganese exceeds 1 (1.9). However, given the unlikely occurrence of this concentration, the conservative assumptions in the exposure assessment, the margin of safety in the reference dose, and the exceedance of less than a factor of two, this intake estimate is not expected to be associated with adverse health effects.

TABLE 3.4.1-1

RISKS DUE TO BACKGROUND CONCENTRATIONS OF SOIL INORGANICS ASSUMING A RESIDENTIAL SCENARIO[a]

Soil Inorganic	Background Soil Concentration[b] mg/kg		Hazard Quotient		Lifetime Cancer Risk	
	Median	UTL	Median	UTL	Median	UTL
Aluminum	10,000	38,700	0.13	0.5	nc[c]	nc
Antimony	0.6	1.0	0.019	0.032	nc	nc
Arsenic	4.0	7.82	0.18	0.36	1.1E-5	2.1E-5
Barium	130	315	0.025	0.059	nc	nc
Beryllium	0.895	1.95	0.0027	0.0059	6.4E-6	1.4E-5
Cadmium[d]	0.20	2.7	0.0053	0.071	1.4E-10	1.9E-9
Chromium[e]	7.2	16.1	0.00009	0.0002	nc	nc
Cobalt	6.0	19.2	0.0013	0.0042	nc	nc
Copper	5.75	30.7	0.0021	0.011	nc	nc
Lead[f]	12	23.3	0.03	0.058	nc	nc
Manganese	320	714	0.84	1.9	nc	nc
Mercury	0.05	0.1	0.0022	0.0043	nc	nc
Nickel	7.0	15.2	0.0047	0.01	nc	nc
Selenium	0.3	1.7	0.00078	0.0045	nc	nc
Thallium	0.2	1.0	0.033	0.16	nc	nc
Uranium	0.9	1.87	0.0039	0.0081	nc	nc
Vanadium	21	41.9	0.039	0.078	nc	nc
Zinc	30.7	50.8	0.0013	0.0022	nc	nc

[a] Risk estimates are bases on reference doses, slope factors, and EPA Region IX default exposure assumptions effective in April 1996.
[b] Background soil concentrations taken from Longmire et al.; 1995, 1142.
[c] nc = noncarcinogen
[d] Cancer risk for cadmium are based solely on inhalation of resuspended dust.
[e] Naturally-occurring chromium is assumed to exist in a trivalent state.
[f] Hazard quotient bases on uptake biokinetic model.

Two background inorganics are also carcinogens. According to the default exposure assumptions used for SALs, the lifetime cancer risks due to background residential soil exposure are estimated at 1 to 2 in 100 000 for arsenic and beryllium.

These background risk estimates provide a frame of reference for the human health assessment and site decisions. If a site-specific risk assessment is necessary to further evaluate risks, background risks can also be calculated using the site-scenario-specific assumptions to assist in remedial action decisions for the site.

3.4.2 Screening Assessment

The purpose of this decision step is to determine if 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 no further action (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. For those chemicals for which SALs are available, each observed concentration datum is compared to 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 a 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 a multiple chemical evaluation, 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 one, then the chemicals are removed from further consideration. If the total normalized value is greater than one, then chemicals having an individual normalized value greater than or equal to 0.1 are retained as COPCs pending further evaluation.

Those chemicals that exceed background concentration thresholds or fail other background comparison tests (certain inorganics and radionuclides) exceed reporting limits in at least one sample (organics), are less than the SAL (all analytes), and 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 multiple chemical evaluations, see Technical Approach to RFI Reports (LANL in preparation, 1281).

3.4.3 Risk Assessment

No human health risk assessment was conducted at PRSs 0-030(e,f) (see Section 5.0 of this RFI report for details).

3.5 Ecological

PRSs 0-030(e,f) are mesa-top sites surrounded by disturbed areas. The area provides limited habitat for biota, does not contain sensitive habitats, and does not contain threatened or endangered species (Ebinger et al. 1994, 05-0232). Therefore, there is no immediate ecological risk at this site.

4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

Data validation was performed on all data from the analytical laboratories. Validation was performed using the guidelines from the ER Project's Generic Quality Assurance Project Plan for RCRA Facility Investigations, Appendix T of the IWP (LANL 1991, 0553). Reviews of the validation and the QA/QC activities for each PRS are included in the following subsections. A summary table of all the QA/QC results for each sample can be found in Appendix B of this document.

As a result of QA/QC activities, qualifiers are added to the data when necessary as part of routine data validation activities. The following is a list of the qualifiers used in this RFI report and their definitions.

J = Estimated quantity. The analyte was detected in the sample, but there were one or more QC parameters associated with this sample that were outside allowed limits.

UJ = Estimated undetected quantity. The analyte was not detected in the sample, but there were one or more QC parameters associated with this sample that were outside allowed limits.

R = Rejected quantity. The data are deemed not usable because one or more of the QC parameters for the analyte were outside allowed limits to the point that the analyte value is highly questionable.

There can be many reasons for qualifying analytical data. For example, there is a set of sample-specific QC parameters that can cause analytes from individual samples to be qualified, such as surrogate recoveries or duplicate results. There are also batch-specific parameters, such as blind QC samples and method blanks that affect all of the samples analyzed in a particular group. Often, the quantity of QA/QC data available for site-specific investigations is inadequate for estimating components of measurement error because statistics cannot be defined for sample sizes of one, or estimated well with small sample sizes. Consequently, QA/QC data for site-specific investigations will rarely be used to adjust data.

4.1 Quality Assurance/Quality Control Results for PRS 0-030(e)

4.1.1 Inorganic Analyses

Soil and water samples were analyzed for the TAL metals in requests 17664, 17863, and 19676. All QC for these requests were within allowed limits; therefore, all data are valid and usable without qualification.

One soil sample was analyzed for TAL metals in request 19853. There were several QC problems with this request. The first was that chromium had a low recovery (68%) in the QC sample and is qualified J (estimated detected quantity). The other QC problem was that the holding time for mercury was exceeded by about ten days. Therefore, the mercury data are qualified J. All other data are valid and usable without qualification.

4.1.2 Organic Analyses

4.1.2.1 Volatile Organic Compounds

Soil and water samples were analyzed for volatiles in request 17856. Problems in this request were with the internal standards for samples AAB0182, AAB0184, and AAB0186. One of the internal standards was low, which caused 15 analytes to be qualified UJ. These analytes are bromobenzene, n-butylbenzene, sec-butylbenzene, tert-butylbenzene, 0-chlorotoluene, p-chlorotoluene, 1,2-dibromo-3chloropropane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, isopropylbenzene, propylbenzene, 1,2,3-trichloropropane, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene. All other data are valid and usable without qualification.

One soil sample was analyzed for volatiles in request 19364. All QC for this request were within allowed limits; therefore, all data are valid and usable without qualification.

4.1.2.2 Semivolatile Organic Compounds

Soil samples were analyzed for semivolatiles in request 17661. All QC for this request were within allowed limits. All data are valid and usable without qualification.

Soil and water samples were analyzed for semivolatiles in request 17856. There was a problem with the QC sample in this request. Anthracene, 1,2-dichlorobenzene, 2-methylphenol, and pentachlorophenol had recoveries between 10 and 50% and are all qualified UJ. All other data are valid and usable without qualification.

One soil sample was analyzed for semivolatiles in request 19364. There was a problem with the QC sample in this request. 1,2-dichlorobenzene had a recovery of less than 10% and is qualified R. Four other analytes, anthracene, 2-methylphenol, naphthalene, and 1,2,4-trichlorobenzene had recoveries between 10 and 50% and are all qualified UJ. All other data are valid and usable without qualification.

4.1.2.3 PCBs/Pesticides

Soil samples were analyzed for PCBs and pesticides in request 17661. The only QC problem associated with this request was for sample AAB3572. For this sample, there were low surrogate recoveries. Because of these low recoveries, all detects for this sample are qualified J. All other data are valid and usable without qualification.

Soil and water samples were analyzed for PCBs and pesticides in request 17856. There were several problems associated with this request. For samples AAB0181 and AAB0182, the percentage difference between the DDT values obtained from the two analytical columns was greater than 25%, which caused this analyte to be qualified J. In sample AAB0186, there were low surrogate recoveries, which caused DDD, DDE, and DDT to be qualified J. All other data are valid and usable without qualification.

One soil sample was analyzed for PCBs and pesticides in request 19364. There was only one QC problem that was found in the QC soil sample. The recovery of Aroclor 1242™ was less than 50%, which causes the value for this analyte to be qualified UJ. All other data are valid and usable without qualification.

4.1.3 Radiochemistry Analyses

In request numbers 18065, 18070, and 20025, soil and water samples were analyzed for isotopic plutonium by alpha spectroscopy, total uranium by kinetic phosphorescence analysis (KPA) and gamma scan, and americium-241 by gamma spectroscopy.

For requests 18065 and 18070, all QC parameters were within allowed limits; therefore, all data are valid and usable without qualification.

For request 20025, americium-241 was qualified J for low tracer recoveries (29%). Plutonium-238, plutonium-239, and uranium are all qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively). All other data are valid and usable without qualification.

4.2 Quality Assurance/Quality Control Results for PRS 0-030(f)

4.2.1 Inorganic Analyses

Soil and water samples were analyzed for TAL metals in request 17010. All QC for this request were within allowed limits; therefore, all data are valid and usable without qualification.

Soil and water samples were analyzed for TAL metals in request 19853. There were several QC problems with this request. The first was that chromium had a low recovery (68%) in the QC sample and is qualified J. The other QC problem was that the holding time for mercury was exceeded by about ten days. Therefore, all of the mercury data are qualified J or UJ. All other data are valid and usable without qualification.

4.2.2 Organic Analyses

4.2.2.1 Volatile Organic Compounds

Soil and water samples were analyzed for volatiles in request 16996. There were only minor problems with this request. One was that acetone had greater than 30% difference in the initial and continuing calibrations for all of the soil samples. Therefore, all acetone detects are qualified J for this variance. Similariy, trichlorotrifluoroethane is qualified J for sample AAB0263 because there was a greater than 30% difference in the continuing calibration for this sample. All other data are valid and usable without qualification.

Soil and water samples were analyzed for volatiles in request 19364. All QC for this request were within allowed limits; therefore, all data are valid and usable without qualification.

4.2.2.2 Semivolatile Organic Compounds

Soil and water samples were analyzed for semivolatiles in request 16996. All QC for this request were within allowed limits; therefore, all data are valid and usable without qualification.

Soil and water samples were analyzed for semivolatiles in request 19364. There were several QC problems with this request. For the soil and water samples AAA8454, AAA8455, AAB8456, and AAB8461, the internal area responses for perylene-d12 were low. The seven analytes that are quantified using this compound are qualified UJ. These analytes are benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, di-n-octylphthalate, dibenzo[a,h]anthracene, and indeno[1,2,3cd]pyrene. For soil samples AAA8454, AAB8458, and AAB8461, 1,2-dichlorobenzene had a recovery of less than 10% and is qualified R. Four other analytes, anthracene, 2-methylphenol, naphthalene, and 1,2,4-trichlorobenzene had recoveries between 10 and 50% and are all qualified UJ. All other data are valid and usable without qualification.

4.2.2.3 PCBs/Pesticides

Soil and water samples were analyzed for PCBs and pesticides in request 16996. All QC for this request were within allowed limits; therefore, all data are valid and usable without qualification.

Soil and water samples were analyzed for PCBs and pesticides in request 16998. The only QC problem associated with this request was for sample AAB0272. For this sample, DDD is qualified J because there was a greater than 25% difference in results between the two analytical columns used in the analysis. All other data are valid and usable without qualification.

Soil and water samples were analyzed for PCBs and pesticides in request 19364. The recovery of Aroclor 1242™ was less than 50%, which causes all of the values for this analyte in the soil samples to be qualified UJ. All other data are valid and usable without qualification.

4.2.3 Radiochemistry Analyses

Soil and water samples were analyzed for isotopic plutonium by alpha spectroscopy, total uranium by KPA and gamma scan, and americium-241 by gamma spectroscopy in request numbers 17008 and 20025.

For request 17008, all QC parameters were within allowed limits; therefore, all data are valid and usable without qualification.

For request 20025, americium-241 was qualified J for low tracer recoveries (29%). Plutonium-238, plutonium-239/240, and uranium are all qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively). All other data are valid and usable without qualification.

5.0 SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 PRS 0-030(e)

5.1.1 History

The septic tanks in this PRS group handled sanitary waste from the original townsite. Old memoranda raise the question of radionuclide contamination of the sanitary system and outfalls into Pueblo Canyon (Tribby 1946, 05-0119; 05-0120).

Recent surveillance reports indicate that no substantial amounts of plutonium have been detected that can be attributed to these septic tanks. Plutonium-bearing waste discharged at TA-45 would mask any previous low levels of plutonium in Pueblo Canyon. The outfall for PRS 0-030(g), which served most of the Laboratory, was apparently upstream from TA-45 in Acid Canyon. The contaminant levels in this outfall may be considered representative of background levels for Acid Canyon. The conclusion is that low levels of plutonium are not precluded in the septic systems, but hard data are lacking.

5.1.2 Description

Three septic tanks in PRS 0-030(e) handled sanitary waste from the original townsite (Francis and Sullivan 1995, 05-0207). Two septic tanks are located north of Canyon Road (e North) and one septic tank is located south of Canyon Road (e South). These tanks serviced apartments, dormitories, and some original Ranch School buildings and are now located on private property.

5.1.3 Previous Investigations

No previous investigations have been performed at this site.

5.1.4 Field Investigation and Sampling Activities

Field activities conducted during this phase of work were preceded by a site survey composed of a documentation/photograph search and site walk-through to physically associate available information with current site conditions. Field activities included geodetic surveying, geophysical surveying, and hand-auger boring for subsurface sample collection and characterization. The field activities at PRSs 0-030(e) North and South were conducted between June and September, 1994. The samples collected are summarized in Table 5.1.4.1 and field activities are discussed in more detail below.

TABLE 5.1.4-1

SUMMARY OF SAMPLES TAKEN
PRSs 0-030 (eN and eS)

LOCATION ID	SAMPLE ID	DEPTH (in.)	MATRIX	VOCs Request #	SVOCs Request #	PCBs Request #	Pesticides Request #	Metals Request #	Radiochemistry Request #	Radvan Request #
00-3826	AAA8459	46 - 58.5	Soil	19364	19364	19364	19364	19853	20025	21083
00-1518	AAB0181	21 - 28	Soil	17856	17856	17856	17856	17863	18070	18077
00-1519	AAB0182	22 - 26	Soil	17856	17856	17856	17856	17863	18070	18077
00-1521	AAB0184	22 - 28	Soil	17856	17856	17856	17856	17863	18070	18077
00-1521	AAB0186	22 - 28	Soil	17856	17856	17856	17856	17863	18070	18077
00-1521	AAB0380	NA[a]	Water (FB)[b]	17856	17856	17856	17856	17863	18070	NR[c]
00-1521	AAB0381	NA	Water (RB)[d]	17856	17856	17856	17856	17863	18070	NR
00-1518	AAB0382	NA	Water (TB)[e]	17856	NR	NR	NR	NR	NR	NR
00-3825	AAA8447	1 - 2	Soil	NR	NR	NR	NR	19676	NR	NR
00-3824	AAA8453	1 - 2	Soil	NR	NR	NR	NR	19676	NR	NR
00-3741	AAB3569	1 - 4	Soil	NR	17661	17661	17661	17664	18065	18056
00-3740	AAB3572	1 - 4	Soil	NR	17661	17661	17661	17664	18065	18056

[a] NA = Not available.
[b] FB = Field blank.
[c] NR = Not requested.
[d] RB = Rinsate blank.
[e] TB = Trip blank.

5.1.4.1 PRS 0-030(e) North

Deviations from the Work Plan for PRS 0-030(e) North

All work was conducted in accordance with the RFI work plan. However, specific deviations from the work plan were made to minimize the effort required to characterize this septic system. The Work Plan directs that the tanks should be sufficiently excavated to expose the top of the tank, and then the tank contents should be sampled. Review of engineering drawings from 1943 and comparison with present day topography suggested that the tanks for PRS 0-030(e) North had already been at least partially removed from the site before construction of the Boy Scout Lodge. Therefore, boreholes were hand-augered at the suspected locations of the two tanks to determine if the tanks were still present and to determine if contamination was present. Results of the hand-augering confirmed that the tanks had been removed and therefore the tanks were not inspected for integrity as directed in the Work Plan. In addition, the outlet pipe could not be located during the site investigation; therefore, surface samples from the outfall area were not obtained.

Geophysical Surveys for PRS 0-030(e) North

Surface geophysical surveys were conducted in an attempt to precisely locate the septic tanks. Geophysical surveying was conducted in February and April 1994.

The February 1994 geophysical survey was conducted at the suspected locations of the two septic tanks in the parking area of 2202 Canyon Road, formerly known as the Boy Scout Lodge. An electromagnetic (EM) 31 survey, Overhauser™ magnetometer survey, and ground penetrating radar (GPR) survey were conducted. The EM31 and magnetometer surveys revealed an anomaly corresponding to the estimated location of the septic tanks. The GPR survey revealed an anomaly to the northeast of the septic tanks' location.

In April 1994 a second geophysical survey was conducted at the same location with a Schonstedt™ magnetometer. This survey showed a magnetic anomaly that corresponded to the previously identified EM31 and magnetometer survey anomaly, although it provided a better definition of the eastern boundary of the septic tank location. The results of the Schonstedt survey supported the original interpretation of the septic tank locations.

Geodetic Surveys for PRS 0-030(e) North

In June 1994 geodetic survey was conducted to mark the suspected locations of the two septic tanks and the outlet pipe. The surveyors determined the estimated location of the tanks and outlet pipe from engineering drawings. From scaling the engineering drawings, each tank

measured 25 ft long x 10 ft wide, with 5 ft of separation between the two tanks. The tanks were oriented parallel to each other with the long axis oriented north-northwest. Sample and hand-auger locations were surveyed following their completion. Geodetic survey data were transferred to FIMAD.

Surface and Subsurface Soil Sampling for PRS 0-030(e) North

Characterization hand-augering activities were conducted at this site to confirm the presence of the septic tanks at the location identified with the geodetic and geophysical surveys and to collect subsurface samples to characterize the tanks' contents.

Outfall Surface Soil Sampling for PRS 0-030(e) North

The location of the outlet pipe could not be located during a field inspection along the edge of Acid Canyon. The engineering drawing from 1943 indicates that the outlet pipe extended approximately 350 ft north-northwest of the two septic tanks down to the edge of the canyon. Surface soil samples were not collected beneath the outlet pipe for PRS 0-030(e) North.

Hand-Augering Activities, June 1994, for PRS 0-030(e) North

Hand-augering activities were conducted on June 22 and 23, 1994. Augering was conducted in the two tanks based on the geodetic and geophysical surveys. A total of six boreholes were augered; three along the center line of the eastern tank and three along the center line of the western tank (Fig. 5.1.4-1). A very hard material, thought to be either concrete or very hard tuff, was encountered in each of the boreholes at depths between 22 and 48 in. below the existing parking lot surface. Approximately 6 in. of asphalt and fill material was found at the top of each borehole. A total of six samples were collected, one from each borehole. Three of these samples were submitted for laboratory analysis: two of the samples from the southern (inlet side) end of the easternmost tank, and the third sample from the southern end of the western tank. The additional three samples were not submitted. The samples were submitted for analysis of TAL metals, VOCs, SVOCs, pesticides, PCBs, radiochemistry (americium-241, isotopic plutonium, total uranium, gamma spectroscopy) and gross alpha, beta, and gamma screening by the MRAL.

Borehole B-1 was hand-augered into the southern one-third of the eastern tank. Refusal was encountered at 3 ft below ground surface (bgs). A sample could not be collected from B-1, so a new borehole, B-1a, was augered next to B-1, and sampled from 21 to 28 in. (sample AAB0181). The sample was composed of brown silty sand. Field screening showed 0 cpm alpha, 240 cpm beta/gamma (both alpha and beta/gamma below background activity), 1.8 ppm

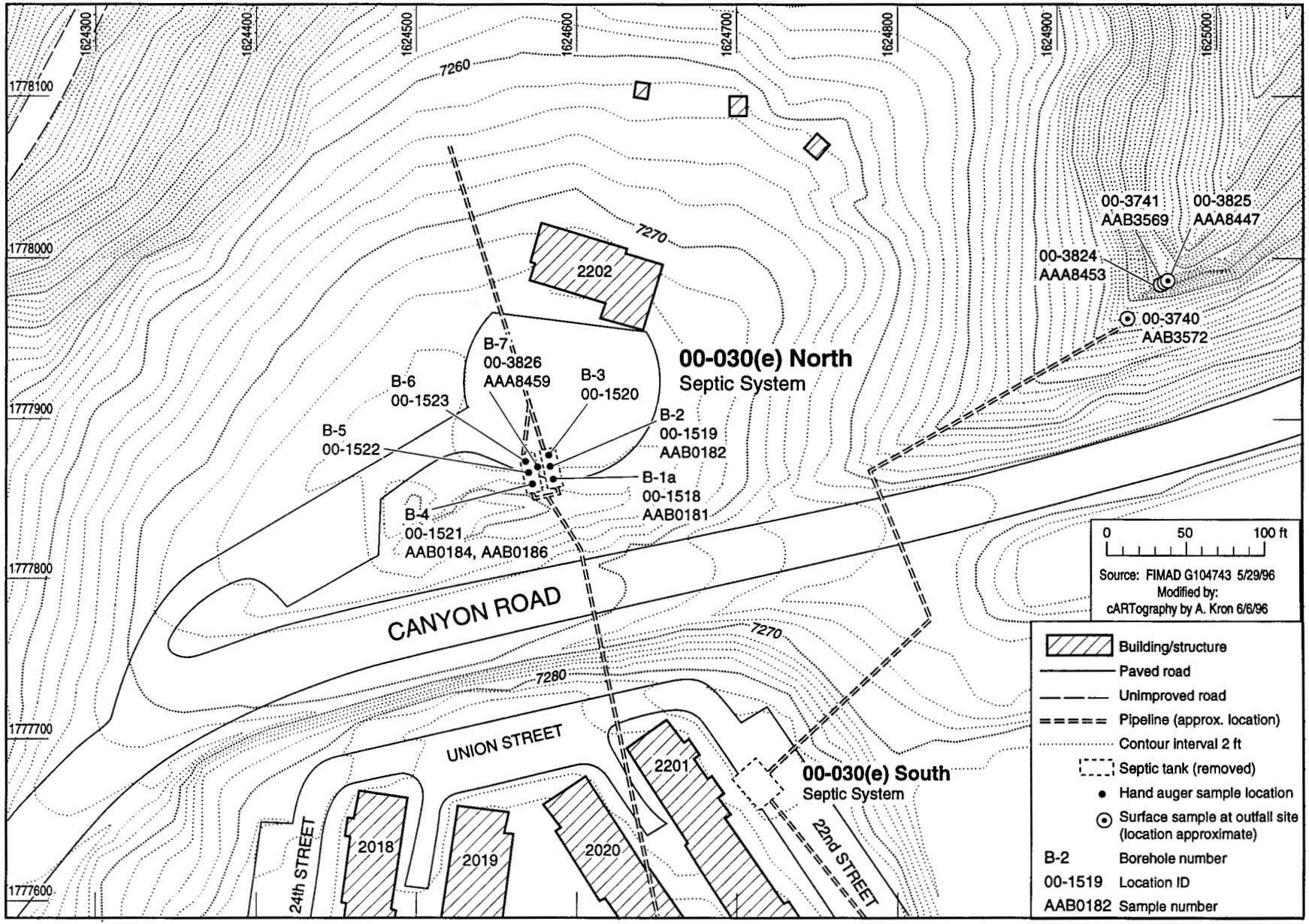

Fig. 5.1.4.1-1. Locations of PRSs 0-030(e) North and South samples.

on the Photovac Microtip™ photoionization detector (PID), and 0 mg/m^3 on the mercury detector. A trip blank, AAB0382, was also assigned to this borehole and was submitted for VOC analysis.

Borehole B-2 was hand-augered into the center of the eastern tank. Refusal was encountered at 2.5 ft bgs. A sample was not able to be collected in B-2, so a new borehole, B-2a, was augered adjacent to B-2 and sampled from 22 to 26 in. (sample AAB0182). The sample was composed of slightly moist brown, silty sand. Field screening showed 0 cpm alpha, 200 cpm beta/gamma, 9.2 ppm on the PID, and 0 mg/m^3 on the mercury detector.

Borehole B-3 was hand-augered into the northern one-third of the eastern tank. Refusal, thought to be due to concrete or very hard tuff, was encountered around 2.5 ft bgs. A sample (AAB0183) was collected from 32 to 38 in. bgs. The sample was composed of slightly moist brown and gray silty sand. Field screening showed 0 cpm alpha, 280 cpm beta/gamma, 50.4 ppm on the PID, and 0 mg/m^3 on the mercury detector. The sample was not submitted for analysis.

Borehole B-4 was hand-augered into the southern one-third of the western tank. Refusal was encountered at a shallow depth (depth unknown); therefore, a new borehole (B-4a) was augered 6 in. to the east. Again, refusal was encountered at a shallow depth (depth unknown) at B-4a, so an additional auger borehole was attempted near B-4. This borehole (B-4b) was sampled at 22 to 28 in. bgs (sample AAB0184). The sample was composed of brown silty sand. Field screening showed 0 cpm alpha, 280 cpm beta/gamma, 1.8 ppm on the PID, and 0 mg/m^3 on the mercury detector. A duplicate sample (AAB0186) was also collected from this borehole, and a field blank (AAB0380) and rinsate blank (AAB0381) were assigned to this borehole.

Borehole B-5 was hand-augered into the center of the western tank. Refusal was encountered at approximately 3 ft (exact depth unknown), and a sample (AAB0187) was collected. This sample was not submitted for analysis.

Borehole B-6 was hand-augered into the northern one-third of the western tank. Refusal was encountered at approximately 3 ft (exact depth unknown), and a sample (AAB0188) was collected. This sample was also not submitted for analysis.

Review of 1943 engineering drawings for these septic tanks shows the elevation of the tanks at 7 278 ft. The current elevation of the ground surface at the location of these tanks is estimated to be between 7 280 to 7 277 ft (OU 1071 RFI Work Plan, Figure 5-42). This suggests that the area of the tank was graded to the level of the bottom of the tanks before the construction of the Boy Scout Lodge. As previously described, the hand-augering attempts consistently met refusal, due to either hard tuff or concrete, at depths between 22 and 48 in.

below the surface of the parking lot. The depth to refusal was shallowest near the south end of the tanks, and progressively deepened to the north. This suggests that the refusal encountered could be due either to hard tuff or the concrete bottom of the septic tanks.

Hand-Augering Activities, September 1994, for PRS 0-030(e) North

Additional hand-auger sampling was conducted at the septic tanks to confirm the appropriateness of a NFA decision at this site. The plan was to hand-auger a single borehole located between the two tanks, to either refusal or 10 ft below the present ground surface. The logic for this borehole location was to confirm that these tanks had been at least partially demolished and removed. It was believed, based on reviewing engineering drawings from 1943 and the present-day topography, that the refusal encountered in June 1994 represented either the tuff bedrock or the concrete floors of the two tanks. It was also possible that the tanks were buried deeper, and the top of the tanks was actually encountered when hand-augering. By drilling a seventh borehole between the two tanks, it could be determined if fill or tuff bedrock is present at the 22 to 48 in. depth range. If fill was encountered below this depth range, then the refusals represented the concrete tank roofs. If tuff was encountered, then it was probably tuff that was encountered earlier, or the tanks were probably demolished and all that remained was the concrete floor of each tank. In addition, taking a sample below the floor elevation would aid in determining if the tanks had leaked contaminants in the past.

Borehole B-7 was hand-augered on September 28, 1994, to a total depth of 58.5 in., where unconsolidated, pinkish tuff was encountered. A sample, AAA8459, was collected from 46.0 to 58.5 in. bgs and submitted for analysis of TAL metals, VOCs, SVOCs, pesticides, PCBs, radiochemistry (americium-241, isotopic plutonium, total uranium, gamma spectroscopy) and gross alpha, beta, and gamma screening in the MRAL.

The depth to tuff at B-7 was approximately 46 in., which is consistent with the depth to hand-auger refusal found in the location of the two septic tanks, suggesting that the two tanks have been removed.

5.1.4.2 PRS 0-030(e) South

Review of the 1943 engineering drawings does not illustrate this septic tank as being in place. However, the 1947 Zia Company Post Plans illustrate the PRS 0-030(e) South septic tank, identified as septic tank 4a, located south-southeast of septic tank 4, PRS 0-030(e) North. A conversation with a Los Alamos County Utilities employee suggested that this septic tank was located in front of the two northern apartments near the intersection of 22nd Street and Union, and was removed when the Chapel Apartments were built.

Deviations from the Work Plan for PRS 0-030(e) South

All work was conducted in accordance with the RFI work plan; however, specific deviations from the work plan were made in an effort to make the effort required to characterize this septic system more efficient. The work plan directs that the tanks should be sufficiently excavated to expose the top of the tank, and then the tank contents should be sampled. Boreholes were hand-augered and drilled, and trenches were excavated to investigate the location of the suspected tank and outlet pipe and to determine if any contamination was present at the site. Results of the hand-augering, drilling, and excavation activities indicated that the tank had been previously removed from the site. Accordingly, the tank was not able to be inspected for integrity, or removed, as directed by the work plan.

Geodetic Surveys for PRS 0-030(e) South

In April 1994, geodetic surveying was conducted to mark the suspected location of the septic tank. The surveyors determined the original location of the tank and outlet pipe from the 1947 Zia Company Post Plans. Surface samples collected beneath the outlet pipe were surveyed. Geodetic survey data were transferred to the FIMAD for incorporation into their database.

Geophysical Surveys for PRS 0-030(e) South

Surface geophysical surveys were conducted in an attempt to precisely locate the septic tanks. Geophysical surveying was conducted in April 1994 at the suspected location of the septic tank adjacent to the northeast end of the apartments and the intersection of 22nd Street and Union. A Schonstedt™ magnetometer survey, Overhauser™ magnetometer survey, EM38 survey, and GPR survey were conducted. The Overhauser™ magnetometer and the EM38 surveys revealed an anomaly corresponding the estimated location of the septic tank.

In August 1994 a second geophysical survey was conducted to trace the septic tank outlet line from the north side of Canyon Road to the south towards the septic tank. This survey used a magnetic field generating transducer that can be traced on the surface with a passive Schonstedt™ magnetometer. The outlet pipe was traced approximately 400 ft from the outfall area to the suspected location of the septic tank.

Surface and Subsurface Soil Sampling for PRS 0-030(e) South

Hand-augering, drilling, and trenching activities were conducted at this site to confirm the presence or absence of the septic tank at the location identified with the geodetic and geophysical surveys, and to collect subsurface samples for laboratory analysis to characterize the tank's contents. Surface soil samples were also collected from the outfall of the septic tank to determine if residual contamination exists.

Outfall Surface Soil Sampling for PRS 0-030(e) South

Two surface soil samples were collected June 3, 1994, at the outfall for the PRS 0-030(e) South septic system. The first surface soil sample, AAB3572, was collected in a sediment trap located approximately 33 ft below the outlet pipe. The sample was collected from a depth of 1 to 4 in. bgs. The sample was a nonorganic sand that contained a few clasts. The second surface soil sample, AAB3569, was collected approximately 33 ft downstream from AAB3572, from a depth of 1 to 4 in. bgs. This sample was collected from old sediment fill on the edge of the stream channel. The fill was sandy to gravelly, nonorganic, and included pieces of tin cans. Both surface soil samples were submitted for analysis of TAL metals, VOCs, SVOCs, pesticides, PCBs, radiochemistry (americium-241, total uranium, plutonium isotopes, and gamma spectroscopy), and gross alpha, beta, and gamma analysis from the MRAL.

On September 13, 1994, two additional surface soil samples were collected from the older fill adjacent to the previous sample location of AAB3569. The first sample, AAA8447, was collected beneath an old tin can and 6 in. north (downstream) of the previously collected sample (AAB3569), at a depth of 1 to 2 in. bgs. The sample was composed of reddish brown silty soil. The second sample, AAA8453, was collected 6 in. south (upstream) of the previously collected soil sample (AAB3569), from a depth of 1 to 2 in. bgs, and was composed of light to medium brown, sandy to gravelly soil, that contained organic matter. Both samples were submitted for total lead screening by x-ray fluorescence and also submitted to a fixed laboratory for total lead analysis.

Trenching, Hand-Augering, and Drilling Activities, August and September 1994, for PRS 0-030(e) South

During August, excavation activities occurred across the projected location of the outlet vitrified clay pipe (VCP), on the south side of Canyon Road near the anomaly detected by the geophysical survey. The trench measured 30 ft long in the east-west direction and 20 ft long in the north to south direction. Tuff bedrock was encountered along both trenches but no VCP was found. In order to locate the septic tank, hand-augering activities were conducted inside the suspected location of the septic tank, based on the results of the geophysical surveys. A total of three boreholes, BS-1, BS-2 and BS-3, were augered along the estimated centerline of the tank interior to total depths ranging between 41 in. and 49 in. bgs (Fig. 5.4.1-1). Approximately 5 in. of asphalt and fill material was observed at the top of each borehole. A total of three samples were collected, one from each borehole.

Borehole BS-1 was hand-augered in the southwestern one-third of the tank. A sample (AAA8445) was collected from 32 to 41 in. bgs. Field screening showed 0 cpm alpha, 254 cpm beta/gamma (both alpha and beta/gamma below background activity), and 0.0 ppm on the PID. The sample was not submitted for analysis.

Borehole BS-2 was hand-augered in the center of the tank. A sample (AAA8446) was collected from 32 to 41 in. bgs. Field screening showed 0 cpm alpha, 250 cpm beta/gamma (both alpha and beta/gamma below background activity), and 0.0 ppm on the PID. The sample was not submitted for analysis.

Borehole BS-3 was hand-augered in the northeastern one-third of the tank. A sample (AAA8448) was collected from 40 to 49 in. bgs. Field screening showed 0 cpm alpha, 289 cpm beta/gamma (both alpha and beta/gamma below background activity), and 0.0 ppm on the PID. The sample was not submitted for analysis.

It could not be determined whether the hand-augered boreholes were inside the tank. Therefore, additional field activities were conducted in order to more precisely locate the septic tank.

During mid-August, when geophysical methods were being used to trace the outlet pipe, an exploratory borehole, BS-4, was augered in the location where the magnetic transducer met refusal in an attempt to determine the presence or absence of the septic tank. The auger met refusal on top of VCP where the transducer was located. No samples were collected from this borehole. A subsequent exploratory borehole was augered, but it was not successful in locating the VCP. Therefore, samples were not collected. The blockage was removed from the VCP and the magnetic transducer was traced along the VCP until it reached the suspected location of the septic tank.

During late August and early September, after utilizing geophysical methods to trace the outlet pipe from the outfall area back to the septic tank, two exploratory boreholes were hand-augered to delineate the end of the outlet pipe and the edge of the septic tank. The easternmost borehole, BS-5, was augered to a total depth of 56 in.; auger refusal occurred on top of what appeared to be VCP. The second borehole, BS-6, was augered to a total depth of 67 in.; auger refusal occurred on top of what appeared to be concrete.

In order to investigate beneath the objects encountered in these two boreholes, a drill rig was used to penetrate the obstructions. Where VCP was encountered, borehole BS-5 was extended using hollow-stem augers to a depth of 56 in. This VCP is believed to be an extension of the pipe thatwas traced to within 1 to 2 ft east of this borehole using geophysics. No samples were collected and the borehole was backfilled and capped with asphalt. Borehole BS-6 was extended, utilizing hollow-stem augers, to a depth of 64 in. where concrete was encountered. A diamond drill bit was used to penetrate 11.5 in. of concrete. Beneath the concrete, this borehole was extended to an approximate depth of 171.5 in. bgs using hollow-stem augers. Soils beneath the concrete consisted of 48 in. of red clay and 48 in. of light red porous tuff. A sample was collected directly beneath the concrete but was not submitted for analysis at the request of the field operations manager (FOM). It is assumed that the concrete encountered in borehole BS-6 was part of the septic tank floor. Seven additional exploratory boreholes were drilled adjacent to and between boreholes BS-5 and BS-6 in an attempt to locate the bottom of the septic tank. With one exception, concrete was not encountered in any of the exploratory boreholes. The exploratory borehole drilled approximately 18 in. west of borehole BS-6 encountered the edge of a concrete slab. No samples were collected from the exploratory boreholes.

Results from tracing the outlet line to the proposed location of the septic tank and the exploratory drilling in the area, suggest that the septic tank was removed during construction of the Chapel Apartments. A review of the drawings for the Chapel Apartments indicated that the hand-augering and drilling activities were conducted near the approximate location of PRS 0-030(e) South (septic tank 4a). This septic tank was identified for removal during construction of the Chapel Apartments, "Location Plan –Areas B, C, and D", dated June 14, 1949, and the "Chapel Apartment Plan", dated June 14, 1949, indicates that the septic tank was removed during construction activities.

Drilling involved a CME-45 all-terrain, hollow-stem auger drill rig with a continuous core-barrel sampling system. Boreholes were drilled and sampled with 8-in. outside diameter (O.D.), 4.25-in. inside diameter (I.D.) hollow-stem augers. Boreholes were continuously sampled with 5-ft long core barrels (3.5-in. I.D. and a 4-in. O.D.). The core barrel was placed inside the hollow-stem auger, extending slightly beyond the auger bit, to collect relatively undisturbed soil and core samples as the augers were advanced. The core barrel was retrieved at 5-ft intervals from within the hollow-stem augers (via a wire-line, latch-retrieval system) for field screening and analytical sample collection. After sampling to the intended depth in each borehole, the augers were extracted for subsequent backfilling. All drilling and sampling was conducted in accordance with applicable Laboratory ER Project procedures.

5.1.4.3 Sampling of PRS 0-030(e) North and South

Sampling Methodology for PRSs 0-030(e) North and South

Boreholes were continuously hand-augered from the ground surface to the total depth of each borehole for PRSs 0-030(e) North and South. Upon retrieval, the outer surface and contents of the auger buckets were screened using hand-held meters to detect gross radiological and chemical contamination, as discussed in the following section. Immediately upon retrieval of subsurface materials, the sample to be analyzed for VOCs was collected directly from the auger bucket before significant volatilization could occur. The remaining material was then placed in a stainless steel bowl or aluminum pan and homogenized. This mixture was then placed in the appropriate containers for each specific analysis. For PRS 0-030(e) North, a portion of each sample was placed in a resealable plastic bag and allowed to sit for several minutes for subsequent mercury vapor monitoring of the sample headspace. All field-screening samples and samples destined for fixed laboratory analysis, were appropriately labeled and assigned unique Laboratory sample identification numbers with bar codes (e.g., AAB0000). All samples were documented on sample collection logs, placed in refrigerated coolers, and transported to the MRAL. All sampling was conducted in accordance with applicable Laboratory ER Project procedures.

Screening Methodology for PRSs 0-030(e) North and South

Upon retrieval of the sample auger bucket while hand-augering, the outer surface and contents of the bucket were screened by the site safety officer (SSO) and radiological screening Personnel (RSP) using hand-held meters to detect chemical and gross radiological contamination. Each sample run was screened for alpha activity using a direct reading Eberline™ ESP-1 with an air-proportional probe, and for beta/gamma activity using a direct reading Eberline™ ESP-1 with an HP™ 260 detector. Equipment was smeared and counted for alpha activity using a Ludlum Model 2000 alpha tray counter and for beta/gamma activity using a direct-reading Eberline ESP-1 with an HP 260 detector. The subsurface material was screened for organic vapors with a PID with a 10.6 eV bulb to monitor for organic vapors. For PRS 0-030(e) North, the core was also screened for mercury vapor using a Jerome™ Model 431-X mercury vapor analyzer. Field screening results indicated that no chemical or radiological contamination was present. The core and work area was monitored for explosive gases with an Mine Safety Administration (MSA) 361 combustible-gas indicator. All field-screening instruments were calibrated and checked on a daily basis by the SSO and RSP.

Field Screening Results

All material extracted during surface soil sampling and hand-augering was screened for alpha and beta/gamma activity, organic vapors, and mercury vapor, as described in the previous section. Action levels in the breathing zone were not exceeded during the field activities. Field screening results were recorded in the SSO site logbook, field screening forms, and sample collection logs.

The field screening readings for septic tank PRS 0-030(e) North are listed below. PID readings ranged from 1.8 to 50.4 ppm, with the maximum reading observed in borehole B-3. No detectable activity was seen on gross alpha monitoring, and gross beta/gamma activities ranged from 200 up to 280 cpm, which are well below contamination criteria levels. Mercury vapor monitoring did not reveal any readings above 0.0 mg/m^3.

The field screening readings for septic tank PRS 0-030(e) South are listed below. PID readings ranged from 0.0 to 0.5 ppm, with the maximum reading observed in the bottom of the exploratory trench. No detectable activity was seen on gross alpha monitoring, and gross beta/ gamma activities ranged from 137 up to 2 289 cpm, which is well below contamination criteria levels.

5.1.5 Background Comparisons

Inorganics

Nine soil samples collected from PRS 0-030(e) were analyzed for TAL metals. Of these nine samples, eight were surface grab samples and one was a field duplicate of a surface grab sample. Eight soil samples were also analyed for total uranium. Some analyses included one or more laboratory duplicates. For purposes of the screening assessment, the highest detected value was used for samples in which a laboratory duplicate was analyzed.

Five inorganics (copper, lead, mercury, silver, and zinc) were detected above their respective background screening values in at least one sample. Further background comparisons were performed for copper, lead, and zinc. Mercury and silver are not subjected to further background comparisons because the background data for these metals are inadequate to support other statistical tests (there are only one or two detections in the background data sets for these metals). Although these two metals were either detected at low levels or detected infrequently in the site data at concentrations that are not expected to be associated with a release, they are carried forward to the human health assessment because of the lack of background information.

Because the data for the other three metals (copper, lead, and zinc) do not otherwise appear to satisfy normality assumptions, nonparametric tests were preferred for further background comparisons. The Gehan modification to the Wilcoxon Rank Sum test and the Quantile test, both of which account reasonably for nondetects, were used for these evaluations. The Gehan test is best suited for assessing complete shifts in distribution, whereas the Quantile test is better suited for assessing partial shifts. Between the two tests most types of differences between distributions can be captured. Observed significance levels (P-values) for these tests are presented in Table 5.1.5-1. If a P-value is less than some small probability, typically 0.05, then there is some reason to suspect that there is a difference between the background and site distributions; otherwise, no difference is indicated.

TABLE 5.1.5-1

STATISTICAL TESTS FOR BACKGROUND COMPARISONS

ANALYTE	GEHAN TEST P-VALUE	QUANTILE TEST P-VALUE
Copper	0.9282	0.2528
Lead	0.1066	0.0161
Zinc	<0.00005	<0.00005

The results for copper are indicative of site concentrations that are not statistically elevated above background. The results for lead and zinc, however, are indicative of site concentrations that are greater than background.

Based on the background comparisons and the further statistical tests performed to compare site and background data, lead, mercury, silver, and zinc are carried forward through the screening assessment process to the human health assessment. The data for each sample that has at least one value above background screening values for these analytes are presented in Table 5.1.5-2.

TABLE 5.1.5-2

INORGANICS WITH CONCENTRATIONS ABOVE BACKGROUND SCREENING VALUES AT PRS 0-030(e)

LOCATION ID	SAMPLE ID	LEAD (mg/kg)	MERCURY (mg/kg)	SILVER (mg/kg)	ZINC (mg/kg)
UTL	N/A[a]	23.3	0.1	n/a[b]	50.8
SAL	N/A	400	23	380	23 000
00-3825	AAA8447	216[c]	0.08[c]	<2.2[c]	83.2[c]
00-3824	AAA8453	69.9	<0.04	<2.3	78
00-3741	AAB3569	615	0.21	<0.66	97.5
00-3740	AAB3572	156	0.15	<0.62	96.8
00-3826	AAA8459	4.3[c]	0.44[e] (J)[d]	0.34[c]	30.7[c]

[a] N/A = Not applicable.
[b] n/a = Not available.
[c] Value represents the maximum of a sample result and its laboratory duplicate.
[d] J = Estimated quantity.

Radionuclides

Seven soil samples collected from PRS 0-030(e) were analyzed for radionuclides. Of these seven samples, six were suface grab samples and one was a field duplicate of a surface grab sample. Some analyses included one or more laboratory duplicates. For purposes of this screening assessment, the highest detected value was used for samples in which a laboratory duplicate was analyzed. As shown in the previous section, uranium was not detected above background screening values and is not considered to be above background. Consequently, uranium will not be carried forward through the screening assessment process.

Two radionuclides (plutonium-238, plutonium-239/240) were detected above their respective background screening values. The concentrations for each sample that has at least one value above background screening values for these analytes are presented in Table 5.1.5-3.

TABLE 5.1.5-3

RADIONUCLIDES WITH CONCENTRATIONS ABOVE BACKGROUND SCREENING VALUES AT PRS 0-030(e)

LOCATION ID	SAMPLE ID	PLUTONIUM-238 (pCi/g)	PLUTONIUM-239/240 (pCi/g)
UTL	N/A	0.014[a]	0.052[a]
SAL	N/A	27	24
00-1518	AAB0181	-0.0057[b]	0.169[b]
00-1519	AAB0182	0.0859	0.166
00-1521	AAB0184	-0.0939	0.232
00-1521	AAB0186	-0.008	0.278

[a] Value is maximum reported background value from LANL Environmental Surveillance Reports.
[b] Value represents the maximum of a sample result and its laboratory duplicate.

Radium-226 was detected at PRS 0-030(e). However, radium-226 is a naturally-occuring radionuclide in the uranium decay chain. For this PRS, uranium is within background. Assuming that uranium and radium-226 are in equlibrium, radium-226 is also within background. Therefore, radium-226 will not be carried forward through the screening assessment process.

Because there are insufficient background data to perform further statistical tests, plutonium-238 and plutonium-239/240 will be carried forward through the screening assessment process.

5.1.6 Evaluation of Organic Constituents

Seven samples collected at PRS 0-030(e) were analyzed for volatiles, semivolatiles, PCBs, and pesticides. Of these seven samples, six were surface grab samples and one was a field duplicate of a surface grab sample. Seven pesticides (alpha-chlordane, gamma-chlordane, DDD, DDE, DDT, dieldrin, and endosulfan I™) were detected in these samples. The concentrations for each sample that has at least one detected value for these analytes are presented in Table 5.1.6-1.

These seven detected organics are carried forward through the screening assessment process.

TABLE 5.1.6-1

ORGANICS WITH DETECTED CONCENTRATIONS AT PRS 0-030(e)

LOCATION ID	SAMPLE ID	CHLORDANE [alpha-] (mg/kg)	CHLORDANE [gamma-] (mg/kg)	DDD [p,p'-] (mg/kg)	DDE [p,p'-] (mg/kg)	DDT [p,p'-] (mg/kg)	DIELDRIN (mg/kg)	ENDOSULFAN I (mg/kg)
SAL	N/A	0.34[a]	0.34[a]	1.9	1.3	1.3	0.028	3.3
00-3740	AAB3572	0.00497(J)[b]	0.00664(J)	<0.003	<0.003	0.0218(J)	0.00471(J)	<0.00189
00-3826	AAA8459	<0.00351[c]	<0.00351[c]	<0.0007	<0.0007	<0.0007	<0.0007	0.00128
00-1518	AAB0181	<0.00182	<0.00182	0.0565	0.0289	0.00405(J)	<0.00353	<0.00182
00-1519	AAB0182	<0.00188	<0.00188	0.0118	0.0377	0.00825(J)	<0.00364	<0.00188
00-1521	AAB0184	<0.0018	<0.0018	0.128	0.0509	0.0325	<0.00349	<0.0018
00-1521	AAB0186	<0.00181	<0.00181	0.0901(J)	0.0439(J)	0.0218(J)	<0.00351	<0.00181

[a] SAL for total chlordane.
[b] J = Estimated quantity.
[c] Value was reported as total chlordane.

Of the organics that were not detected in any sample collected from PRS 0-030(e), seven had reporting limits (RPLs) greater than SALs [benzo[a]pyrene, bis(2-chloroethyl)ether, dibenzo[a,h]anthracene, hexachlorobenzene, N-nitrosodi-n-propylamine, N-nitrosodimethylamine, and vinyl chloride]. In addition, 29 others do not have SALs to which the RPLs can be compared [acenaphthylene, benzo[g,h,i]perylene, delta-BHC, bis(2-chloroethoxy)methane, bromobenzene, bromochloromethane, 4-bromophenylphenyl ether, n-butylbenzene, sec-butylbenzene, 4-chloro-3-methylphenol, 4-chlorophenylphenyl ether, p-chlorotoluene, 1,2-dibromoethane, 1,3-dichloropropane, 2,2-dichloropropane, 1,1-dichloropropene, cis-1,3-dichloropropene, trans-1,3-dichloropropene, 2-hexanone, 4-isopropyltoluene, methyl iodide, 2-methyl-4,6-dinitrophenol, 2-methylnaphthalene, 3-nitroaniline, 4-nitroaniline, 2-nitrophenol, 4-nitrophenol, phenanthrene, and propylbenzene]. These 36 organics generally fall into two general categories: polycyclic aromatic hydrocarbons (PAHs) and organic solvents. PAHs are products of combustion of organic materials and are associated with both natural (e.g., forest fires) and anthropogenic (e.g., combustion of fossil fuels) sources. Historical activities at TA-1 that may have resulted in the production of PAHs are likely limited to the operation of several incinerators; however, inadvertent releases of chemicals tothe sanitary sewer system, if any, would have most likely been associated with research activities, not with the operation of the incinerators. Organic solvents are used in a wide variety of applications, including degreasing operations and general organic chemistry research. While it is possible that one or more of the organic solvents listed above may have been used at TA-1, none are believed to have been used in large quantities nor were identified as COPCs in the RFI Work Plan (LANL 1992, 0781). Therefore, none of the nondetected organics are carried forward tot he screening assessment.

5.1.7 Human Health Assessment

5.1.7.1 Screening Assessment

Thirteen chemicals were carried forward from the background and reporting limit comparisons. One analyte, lead, was detected at a concentration above its SAL in one sample, as shown in Fig. 5.1.7-1 and Table 5.1.7-1. The remaining twelve chemicals (i.e., alpha-chlordane, gamma-chlordane, DDD, DDE, DDT, dieldrin, endosulfan I, mercury, plutonium-238, plutonium-239/240, silver, and zinc) are included in the following multiple chemical evaluation.

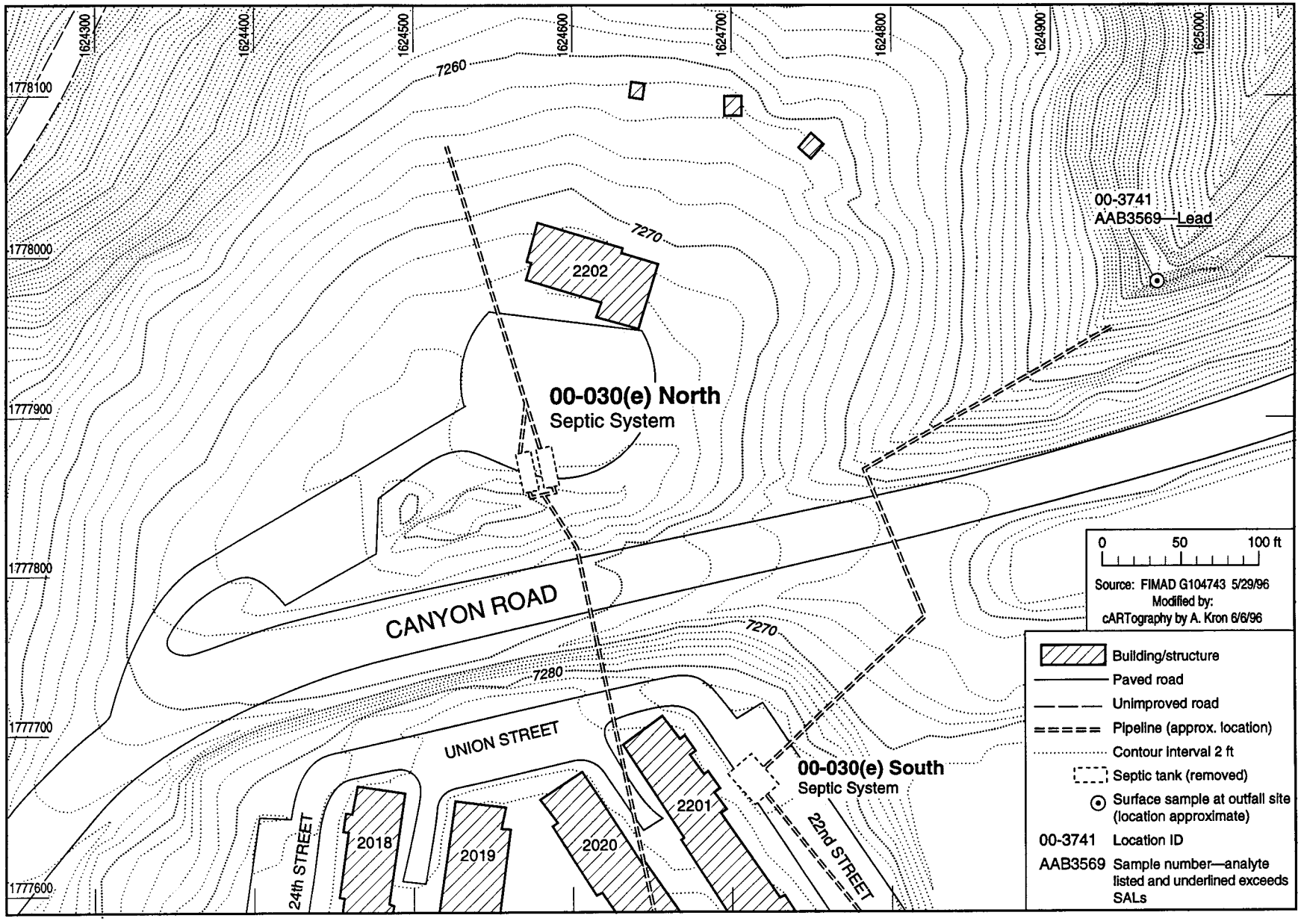

Fig. 5.1.7-1. Location of analyte that exceeds SAL at PRS 0-030(e).

TABLE 5.1.7-1

CHEMICAL WITH CONCENTRATIONS IN SOIL THAT EXCEED SAL AT PRS 0-030(e)

LOCATION ID	SAMPLE ID	LEAD (mg/kg)
SAL[a]	N/A[b]	400
00-3741	AAB3569	615

[a] SAL = Screening action level.
[b] N/A = Not applicable.

TABLE 5.1.7-2

PRS 0-030(e) MULTIPLE CHEMICAL EVALUATION FOR SOIL

ANALYTE	LOCATION ID	SAMPLE ID	SAMPLE VALUE (mg/kg) or (pCi/g)	SOIL SAL[a] (mg/kg) or (pCi/g)	NORMALIZED VALUE
Noncarcinogenic Effects					
Endosulfan I	00-3826	AAA8459	0.00128	3.3	0.00039
Mercury	00-3826	AAA8459	0.44[b] (J)[c]	23	0.019
Silver	00-3826	AAA8459	0.34	380	0.00089
Zinc	00-3741	AAA3569	97.5	23000	0.0042
				Total:	**0.30**
Carcinogenic Effects					
Alpha-chlordane	00-3740	AAB3572	0.00497 (J)	0.34[d]	0.015
Gamma-chlordane	00-3740	AAB3572	0.00664 (J)	0.34	0.020
[p,p']-DDD	00-1521	AAB0184	0.128	1.9	0.067
[p,p']-DDE	00-1521	AAB0184	0.0509	1.3	0.039
[p,p']-DDT	00-1521	AAB0184	0.0325	1.3	0.025
Dieldrin	00-3740	AAB3572	0.00471 (J)	0.028	0.17
				Total:	**0.33**
Radiation Effects					
Plutonium-238	00-1519	AAB0182	0.0859	27	0.0032
Plutonium-239/240	00-1521	AAB0186	0.278	24	0.012
				Total:	**0.015**

[a] SAL = Screening action level.
[b] Value represents the maximum of a sample and its laboratory duplicate.
[c] J = Estimated quantity.
[d] SAL for total chlordane.

A multiple chemical evaluation is performed separately for three classes of analytes: noncarcinogens, carcinogens (nonradioactive), and radionuclides. In this case, all three classes of analytes were identified for the multiple chemical evaluation. Table 5.1.7-2 presents the results of the multiple chemical evaluation for PRS 0-030(e). The total normalized values are 0.30, 0.33, and 0.015 for noncarcinogenic effects, carcinogenic effects (nonradioactive), and radiation effects, respectively. These results indicate that the chemicals included in this multple chemical analysis should not pose an unacceptable noncarcinogenic, carcinogenic, or radiation health risk. Therefore, none are identified as COPCs.

Based on the results of this evaluation of chemicals detected in soil samples collected from PRS 0-030(e), lead is the only chemical identified as a COPC. The maximum lead concentration is 615 mg/kg, which is approximately 50% higher than its SAL of 400 mg/kg. As discussed in Section 5.1.4.2 (field results), this sample was collected in an older fill below the outfall in the vicinity of a tin can; the lead concentration in the second outfall sample was 156 mg/kg. Following receipt of these analytical results, two additional outfall samples were collected, both from the older fill, one 6 in. upstream and one 6 in. downstream of the sample near the tin can. The lead concentrations in these samples was 69.9 and 216 mg/kg, respectively. Given that (1) the SAL is based on long-term exposure by a resident, (2) the extent of lead in soil in excess of the SAL is only in the older fill and is very limited, and (3) this area is located on a slope where potential exposures are expected to be limited, lead is not retained as a COPC at PRS 0-030(e). If the lead is removed by erosion of th older fill it will only serve to dilute the concentration of lead downchannel.

5.1.7.2 Risk Assessment

No human health risk assessment was performed for this PRS because the screening assessment did not identify any COPCs requiring further evaluation.

5.1.8 Ecological Assessment

PRSs 0-030(e,f) are mesa-top sites surrounded by disturbed areas. The area provides limited habitat for biota, does not contain sensitive habitats, and threatened or endangered species are not present there (Ebinger et al. 1994, 05-0232). Therefore, there is no immediate ecological risk at this site.

5.1.9 Extent of Contamination

Lead was detected in a single outfall sample at a concentration of 615 mg/kg, which exceeds its SAL of 400 mg/kg by approximately 50%. However, samples collected 6 in. upstream or

downstream of this sample contain lead at concentrations of 69.9 and 216 mg/kg, respectively, indicating that the area containing lead at concentrations greater than its SAL is very limited.

5.1.10 Conclusions and Recommendations

PRS 0-030(e) is recommended for NFA for both ecological and human health concerns. This recommendation is based on NFA criterion 4, which states that the PRS has been characterized in accordance with current state and federal guidelines, and that COPCs are not present in concentrations that would pose an unacceptable risk. Although lead was detected in a single sample at a concentration that exceeded the SAL by approximately 50%, the lead concentrations in samples collected 6 in. upstream or downstream of this sample were below SAL. Given that (1) the SAL is based on long-term exposure by a resident, (2) the extent of lead in soil in excess of the SAL is very limited, and (3) this area is located on a slope where potential exposures are expected to be limited, concentrations of lead remaining at the site do not pose an unacceptable risk to human health. In addition, the results of the multiple chemical evalucations suggest that cumulative exposure to the other chemicals detected above background (inorganics) or reporting limits (organics) does not pose an unacceptable human health risk.

5.2 PRS 0-030(f)

5.2.1 History

The septic tanks in this PRS group handled sanitary waste from the original townsite. Old memoranda raise the question of radionuclide contamination of the sanitary system and outfalls into Pueblo Canyon (Tribby 1946, 05-0119; 05-0120).

Recent surveillance reports indicate that no substantial amounts of plutonium have been detected that can be attributed to these septic tanks. Plutonium-bearing waste discharged at TA-45 would mask any previous low levels of plutonium in Pueblo Canyon. The outfall for PRS 0-030(g), which served most of the Laboratory, was apparently upstream from TA-45 in Acid Canyon. The contaminant levels in this outfall may be considered representative of background for Acid Canyon. The conclusion is that low levels of plutonium are not precluded in the septic systems, but hard data are lacking.

5.2.2 Description

PRS 0-030(f), Septic Tank #5, consists of two tanks located south of Canyon Road and north of Rose Street near the United Church (The Zia Company 1947, 05-0132). These tanks, labeled collectively as "Septic Tank #2" on a 1943 engineering drawing, serviced a school, a post

exchange, and a few of the original Ranch School buildings; consequently, there is very little chance that any radioactive material or RCRA material exists in PRS 0-030(f) (US Engineer Office 1943, 05-0169).

5.2.3 Previous Investigations

No previous investigations have been performed at this site.

5.2.4 Field Investigation and Sampling Activities

Site investigation activities for PRS 0-030(f) began with historical data searches and reviews, personal interviews, site surveys, and geodetic surveying of the suspected location of the septic tank. Geophysical surveying was then conducted in the vicinity of the suspected septic tank locations to confirm the presence of the septic tanks and to provide a more precise determination of the location and geometry of the septic tanks system. Drilling and sampling of boreholes within and around the septic tanks were conducted to characterize the tank contents, to determine if the tank contained chemical or radiological contamination, and to determine if a release had occurred from within the septic tank to the surrounding soil and tuff. The samples collected are summarized in Table 5.2.4.1 and field activities are discussed in more detail below.

Deviations from the Work Plan

All work was conducted in accordance with the RFI work plan; however, specific deviations from the work plan were made due to the location of the septic tanks near the United Church School. The tanks are located immediately adjacent to the northeast corner of the United Church School building, and beneath a sidewalk and block wall. The work plan directs that the tanks should be sufficiently excavated to expose the top of the tank, and then the tank contents should be sampled. The decision was made to use samples collected from boreholes drilled within and surrounding the septic tanks, instead of excavating materials from within the tanks, to characterize the contents of the tanks. This eliminated the need to remove the sidewalk and block wall, and eliminated the problems associated with excavating the tanks near the northeast corner of the United Church School building. Accordingly, the tank has not been inspected for integrity, and samples have not been collected from directly below the tank as directed by the RFI work plan. Instead, three additional samples were collected of fill material within the western tank, and two samples were collected from areas surrounding the septic tanks at points where contamination, if present, would most likely be detected. These locations included one point directly between the two tanks, and one point directly north of the western tank, which was the common outlet for the two tanks.

TABLE 5.2.4.1

SUMMARY OF SAMPLES TAKEN
PRS 0-030(f)

LOCATION ID	SAMPLE ID	DEPTH (ft)	MATRIX	VOCs Request #	SVOCs Request #	PCBs Request #	Pesticides Request #	Metals Request #	Radiochemistry Request #	Radvan Request #
00-3827	AAA8454	14.5	soil	19364	19364	19364	19364	19853	20025	21083
00-3827	AAA8455	N/A[a]	water (RB)[b]	19364	19364	19364	19364	19853	20025	NR[c]
00-3827	AAA8461	14.5	soil	19364	19364	19364	19364	19853	20025	21083
00-3828	AAA8456	N/A	water (FB)[d]	19364	19364	19364	19364	19853	20025	NR
00-3828	AAA8457	N/A	water (TB)[e]	19364	NR	NR	NR	NR	NR	NR
00-3828	AAA8458	10.5	soil	19364	19364	19364	19364	19853	20025	21083
00-1488	AAB0262	2.5–4.0	soil	16996	16996	16996	16998	17010	17008	N/A
00-1488	AAB0291	N/A	water (RB)	16996	16996	16996	16998	17010	17008	NR
00-1485	AAB0263	7.5–8.5	soil	16996	16996	16996	16998	17010	17008	N/A
00-1485	AAB0270	4.0–5.0	soil	16996	16996	16996	16998	17010	17008	N/A
00-1485	AAB0272	10.0–11.5	soil	NR	16996	16996	16998	17010	17008	N/A
00-1485	AAB0307	N/A	water (TB)	16996	NR	NR	NR	NR	NR	NR
00-1486	AAB0266	2.5 –3.5	soil	16996	16996	16996	16998	17010	17008	N/A
00-1486	AAB0271	2.5–3.5	soil	16996	16996	16996	16998	17010	17008	N/A

a N/A = Not available.
b RB = Rinsate blank.
c NR = Not requested.
d FB = Field blank.
e TB = Trip blank.

Geodetic Surveys

A geodetic survey was conducted in February 1994 to mark the suspected locations of the septic tanks. RFI work plan figures showed that the tanks were located in the parking lot to the west of the United Church School. However, based on examination of historical aerial photographs, records review including maps and engineering plans, and visual inspection of the site, the tanks were determined to be located slightly northeast of the United Church School (Fig. 5.2.4-1). Engineering drawings indicated that the eastern and western tanks were oriented to the northeast and had dimensions of approximately 35 ft long x 10 ft wide, and 25 ft long x10 ft wide, respectively. The location of the eastern tank is almost completely beneath a sidewalk and block wall, making access to the tank difficult. The western tank also lies beneath the sidewalk and block wall, but extends farther northward such that the northern portion of the tank is accessible for sampling. Sample and borehole locations were surveyed. Geodetic survey data was transferred to FIMAD.

Geophysical Surveys

Surface geophysical surveys were conducted in an attempt to precisely locate the septic tanks. Geophysical surveys were conducted in February and April 1994.

The February 1994 geophysical survey was conducted in the United Church parking lot near the northwestern corner of the United Church School. The location of the survey area was chosen based on estimated locations of the septic tanks from engineering drawings. Two magnetic anomalies were detected using a magnetometer survey (EM31), the largest of which was suspected to possibly represent the locations of the septic tanks. Although the EM31 detected the septic tank anomaly, there was too much interference from the metal fence to distinguish between the fence and the septic tank. A few days after this geophysical survey, a geodetic survey was conducted at the site to more precisely locate the septic tanks based on engineering drawings. The geodetic survey placed the septic tanks approximately 40 ft east of the geophysical survey area that had just been surveyed. Four exploratory boreholes were drilled at the geodetic survey location in March 1994 and the presence of the tanks was confirmed in this area.

In April 1994 a second geophysical survey was conducted at the geodetically surveyed location of the septic tanks. Two geophysical survey methods were used: a Schonstedt™ magnetometer and a GPR. The purpose of this geophysical survey was to more precisely locate the tanks and confirm their dimensions using a different type of magnetometer that should be less susceptible to interference from nearby objects. The Schonstedt™ magnetometer survey detected a strong

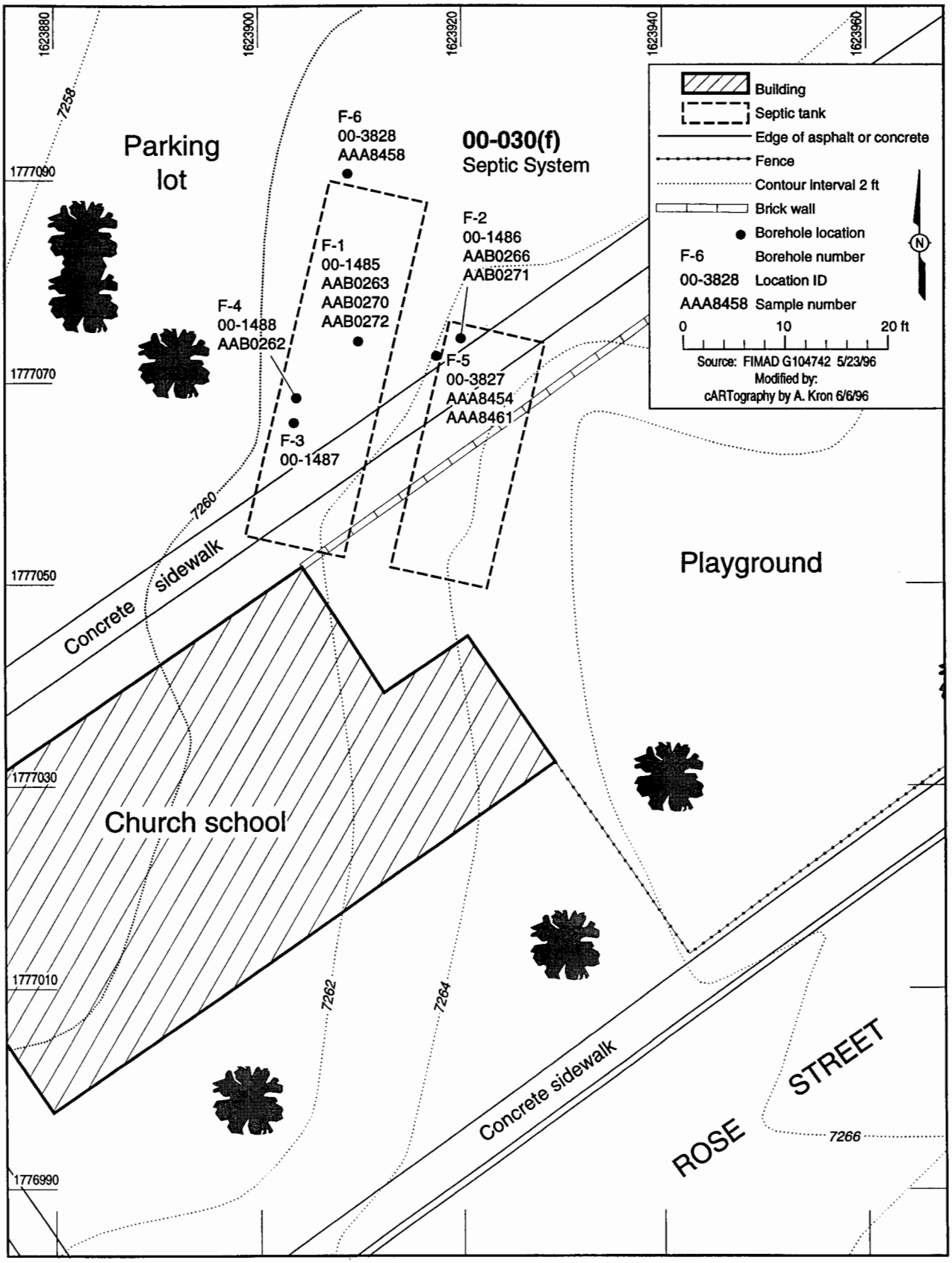

Fig. 5.2.4-1. Locations of PRS 0-030(f) samples.

magnetic anomaly corresponding to the northeastern and northwestern walls of the septic tanks. Although the outer walls of the two tanks were confirmed, this survey was not able to detect two distinct anomalies that could support the presence of two tanks. Measurements along the sidewalk, near the concrete parking stops, and near the buildings were inconclusive because of magnetic interference from the metal in these objects. The GPR survey produced a few anomalies, but they did not correspond and were not interpreted to represent sections of the septic tanks.

Drilling and Subsurface Sampling

Characterization drilling activities were conducted at this site to confirm the presence of the septic tanks at the location identified by the geodetic survey, and to collect subsurface samples for laboratory analysis to characterize the tanks' contents. Drilling and subsurface sampling were conducted on March 22, 1994. Drilling was conducted at the suspected location of the tanks based on the geodetic survey. A total of four boreholes were drilled, three within the western tank and one within the eastern tank (Figure 5.2.4-1).

Borehole 030(f)-1 was drilled into the center point of the surveyed location of the western tank to a depth of 13.5 ft, where refusal was encountered due to concrete. Continuous core was collected, and only fill material was encountered with no consolidated tuff. Three samples were collected from this borehole and each was analyzed for gross alpha, beta and gamma radiation in the MRAL, and fixed laboratory analyses of americium-241, total uranium, isotopic plutonium, TAL metals, VOCs, SVOCs, pesticides, and PCBs. The first sample, AAB0270, was collected from 4 to 5 ft, the second, AAB0263, from 7.5 to 8.5 ft, and the third, AAB0272, from 10.0 to 11.5 ft. The sample collected for analysis of VOCs from AAB0272 was not submitted for analysis. All samples were collected from fill material composed of brown silty-sand that was moderately moist.

Borehole 030(f)-2 was drilled into the northwest corner of the eastern tank. The majority of the eastern tank lies beneath a sidewalk and block wall to the northeast of the United Church School, so physical access precluded drilling into any portion of the tank except for the northwest corner. Borehole 030(f)-2 was drilled to a depth of 5 ft, where refusal was met due to the presence of concrete. Continuous core was collected, and only fill material was encountered. Sample AAB0271, plus one duplicate, AAB0266, were collected at a depth of 2.5 to 3.5 ft and analyzed for gross alpha, beta, and gamma radiation in the MRAL, and fixed laboratory analysis of americium-241, total uranium, isotopic plutonium, TAL metals, VOCs, SVOCs, pesticides, and PCBs. Both samples were collected from brown clayey-silt to silty sand fill material.

Borehole 030(f)-3 was drilled into the west-central portion of the western tank. The southeastern corner of the west septic tank is covered by a sidewalk and block wall, preventing access to this portion of the septic tank. Borehole 030(f)-3 was placed as far south as possible within the western tank in an attempt to characterize the contents of the southern part of the tank. This borehole was drilled to a depth of 5 ft, where refusal was encountered due to concrete. Only fill material was encountered in the continuous core. Because concrete was encountered at such a shallow depth, the question was raised as to whether the interior of the septic tank was encountered, or if this borehole intercepted one of the side walls of the tank. Therefore, no samples were collected from this borehole, and a new borehole, 030(f)-4, was attempted 2 ft north of 030(f)-3.

Borehole 030(f)-4 was drilled to a total depth of 5 ft where refusal was encountered once again due to concrete. Continuous core was collected and only fill material was encountered. It was still questionable whether the fill material was from within the tank; nevertheless one sample, AAB0262, was collected from 2.5 to 4 ft. The sample was analyzed for gross alpha, beta and gamma radiation in the MRAL, and fixed laboratory analysis of americium-241, total uranium, isotopic plutonium, TAL metals, VOCs, SVOCs, pesticides, and PCBs.

Drilling consisted of using a CME-45 all-terrain, hollow-stem auger drill rig with a continuous core-barrel sampling system. Boreholes were drilled and sampled with 8-in. O.D., 4.25-in. I.D., hollow-stem augers. Boreholes were continuously sampled with 5-ft-long core barrels (3.5-in. I.D. and a 4-in. O.D.). The core barrel was placed inside the hollow-stem auger, extending slightly beyond the auger bit, to collect relatively undisturbed soil and core samples as the augers were advanced. The core barrel was retrieved at 5-ft intervals from within the hollow-stem augers, on a wire-line, latch-retrieval system for field screening and analytical sample collection. After sampling to the intended depth in each borehole, the augers were extracted for subsequent backfilling. All drilling and sampling was conducted in accordance with applicable LANL ER Project procedures.

Hand-Auger Sampling

Analytical results from drilling operations in March, 1994 indicated that no chemical or radiological contamination was present within core samples most likely collected from within the septic tanks. Additional hand-auger sampling was then planned to confirm the appropriateness of a NFA decision for this site. Between September 28–29, 1994, two hand-auger borings were drilled at the most likely locations for intercepting contaminants from the tanks, if any existed. Both boreholes were to be advanced to at least 14 ft if possible.

Borehole 030(f)-5 was hand-augered at a location between the two tanks to a depth of 14.5 ft without encountering any obstructions. One sample, AAA8454, and one duplicate, AAA8461, were collected from the bottom of the borehole, and analyzed for gross alpha, beta, and gamma radiation by MRAL, and fixed laboratory analysis of americium-241, isotopic plutonium, total uranium, gamma spectroscopy, TAL metals, VOCs, SVOCs, pesticides, and PCBs. Samples were collected from unconsolidated reddish sand fill material.

Borehole 030(f)-6 was hand-augered at the north end of the western septic tank, which was the common outlet for the two tanks. The hand-auger was advanced to 10.5 ft, and could not be advanced farther. It is unknown if concrete, tuff, or tight fill was encountered at 10.5 ft that precluded further advancement of the hand-auger. One sample, AAA8458, was collected from the bottom of this borehole, and analyzed for gross alpha, beta and gamma radiation by MRAL, and fixed laboratory analysis of americium-241, isotopic plutonium, total uranium, gamma spectroscopy, TAL metals, VOCs, SVOCs, pesticides, and PCBs. Samples were collected from brown silty sand fill material.

Sampling Methodology

Boreholes completed with a drill rig were continuously cored from the ground surface to the total depth of each borehole. Upon retrieval, the outer surface and contents of the core barrels were screened using hand-held meters to detect gross radiological and chemical contamination, as discussed in the screening methodology section of this report. Immediately after the core barrel was opened and screened, the sample to be analyzed for VOCs was collected directly from the core, before significant volatilization could occur. The desired section of the core was then placed in a stainless steel bowl or aluminum pan and homogenized. This mixture was then placed in the appropriate containers for each specific analysis. All field-screening samples and samples destined for fixed laboratory analysis were appropriately labeled and assigned unique LANL sample identification numbers with bar codes (e.g., AAB0000). All samples were documented on sample collection logs, placed in refrigerated coolers, and transported to the MRAL. All sampling was conducted in accordance with applicable LANL ER Project procedures.

Screening Methodology

After retrieving the sample barrels while coring with the drill rig, the outer surface and contents of the barrel were screened by the SSO and RSP using hand-held meters to detect chemical and gross radiological contamination. Each sample run was screened for alpha activity using a direct reading Eberline™ ESP-1 with an air-proportional probe, and for beta/gamma activity using a direct reading Eberline™ ESP-1 with an HP 260 detector. Equipment was smeared and

counted for alpha activity using a Ludlum Model 2000 alpha tray counter and for beta/gamma activity using a direct-reading Eberline™ ESP-1 with an HP™ 260 detector. The core was screened for organic vapors with a Photovac Microtip™ photoionization detector (PID) with a 10.6 eV bulb to monitor for organic vapors. In an effort to consistently obtain the highest core screening values, the shoe of the core barrel was cracked open slightly to allow the probe of the PID to be inserted into the interior of the core and collect readings before significant volatilization could occur. The core was also screened for mercury vapor using a Jerome™ Model 431-X mercury vapor analyzer. A portion of each sample was placed in a resealable plastic bag and allowed to sit for several minutes for subsequent mercury vapor monitoring of the sample headspace. Field screening results indicated that no chemical or radiological contamination was present. The core and work area were monitored with an MSA™ 361 combustible-gas indicator for explosive gases. All field-screening instruments were calibrated and checked on a daily basis by the SSO and RSP.

Field Screening Results

Each sample run retrieved during drilling and all material extracted during hand-augering was screened for alpha and beta/gamma activity, organic vapors, and mercury vapor as described in Section 4.1.6. Action levels in the breathing zone were not exceeded during the field activities. Field screening results were recorded in the SSO site logbook, field screening forms, and sample collection logs.

PID readings ranged from 0.5 to 9.4 ppm, with the maximum reading observed in borehole 030(f)-2 at a depth of 2.5 to 3.5 ft. No detectable activity was seen on gross alpha monitoring instruments. Gross beta/gamma activities observed ranged from 114 up to 300 cpm, well below established contamination criteria levels. Mercury vapor monitoring did not reveal any readings above 0.0 mg Hg/m^3.

5.2.5 Background Comparisons

Inorganics

Three soil samples collected from PRS 0-030(f) were analyzed for TAL metals. Six soil samples were analyzed for a subset of TAL metals. Of these nine samples, seven were grab samples and two were field duplicates of grab samples. All nine soil samples were also analyzed for total uranium.

Two inorganics (lead and mercury) were detected above their respective background screening values in at least one sample. Further background comparisons were performed for lead. Mercury was not subjected to further background comparisons because the background data for this metal are inadequate to support other statistical tests (there are only one or two detections in the background data set for this metal). Although mecury was detected at concentrations that are not expected to be associated with a release, it is carried forward through the screening assessment process because of the lack of background information.

Because the data for lead does not otherwise appear to satisfy normality assumptions, non-parametric tests were preferred for further background comparisons. The Gehan modification to the Wilcoxon Rank Sum test and the Quantile test, both of which account reasonably for nondetects, were used for these evaluations. The Gehan test is best suited for assessing complete shifts in distribution, whereas the Quantile test is better suited for assessing partial shifts. Between the two tests, most types of differences between distributions can be captured. Observed significance levels (P-values) for these tests are presented in Table 5.2.5-1. If a P-value is less than some small probability, typically 0.05, then there is some reason to suspect that there is a difference between the background and site distributions; otherwise no difference is indicated.

TABLE 5.2.5-1

STATISTICAL TESTS FOR BACKGROUND COMPARISONS

ANALYTE	GEHAN TEST P-VALUE	QUANTILE TEST P-VALUE
Lead	0.8463	0.8692

The results for lead are indicative of site concentrations that are not statistically elevated above background.

Based on the background comparisons and the further statistical tests performed to compare site and background data, mercury is carried forward through the screening assessment process. The data for each sample that has at least one value above background screening values for mercury are presented in Table 5.2.5-2.

TABLE 5.2.5-2

INORGANICS WITH CONCENTRATIONS ABOVE BACKGROUND SCREENING VALUES AT PRS 0-030(f)

LOCATION ID	SAMPLE ID	MERCURY (mg/kg)
UTL[a]	N/A[b]	0.1
SAL[c]	N/A	23
00-3827	AAA8454	0.36 (J)[d]
00-3828	AAA8458	0.31 (J)
00-3827	AAA8461	0.37 (J)

[a] UTL = Upper tolerance limit.
[b] N/A = Not applicable.
[c] SAL = Screening action level.
[d] J = Estimated quantity.

Radionuclides

Nine soil samples collected from 0-030(f) were analyzed for radionuclides. Of these nine soil samples, seven were grab samples and two were field duplicates of grab samples. As shown in the previous section, uranium was not detected above background screening values and is not considered to be above background. Consequently, uranium will not be considered further.

Two radionuclides (plutonium-238 and plutonium-239/240) were detected above their respective background screening values. The concentrations for each sample that has at least one value above background screening values for these analytes are presented in Table 5.2.5-3.

TABLE 5.2.5-3

RADIONUCLIDES WITH CONCENTRATIONS ABOVE BACKGROUND SCREENING VALUES AT PRS 0-030(f)

LOCATION ID	SAMPLE ID	PLUTONIUM-238 (pCi/g)	PLUTONIUM-239/240 (pCi/g)
UTL[a]	N/A[b]	0.014[c]	0.052[d]
SAL[e]	N/A	27	24
00-1488	AAB0262	0.0196	0.0381
00-1485	AAB0263	0.0652	-0.035
00-1486	AAB0266	0.0802	0.0136
00-1485	AAB0270	0.0175	-0.0299
00-1485	AAB0272	-0.158	0.103

[a] UTL = Upper tolerance limit.
[b] N/A = Not applicable.
[c] Value is maximum reported background value from LANL Environmental Surveillance Reports.
[d] Value represents the maximum of a sample and its laboratory duplicate.
[e] SAL = Screening action level.

Radium-226 was detected at PRS 0-030(f). However, radium-226 is a naturally-occuring radionuclide in the uranium decay chain. For this PRS, uranium is within background. Assuming that uranium and radium-226 are in equlibrium, radium-226 is also within background. Therefore, radium-226 will not be carried forward through the screening assessment process.

Because there is insufficient background data to perform further statistical tests, plutonium-238 and plutonium-239/240 are carried forward through the screening assessment process.

5.2.6 Evaluation of Organics

Nine samples collected at 0-030(f) were analyzed for volatiles, semivolatiles, PCBs, and pesticides. Seven organics (acetone, DDD, DDE, DDT, dieldrin, endosulfan™ II, and 1,1,2-trichloro-1,2,2-trifluoroethane) were detected in these samples. Five of these organics (DDD, DDE, DDT, dieldrin, and endosulfan™ II) are pesticides, which are likely present as a result of a domestic use rather than historical Laboratory operations. The concentrations for each sample that has at least one detected value for these analytes are presented in Table 5.2.6-1. Although acetone is a common Laboratory contaminant, there is no evidence of Laboratory contamination in these samples (see Section 4.2.2.1).

TABLE 5.2.6-1

ORGANICS WITH DETECTED CONCENTRATIONS AT PRS 0-030(f)

LOCATION ID	SAMPLE ID	ACETONE (mg/kg)	DDD [p,p'-] (mg/kg)	DDE [p,p'-] (mg/kg)	DDT [p,p'-] (mg/kg)	DIELDRIN (mg/kg)	ENDOSULFAN II (mg/kg)	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (mg/kg)
SAL[a]	N/A[b]	2 000	1.9	1.3	1.3	0.028	3.3	4 100
00-3827	AAA8454	<0.023	<0.00074	0.00283	<0.00074	<0.00074	<0.00074	<0.006
00-3828	AAA8458	<0.022	0.00771	0.0206	0.0132	0.00298	0.00126	<0.005
00-3827	AAA8461	<0.022	<0.00074	0.00379(J)[c]	<0.00074	<0.00074	<0.00074	<0.006
00-1488	AAB0262	0.14(J)	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.005
00-1485	AAB0263	0.19(J)	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	0.27(J)
00-1486	AAB0266	0.2(J)	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.005
00-1485	AAB0270	0.056(J)	<0.0037	<0.0037	<0.0037	<0.0037	<0.0037	<0.005
00-1486	AAB0271	0.57(J)	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.005
00-1485	AAB0272	NA[d]	0.0073(J)	0.036	0.024	<0.0038	<0.0038	NA

[a] SAL = Screening action level.
[b] N/A = Not applicable.
[c] J = Estimated quantity.
[d] NA = Not analyzed.

These seven detected organics will be carried forward through the screening assessment process.

Of the organics that were not detected in any sample collected from 0-030(f), eight had RPLs greater than SALs [m-benzidine, benzo[a]pyrene, bis(2-chloroethyl)ether, dibenzo[a,h]anthracene, hexachlorobenzene, N-nitrosodi-n-propylamine, N-nitrosodimethylamine, and vinyl chloride]. In addition, 29 others do not have SALs to which the RPLs can be compared [acenaphthylene, benzo[g,h,i]perylene, delta-BHC, bis(2-chloroethoxy)methane, bromobenzene, bromochloromethane, 4-bromophenylphenyl ether, n-butylbenzene, sec-butylbenzene, 4-chloro-3-methylphenol, 4-chlorophenylphenyl ether, p-chlorotoluene, 1,2-dibromoethane, 1,3-dichloropropane, 2,2-dichloropropane, 1,1-dichloropropene, cis-1,3-dichloropropene, trans-1,3-dichloropropene, 2-hexanone, 4-isopropyltoluene, methyl iodide, 2-methyl-4,6-dinitrophenol, 2-methylnaphthalene, 3-nitroaniline, 4-nitroaniline, 2-nitrophenol, 4-nitrophenol, phenanthrene, and propylbenzene]. These 36 organics generally fall into two general categories: polycyclic aromatic hydrocarbons (PAHs) and organic solvents. PAHs are products of combustion of organic materials and are associated with both natural (e.g., forest fires) and anthropogenic (e.g., combustion of fossil fuels) sources. Historical activities at TA-1 that may have resulted in the production of PAHs are likely limited to the operation of several incinerators; however, inadvertent releases of chemicals tothe sanitary sewer system, if any, would have most likely been associated with research activities, not with the operation of the incinerators. Organic solvents are used in a wide variety of applications, including degreasing operations and general organic chemistry research. While it is possible that one or more of the organic solvents listed above may have been used at TA-1, none are believed to have been used in large quantities nor were identified as COPCs in the RFI Work Plan (LANL 1992, 0781). Therefore, none of the nondetected organics are carried forward tot he screening assessment.

5.2.7 Human Health Assessment

5.2.7.1 Screening Assessment

Ten chemicals were carried forward from the background and reporting limit comparisons. No analyte was detected at a concentration greater than its SAL; therefore, these ten chemicals (i.e., acetone, DDD, DDE, DDT, dieldrin, endosulfan™ II, mercury, plutonium-238, plutonium-239/240, and 1,1,2-trichloro-1,2,2-trifluoroethane) are included in the following multiple chemical evaluation.

TABLE 5.2.7-2

PRS 0-030(f) MULTIPLE CHEMICAL EVALUATION FOR SOIL

ANALYTE	LOCATION ID	SAMPLE ID	SAMPLE VALUE (mg/kg) or (pCi/g)	SOIL SAL[a] (mg/kg) or (pCi/g)	NORMALIZED VALUE
Noncarcinogenic Effects					
Acetone	00-1486	AAB0271	0.57 (J)[b]	2 000	0.00029
Endosulfan II	00-3828	AAA8458	0.00126	3.3	0.00038
Mercury	00-3827	AAA8461	0.37 (J)	23	0.016
1,1,2-Trichloro-1,2,2-trifluoroethane	00-1485	AAB0263	0.27 (J)	4 100	0.000066
				Total:	**0.017**
Carcinogenic Effects					
[p,p']-DDD	00-3828	AAA8458	0.0071	1.9	0.0037
[p,p']-DDE	00-1485	AAB0272	0.036	1.3	0.028
[p,p']-DDT	00-1485	AAB0272	0.024	1.3	0.018
Dieldrin	00-3828	AAB8458	0.00298	0.028	0.11
				Total:	**0.16**
Radiation Effects					
Plutonium-238	00-1486	AAB0266	0.0802	27	0.0030
Plutonium-239/240	00-1485	AAB0272	0.103	24	0.0043
				Total:	**0.0073**

[a] SAL = Screening action level.
[a] J = Estimated quantity.

A multiple chemical evaluation is performed separately for three classes of analytes: noncarcinogens, carcinogencs (nonradioactive), and radionuclides. In this case, all three classes of analytes were identified for the multiple chemical evaluation. Table 5.2.7-1 presents the results of the multiple chemical evaluation for PRS 0-030(f). The total normalized values are 0.017, 0.16, and 0.0073 for noncarcinogenic effects, carcinogenic effects (nonradioactive), and radiation effects, respectively. These results indicate that the chemicals included in this multple chemical analysis should not pose an unacceptable noncarcinogenic, carcinogenic, or radiation health risk. Therefore, none are identified as COPCs.

5.2.7.2 Risk Assessment

No human health risk assessment was performed for this PRS because the screening assessment did not identify any COPCs requiring further evaluation.

5.2.8 Ecological Assessment

PRSs 0-030(e,f) are mesa-top sites surrounded by disturbed areas. The area provides limited habitat for biota, does not contain sensitive habitats, and threatened or endangered species are not present there (Ebinger et al. 1994, 05-0232). Therefore, there is no immediate ecological risk at this site.

5.2.9 Extent of Contamination

No COPCs were identified for PRS 0-030(f).

5.2.10 Conclusions and Recommendations

PRS 0-030(f) is recommended for NFA for both ecological and human health concerns. This recommendation is based on NFA criterion 4, which states that the PRS has been characterized in accordance with current state and federal guidelines, and that COPCs are not present in concentrations that would pose an unacceptable risk. No chemicals were detected at concentrations greater than SAL and the results of the multiple chemical evaluation suggest that cumulative exposure to the chemicals detected above background (inorganics) or reporting limits (organics) does not pose an unacceptable risk to human health.

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APPENDIX A ANALYTICAL DATA

All analytical data are available in the Facility for Information Management, Analysis, and Display (FIMAD) database. If the FIMAD database is not accessible, data will be provided upon request. A hard copy of the data is available from the Records Processing Facility (RPF) under "Analytical Data for Potential Release Sites 0-030(e,f)."

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APPENDIX B DATA QUALITY EVALUATION TABLES

TABLE B-1
SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 00-030(e)

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
17661	AAB3569	Soil	Pesticides[a]	All data are valid and usable without qualification.
17661	AAB3572	Soil	Pesticides	All detected values are qualified[b] UJ for low surrogate recoveries.
17661	AAB3569	Soil	SVOCs[c]	All data are valid and usable without qualification.
17661	AAB3572	Soil	SVOCs	All data are valid and usable without qualification.
17664	AAB3569	Soil	TAL metals[d]	All data are valid and usable without qualification.
17664	AAB3572	Soil	TAL metals	All data are valid and usable without qualification.
17856	AAB0181	Soil	Pesticides	DDT data are qualified J for a percent difference greater than 25% between the two analytical columns.
17856	AAB0182	Soil	Pesticides	DDT data are qualified J for a percent difference greater than 25% between the two analytical columns.
17856	AAB0184	Soil	Pesticides	All data are valid and usable without qualification.
17856	AAB0186	Soil	Pesticides	DDD, DDE, and DDT data are qualified J for low surrogate recoveries.
17856	AAB0380	Water	Pesticides	All data are valid and usable without qualification.
17856	AAB0381	Water	Pesticides	All data are valid and usable without qualification.
17856	AAB0181	Soil	SVOCs	Four analytes are qualified UJ[e] for low recoveries in the QC sample (>10% and <50%).
17856	AAB0182	Soil	SVOCs	Four analytes are qualified UJ for low recoveries in the QC sample (>10% and <50%).
17856	AAB0184	Soil	SVOCs	Four analytes are qualified UJ for low recoveries in the QC sample (>10% and <50%).
17856	AAB0186	Soil	SVOCs	Four analytes are qualified UJ for low recoveries in the QC sample (>10% and <50%).
17856	AAB0380	Water	SVOCs	Four analytes are qualified UJ for low recoveries in the QC sample (>10% and <50%).
17856	AAB0381	Water	SVOCs	Four analytes are qualified UJ for low recoveries in the QC sample (>10% and <50%).
17856	AAB0181	Soil	VOCs[f]	All data are valid and usable without qualification.
17856	AAB0182	Soil	VOCs	Fifteen analytes are qualified UJ for low internal standard
17856	AAB0184	Soil	VOCs	Fifteen analytes are qualified UJ for low internal standard
17856	AAB0186	Soil	VOCs	Fifteen analytes are qualified UJ for low internal standard
17856	AAB0380	Water	VOCs	All data are valid and usable without qualification.
17856	AAB0381	Water	VOCs	All data are valid and usable without qualification.
17856	AAB0382	Water	VOCs	All data are valid and usable without qualification.
17863	AAB0181	Soil	TAL metals	All data are valid and usable without qualification.
17863	AAB0182	Soil	TAL metals	All data are valid and usable without qualification.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 00-030(e)

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
19364	AAA8461	Soil	VOCs	All data are valid and usable without qualification.
19853	AAA8454	Soil	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
19853	AAA8455	Water	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
19853	AAA8456	Water	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
19853	AAA8458	Soil	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
19853	AAA8461	Soil	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
20025	AAA8454	Soil	Radiological	Americium-241 data are qualified J for low tracer recoveries (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).
20025	AAA8455	Water	Radiological	Americium-241 data are qualified J for low tracer recoveries (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).
20025	AAA8456	Water	Radiological	Americium-241 data are qualified J for low tracer recoveries (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).
20025	AAA8458	Soil	Radiological	Americium-241 data are qualified J for low tracer recoveries (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).
20025	AAA8461	Soil	Radiological	Americium-241 data are qualified J for low tracer recoveries (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).

[a] Pesticide analyses include polychlorinated byphenls (PCBs).
[b] J = Estimated detected quantities.
[c] SVOCs = Semivolatile organic compounds.
[d] TAL metals = Target analyte list metals.
[e] UJ = Estimated detected quantities.
[f] VOCs = Volatile organic compounds.
[g] Radiological = Analyses for americium-241, gamma scan, plutonium-238, plutonium-239, and total uranium.
[h] R = Rejected quantities.

TABLE B-2

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 00-030(f)

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
16996	AAB0262	Soil	PCBs[a]	All data are valid and usable without qualification.
16996	AAB0263	Soil	PCBs	All data are valid and usable without qualification.
16996	AAB0266	Soil	PCBs	All data are valid and usable without qualification.
16996	AAB0270	Soil	PCBs	All data are valid and usable without qualification.
16996	AAB0271	Soil	PCBs	All data are valid and usable without qualification.
16996	AAB0272	Soil	PCBs	All data are valid and usable without qualification.
16996	AAB0291	Water	PCBs	All data are valid and usable without qualification.
16996	AAB0262	Soil	SVOCs[b]	All data are valid and usable without qualification.
16996	AAB0263	Soil	SVOCs	All data are valid and usable without qualification.
16996	AAB0266	Soil	SVOCs	All data are valid and usable without qualification.
16996	AAB0270	Soil	SVOCs	All data are valid and usable without qualification.
16996	AAB0271	Soil	SVOCs	All data are valid and usable without qualification.
16996	AAB0272	Soil	SVOCs	All data are valid and usable without qualification.
16996	AAB0291	Water	SVOCs	All data are valid and usable without qualification.
16996	AAB0262	Soil	VOCs[c]	Acetone data are qualified[d] J for a percent difference of greater than 30% for calibrations.
16996	AAB0263	Soil	VOCs	Acetone and trichlorotrifluoroethane data are qualified J f a percent difference greater than 30% for calibrations.
16996	AAB0266	Soil	VOCs	Acetone data are qualified J for a percent difference of greater than 30% for calibrations.
16996	AAB0270	Soil	VOCs	Acetone data are qualified J for a percent difference of greater than 30% for calibrations.
16996	AAB0271	Soil	VOCs	Acetone data are qualified J for a percent difference of greater than 30% for calibrations.
16996	AAB0291	Water	VOCs	All data are valid and usable without qualification.
16996	AAB0307	Water	VOCs	All data are valid and usable without qualification.
16998	AAB0262	Soil	Pesticides[e]	All data are valid and usable without qualification.
16998	AAB0263	Soil	Pesticides	All data are valid and usable without qualification.
16998	AAB0266	Soil	Pesticides	All data are valid and usable without qualification.
16998	AAB0270	Soil	Pesticides	All data are valid and usable without qualification.
16998	AAB0271	Soil	Pesticides	All data are valid and usable without qualification.
16998	AAB0272	Soil	Pesticides	DDD data are qualified J for a percent difference of greate than 25% between the two analytical columns.
16998	AAB0291	Water	Pesticides	All data are valid and usable without qualification.
17008	AAB0262	Soil	Radiological[f]	All data are valid and usable without qualification.
17008	AAB0263	Soil	Radiological	All data are valid and usable without qualification.
17008	AAB0266	Soil	Radiological	All data are valid and usable without qualification.

TABLE B-2 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 00-030(f)

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
17008	AAB0270	Soil	Radiological	All data are valid and usable without qualification.
17008	AAB0271	Soil	Radiological	All data are valid and usable without qualification.
17008	AAB0272	Soil	Radiological	All data are valid and usable without qualification.
17008	AAB0291	Water	Radiological	All data are valid and usable without qualification.
17010	AAB0262	Soil	TAL metals	All data are valid and usable without qualification.
17010	AAB0263	Soil	TAL metals	All data are valid and usable without qualification.
17010	AAB0266	Soil	TAL metals	All data are valid and usable without qualification.
17010	AAB0270	Soil	TAL metals	All data are valid and usable without qualification.
17010	AAB0271	Soil	TAL metals	All data are valid and usable without qualification
17010	AAB0272	Soil	TAL metals	All data are valid and usable without qualification
17010	AAB0291	Water	TAL metals	All data are valid and usable without qualification.
19364	AAA8454	Soil	Pesticides	Aroclor 1242™ data are qualified UJ for low recovery in the QC sample (10 to 50%).
19364	AAA8455	Water	Pesticides	All data are valid and usable without qualification.
19364	AAA8456	Water	Pesticides	All data are valid and usable without qualification.
19364	AAA8458	Soil	Pesticides	Aroclor 1242™ data are qualified UJ for low recovery in the QC sample (10 to 50%).
19364	AAA8461	Soil	Pesticides	Aroclor 1242™ data are qualified UJ for low recovery in th QC sample (10 to 50%). DDD data are qualified J for high surrogate recoveries (178% and 189%).
19364	AAA8454	Soil	SVOCs	1,2-dichlorobenzene data are qualified R for a recovery of less than10% in the QC sample. Four analytes are qualif UJ for recoveries between 10 and 50% in the QC sample. Seven analytes are qualified UJ for a low internal standar
19364	AAA8455	Water	SVOCs	Seven analytes are qualified UJ for a low internal standar
19364	AAA8456	Water	SVOCs	Seven analytes are qualified UJ for a low internal standar
19364	AAA8458	Soil	SVOCs	1,2-dichlorobenzene data are qualified R for a recovery of less than10% in the QC sample. Four analytes are qualif UJ for recoveries between 10 and 50% in the QC sample.
19364	AAA8461	Soil	SVOCs	1,2-dichlorobenzene data are qualified R for a recovery of less than10% in the QC sample. Four analytes are qualif UJ for recoveries between 10 and 50% in the QC sample. Seven analytes are qualified UJ for a low internal standar
19364	AAA8454	Soil	VOCs	All data are valid and usable without qualification.
19364	AAA8455	Water	VOCs	All data are valid and usable without qualification.
19364	AAA8456	Water	VOCs	All data are valid and usable without qualification.
19364	AAA8457	Water	VOCs	All data are valid and usable without qualification.
19364	AAA8458	Soil	VOCs	All data are valid and usable without qualification.

TABLE B-2 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 00-030(f)

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
19364	AAA8461	Soil	VOCs	All data are valid and usable without qualification.
19853	AAA8454	Soil	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
19853	AAA8455	Water	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
19853	AAA8456	Water	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
19853	AAA8458	Soil	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
19853	AAA8461	Soil	TAL metals	Chromium data are qualified J for a low recovery in the QC sample (68%). Mercury data are qualified J or UJ for exceeding recommended holding times.
20025	AAA8454	Soil	Radiological	Americium-241 data are qualified J for low tracer recoveri (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).
20025	AAA8455	Water	Radiological	Americium-241 data are qualified J for low tracer recoveri (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).
20025	AAA8456	Water	Radiological	Americium-241 data are qualified J for low tracer recoveri (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).
20025	AAA8458	Soil	Radiological	Americium-241 data are qualified J for low tracer recoveri (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).
20025	AAA8461	Soil	Radiological	Americium-241 data are qualified J for low tracer recoveri (29%). Plutonium-238, plutonium-239, and uranium data are qualified J for low recoveries in the QC sample (68%, 71%, and 69%, respectively).

[a] PCBs = Polychlorinated biphenyls.
[b] SVOCs = Semivolatile organic compounds.
[c] VOCs = Volatile organic compounds.
[d] J = Estimated detected quantities.
[e] Pesticide analyses include polychlorinated byphenls (PCBs).
[f] Radiological = Analyses for americium-241, gamma scan, plutonium-238, plutonium-239, and total uranium.
[g] TAL metals = Target analyte list metals.
[h] UJ = Estimated detected quantities.
[i] R = Rejected quantities.

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APPENDIX C RISK ASSESSMENT CALCULATIONS

No risk assessment was performed for potential release sites 0-030(e,f).

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