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Date: July 22, 1996
Refer to: EM/ER:96-451

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

SUBJECT: SUBMITTAL OF THE RFI REPORT FOR PRSs 0-028(a, b) IN TA-0

Dear Mr. Garcia:

Enclosed are two copies of the Los Alamos National Laboratory's Resource Conservation and Recovery Act Facility Investigation (RFI) Report concerning Potential Release Sites 0-028(a, b) in Technical Area 0. One report is for your information and the second should go to your technical branch. 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. Mr. Jim Piatt of the Surface Water Quality Bureau has been provided a copy of this report. His bureau has expressed an interest in reviewing sections of these reports such as 2.3.1 (surface water) and Chapter 5 (specific results, ıclusions, and recommendations).

Please ask your office to contact Garry Allen at (505) 667-3394 or Bonnie Koch 505) 665-7202 if you have any questions.

LANL
1 / 1071 / 0

cerely,

g Jansen, Program Manager
NL/ER Project

Sincerely,

for Theodore J. Taylor, Program Manager
DOE/LAAO

TT/el

Enclosures: RFI Report for PRSs 0-028(a, b) at TA-0
Certification

1431

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RFI Report for Potential Release Sites

0-028(a,b)

Septic Systems

Field Unit 1

Environmental Restoration Project

July 1996

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-96-2421

EXECUTIVE SUMMARY

This report presents the results of the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for potential release sites (PRSs) 0-028(a,b).

These PRSs are located in Los Alamos townsite and 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 and report include both hazardous (as defined by RCRA) and radiological constituents. Following is a brief description of PRSs 0-028(a,b); a more detailed description can be found in Section 5.1 of this report.

PRS 0-028(a), the Los Alamos County Golf Course, and PRS 0-028(b), the North Mesa athletic fields, are located in the northern portion of Los Alamos County. The Los Alamos County Golf Course was irrigated with effluent from the former Central Wastewater Treatment Plant (PRS 0-019) from 1948 until about 1964 and by the Pueblo Wastewater Treatment Plant (PRS 0-018[b]) from 1951 to 1993. The North Mesa athletic fields may have been watered by effluent from the Pueblo plant beginning in 1952; however, there is no documentation to verify this possibility. Although these plants were intended to handle only sanitary waste, small but detectable levels of radiation and chemical wastes have been observed in their effluents (LANL 1992, 0781).

The objective of the Phase I investigation was to determine if any contaminant releases from PRSs 0-028(a,b) had occurred. Soil at these PRSs potentially contains the following chemicals of potential concern (COPCs): total uranium, plutonium, and americium; semivolatile and volatile organic compounds; metals; polychlorinated biphenyls (PCBs); and pesticides. To assess the nature of these COPCs and define the extent of their migration, surface samples and hand-augered borehole samples were collected.

Data analysis was conducted using methodologies described in Section 3.0 of this report. A focused data quality evaluation can be found in Section 4.0 of this report. There are no significant concerns with the overall quality of data for PRSs 0-028(a,b). No COPCs were identified in the screening assessment. PRSs 0-028(a,b) are recommended for no further action (NFA). A summary of proposed actions at this PRS is presented in Table ES-1.

TABLE ES-1

SUMMARY OF PROPOSED ACTIONS

		PROPOSED ACTION			
PRS	HSWA[a]	NFA CRITERIA	FURTHER ACTION[b]	RATIONALE	SUBSECTION NUMBER
0-028(a) 0-028(b)	X X	4 4		No COPCs were identified in the screening assessment.	5.1

[a] This column indicates whether or not the site is listed on the Hazardous and Solid Waste Ammendments (HSWA) module (Module VIII) of the Laboratory's Resource Conservation And Recovery Act (RCRA) operating permit.

[b] For information on NFA criteria, see Los Alamos National Laboratories (LANL) Environmental Restoration (ER) Project Consistency Team Policy Number 015 (Environmental Restoration Project 1995, 1173).

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1.0 INTRODUCTION

This report presents the results of the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of two potential release sites (PRSs) in Technical Area (TA) 0 at Los Alamos National Laboratory (the Laboratory or LANL). These PRSs are located on Los Alamos County properties. Included in this report are the site-specific investigation activities, data assessment, and analysis approach used in the Phase I investigation. Based on analytical results of the Phase I site investigation, PRSs 0-028(a,b) are recommended for no further action (NFA).

1.1 General Site History

PRSs 0-028(a,b) are located on Los Alamos County property within the townsite of Los Alamos, New Mexico (Fig. 1.1-1). PRS 0-028(a), the Los Alamos County Golf Course, and PRS 0-028(b), the North Mesa athletic fields, are located in the northern portion of Los Alamos County. The Los Alamos County Golf Course was irrigated with effluent from the former Central Wastewater Treatment Plant (PRS 0-019) from 1948 until about 1964 and by the Pueblo Wastewater Treatment Plant (PRS 0-018[b]) from 1951 to 1993. The North Mesa athletic fields may have been watered by effluent from the Pueblo plant beginning in 1952; however, there is no documentation to verify this possibility. Although these plants were intended to handle only sanitary waste, small but detectable levels of radiation and chemical wastes have been observed in their effluents (LANL 1992, 0781).

1.2 RFI Overview

The objective of the Phase I investigation was to determine if any contaminant releases from PRSs 0-028(a,b) had occurred. Soil at these PRSs potentially contains the following chemicals of potential concern (COPCs): total uranium, plutonium, and americium; semivolatile and volatile organic compounds; metals; polychlorinated biphenyls (PCBs); and pesticides. To assess the nature of these COPCs and define the extent of their migration, surface samples and hand-augered borehole samples were collected.

COPCs may have been released to the environment via percolation or runoff after the wastewater treatment plants' effluents were used as irrigation water. As a result, contaminants may be present in the soil and/or tuff. Contaminants present in the soil or tuff may leach or disperse through the vadose zone or be entrained by surface water and transported downstream by runoff. Possible human exposure to contaminants from these PRSs may occur through incidental ingestion of soil particles and dermal contact with soil.

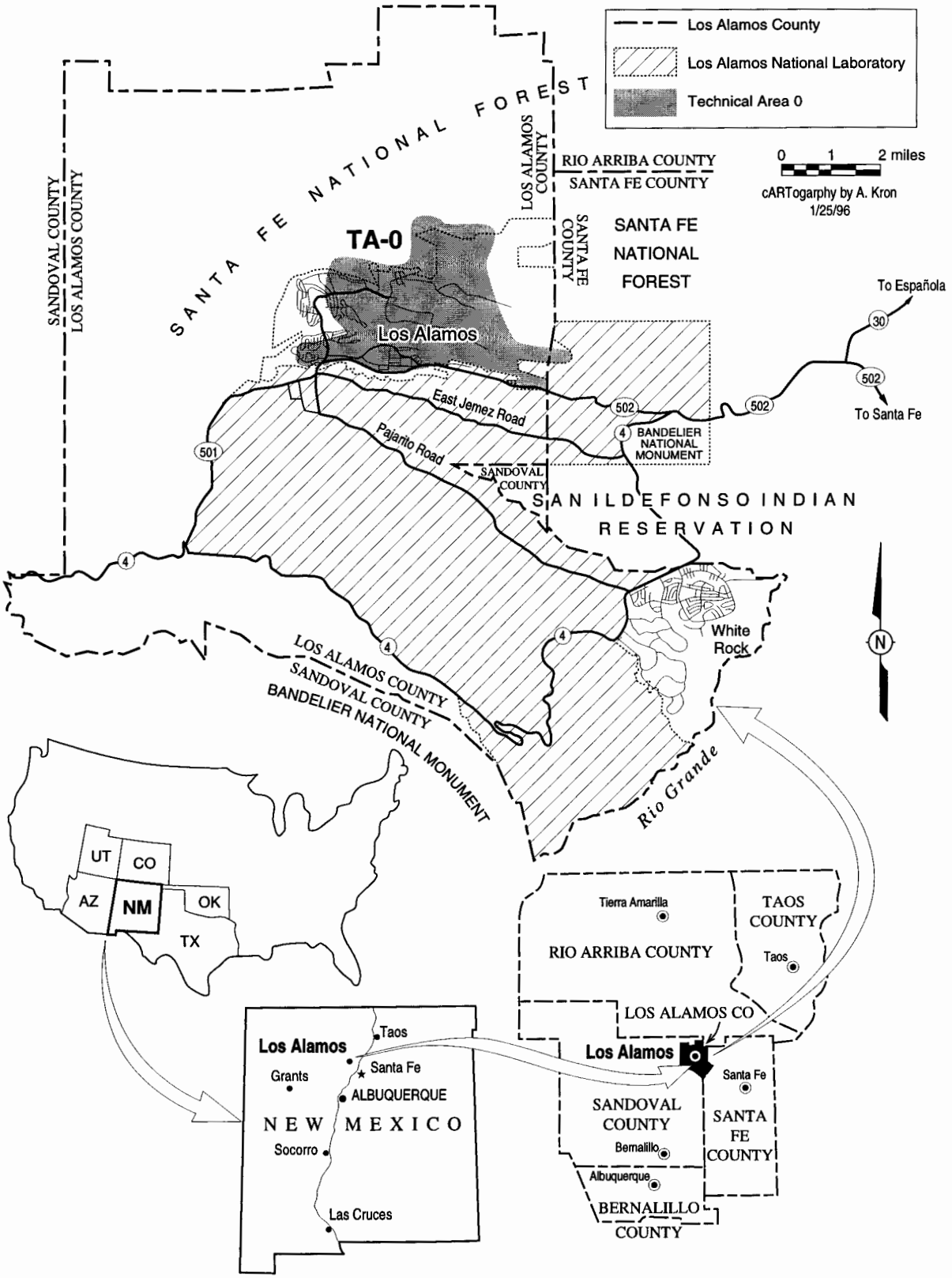


Fig. 1.1-1. Location map of TA-0 within Los Alamos National Laboratory, Los Alamos County, New Mexico.

A conceptual exposure model was developed describing the potential sources of contamination, potential pathways for contaminant migration, and potential pathways to human receptors (LANL 1992, 0781). This conceptual model provides the basis for the field investigations. COPCs to be considered in a risk assessment are identified through a screening assessment, and a human health assessment is performed by considering concentration, extent of contamination, and reasonable pathways of exposure to potential contaminants.

1.3 Field Activities

PRSs 0-028(a,b) were surveyed in March 1996 to establish the sampling locations, and the RFI fieldwork activities were completed on April 3 and 4, 1996. The fieldwork consisted of near-surface and hand-augered coring at five locations at the North Mesa athletic fields and ten locations at the Los Alamos County Golf Course. All applicable LANL Environmental Restoration (ER) Project standard operating procedures (SOPs) were followed. Samples were field-screened for radioactive contamination and, as determined by the chain-of-custody procedures, delivered to the Sample Management Office (SMO) for complete laboratory analysis.

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.

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 at PRSs 0-028(a,b), is presented below. The generalized stratigraphy at TA-0 is shown in Fig. 2.2.1-1.

PRS 0-028(a), the Los Alamos County Golf Course, is located between Rendija Canyon to the north and Walnut Canyon, a small tributary to Pueblo Canyon, to the south. At an elevation of 7 210–7 400 ft, this site is located on a paleo-alluvial fan built outward from Rendija Canyon and is subsequently dissected by modern drainages. The paleo-alluvial fan comprises post-Bandelier alluvium derived from the Jemez Mountains, which lie to the west of the site. Bedrock underlying PRS 0-028(a) is the upper (Tshirege) member of the Bandelier Tuff (Fig. 2.2.1-1), and comprises fallout and ash-flow deposits of silicic volcanic rock from eruptions 1.2 million years ago. The exact cooling unit that underlies the golf course has not been determined with certainty. It may be the uppermost part of cooling unit 3 or cooling unit 4, which is exposed approximately one mile to the south. Post-Bandelier alluvium is up to 30 ft thick at the golf course and consists of poorly sorted clay-rich sand, gravel, and cobbles derived mainly from the Tschicoma Formation. Much of the post-Bandelier alluvium consists of angular to subrounded lithic clasts of Tshicoma volcanic rocks, crystals of feldspar, quartz, and biotite, and other ferromagnesian minerals derived from the Tshicoma Formation. In addition, the post-Bandelier alluvium contains clasts of pumice and tuff probably derived from units of the Bandelier Tuff. The Bandelier Tuff is underlain by sedimentary rocks of the Puyé Formation, which consists of fine- to coarse-grained fanglomerates interbedded locally with river gravels, lacustrine siltstone, and clay. Material composing the fanglomerates is derived mainly from the Tschicoma Formation to the west. Puyé Formation is not exposed at this site.

PRS 0-028(b), the North Mesa athletic fields, is located on North Mesa between Pueblo and upper Bayo Canyons at an elevation of approximately 7 300 ft. Bedrock underlying the site is of cooling unit 3 of the upper (Tshirege) member of the Bandelier Tuff (Fig. 2.2.1-1), and comprises fallout and ash-flow deposits of silicic volcanic rock from eruptions 1.5–1.2 million years ago. Cooling unit 3 is a cliff-forming, nonwelded to partially welded unit. The Bandelier Tuff is overlain by a thin layer of soil (less than 1 ft). Alluvium, which is commonly present at many mesa sites, does not appear to be present at this site. The Bandelier Tuff is underlain by sedimentary rocks of the Puyé Formation, which consists of fine- to coarse-grained fanglomerates

interbedded locally with river gravels, lacustrine siltstone, and clay. Material composing the fanglomerates is derived mainly from the Tschicoma Formation to the west. Puyé Formation is not exposed at this site.

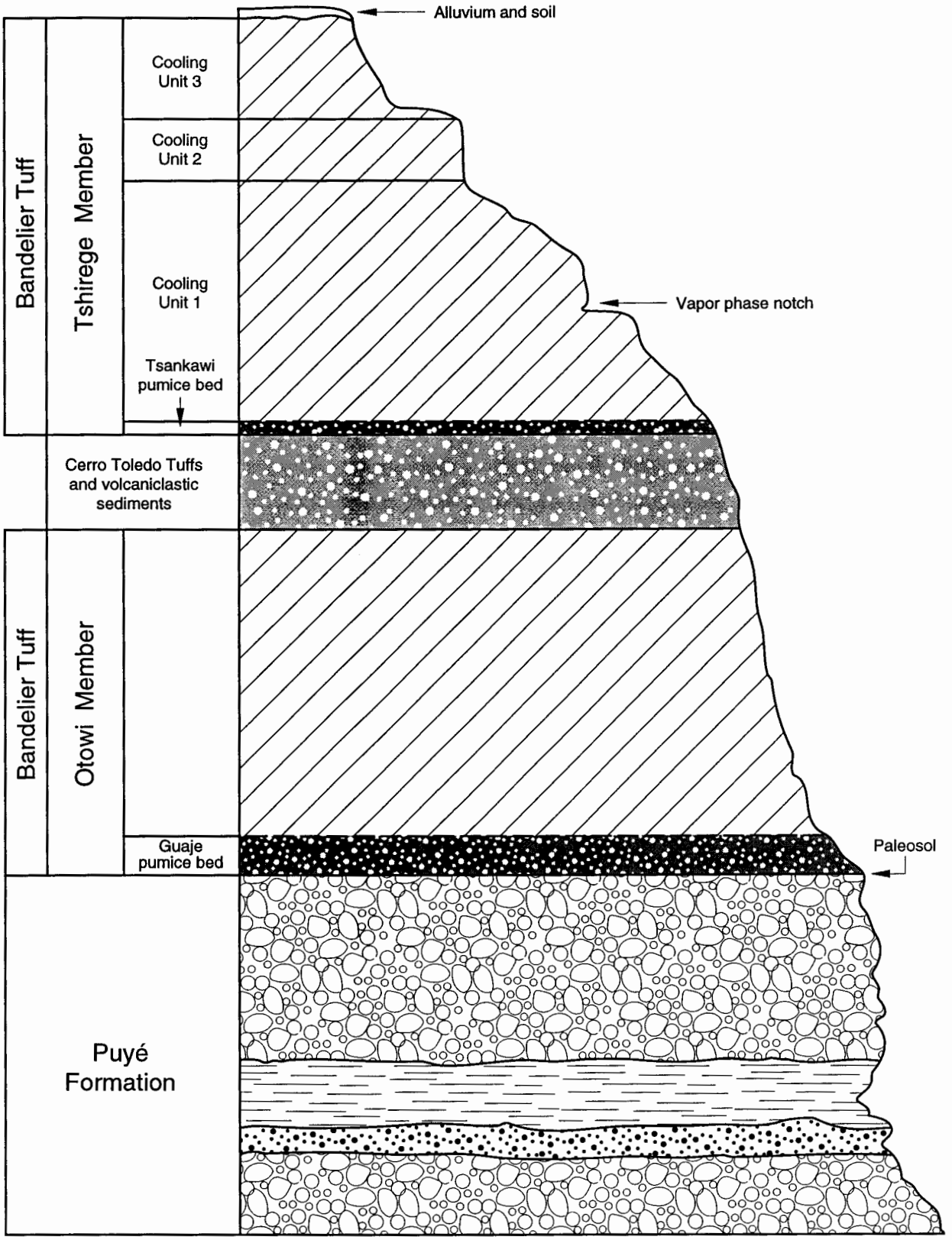


Fig. 2.2.1-1. Stratigraphy of TA-0.

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 PRSs 0-028(a,b) is presented below.

It is likely that no undisturbed soil remains at PRS 0-028(a). The upper 1–2 ft of soil/alluvium has been heavily disturbed by plowing, regrading, and fertilizing associated with building and improving the golf course; much of the soil and alluvium has been either removed or added. Soil exposed during golf course excavations is very clay-rich, but its original source is not known. It is also likely that no undisturbed soil remains at PRS 0-028(b). The upper surface of the athletic fields has been heavily disturbed by activities associated with improving the playing surface; much of the material there has possibly been removed or added. Soils in the area of PRSs 0-028(a,b) area have not been surveyed or studied. However, because the rock type, elevation, and geological setting at PRSs 0-028(a,b) are similar to TA-21 and other mesa sites, any undisturbed soils at these sites would probably be similar to soils at TA-21. In general these soils, developed on Bandelier Tuff and alluvium, are moderately to well-developed and belong to either the Hackroy or Nyjack soil series (Nyhan et al. 1978, 0161). The Hackroy series consists of very shallow to shallow, well-drained soils that have an A-Bt-R profile. Soil textures range from sandy loam to clay. The Nyjack series consists of moderately deep, well-drained soils that have an A-Bt-C-R profile. Texture ranges from gravely sandy loam to clay loam. In the TA-0 area, the R horizon is highly fractured Bandelier Tuff that shows signs of incipient weathering, and usually has clay-rich soil matrix along bedrock fractures.

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 0-028(a,b) are developed recreation areas located on a mesa. There is no surface water present at these sites; however, the potential exists for runoff following a thunderstorm or snow melt. Surface runoff from the golf course and athletic fields occurring as sheetflow during precipitation events is highly unlikely since the area is densely vegetated with little or no exposed soil.

2.3.2 Ground Water

The main aquifer beneath North Mesa is at an elevation of approximately 6 000 ft. At mesa sites such as PRSs 0-028(a,b), the surface is separated from the main aquifer by an unsaturated zone 1 000–1 300 ft thick. No perched aquifers or springs are known to exist in the immediate vicinity of this site.

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). PRSs 0-028(a,b) are characterized by heavy recreational development and urban disturbance. Because of this high level of disturbance, plant and animal inventories are not relevant and were not performed for this site.

2.5 Cultural Surveys

The National Historic Preservation Act requires a cultural resource survey. However, a survey was not conducted in the area of PRSs 0-028(a,b) because the sites are developed, urban areas and a survey would not be relevant.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSES

The decision approach used for PRSs 0-028(a,b) 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 were submitted to the SMO, the mobile radiological analytical laboratory (MRAL), and/or the mobile chemistry analytical laboratory (MCAL) for analysis.

3.1.1 Analytical Methods

All samples were analyzed using Environmental Protection Agency (EPA) SW-846 methods or the equivalent.

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 from consideration for background comparison 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 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 background screening value estimated from background data. Background screening values are upper tolerance limits (UTLs), maximum reported concentrations, or detection limits of nondetected chemicals. These background screening values are derived from LANL-wide soil background data. Details on the calculation of these background screening values are presented in "Natural Background Geochemistry and Statistical Analysis of Selected Soil Profiles, Sediments, and Bandelier Tuff" (Longmire, et al. 1995, 1266). There is one inorganic chemical, silver, for which LANL-wide soil background data do not exist. In this chemical-specific case, PRS sample-specific detection limits for silver are used as nominal background screening values.

Details of statistical methods used to generate UTLs 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, 1295). Further statistical comparisons between site and background data might be performed when UTLs 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 screening assessment. If a chemical does not have a reported concentration that exceeds the background screening value, then that chemical is removed from further consideration.

The ER Project has developed UTLs for the most commonly sampled chemicals and the most commonly analyzed media. For chemicals and 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 decision 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 through the screening assessment process. If a chemical does not have a reported concentration that exceeds its reporting limits, then that chemical 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 the chemical can be expected to be present at the site based on historical operations.

3.4 Human Health

3.4.1 Risk Due to Background

Background risks can result from inorganics that are naturally occurring at a site. Calculation of 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. SALs are based on health-protective assumptions for a residential scenario (EPA 1995, 1307). 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 UTL 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 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 UTL concentration 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.

Two of the 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 each for arsenic and beryllium.

These background risk estimates provide a frame of reference for the screening 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 the remedial action decisions for the site.

TABLE 3.4.1-1

RISK 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	19.3	0.00009	0.0002	nc	nc
Cobalt	6.0	19.2	0.0013	0.0042	nc	nc
Copper	5.75	15.5	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 based 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 risks 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 based on uptake biokinetic model.

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 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), or exceed reporting limits in at least one sample (organics), and are less than the SAL (all analytes) are included in the multiple chemical evaluation. These chemicals are divided into three classes: noncarcinogens, chemical carcinogens, and radionuclides. Additive effects are assumed within each class, but each class is evaluated separately. For further information on multiple chemical evaluations, see Technical Approach to RFI Reports (LANL in preparation, 1281).

3.4.3 Risk Assessment

No human health risk assessment was performed for PRSs 0-028(a,b) (see Section 5.0 for details).

3.5 Ecological

All information obtained from the Phase I investigation at PRSs 0-028(a,b) will be considered as part of a larger ecological exposure unit once the ecological exposure unit approach has been formally approved by LANL's regulators. Cumulative effects will be evaluated as part of the ecological risk assessment for the entire exposure unit.

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.

Target analyte list (TAL) metal analyses were conducted by graphite furnace atomic absorption (FAA) (EPA SW-846 method 7000a), cold vaporization atomic absorption (CVAA) (EPA SW-846 Method 7471), and inductively coupled plasma emission spectroscopy (ICPES) (EPA SW-846 Method 6010). The TAL metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and thallium.

Semivolatile organic compound (SVOCs) analyses were performed using gas chromatography/ mass spectroscopy (GC/MS) (EPA SW-846 Method 8270). Organochlorine pesticide and PCB analyses were performed using gas chromatography (GC) (EPA SW-846 Method 8081). Volatile organic compound (VOC) analyses were performed using purge and trap couples with GC/MS (EPA SW-846 Method 8260).

Radiological analyses were performed using gamma spectroscopy. The specific methods used for radiological analyses varied between the laboratories.

Data validation was performed by Los Alamos Technical Associates (LATA) on all data from the analytical laboratories. When the data validator found it necessary to qualify sample data because of failed quality control and/or noncompliance of method applications, the following codes were applied:

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.

J- = The associated numerical value is an estimated quantity biased low.

J+ = The associated numerical value is an estimated quantity biased high.

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 Inorganic Analysis

4.1.1 Request 1942

The percent recovery from the matrix spike sample was below the lower control limit for chromium. Sample data for chromium were qualified J-. All other data are valid and usable without qualification.

4.1.2 Request 1947

The relative percent difference (RPD) was beyond the acceptance criteria for aluminum, barium, chromium, lead, and manganese in the duplicate sample analysis. Therefore, sample data for the five elements were qualified J. All other data are valid and usable without qualification.

4.2 Organic Analysis

4.2.1 Request 1941

Samples associated with request 1941 were analyzed for SVOCs, VOCs, and organochlorine pesticides/PCBs. All QC criteria associated with the SVOCs and pesticide/PCB analyses were met. However, one SVOC target compound, phenanthrene, was qualified J for a detected concentration below the EQL but above 1 ug/kg. Otherwise, all QC criteria associated with the SVOCs and pesticide/PCB analyses were met. For the VOCs analysis, the EQL was raised for methylene chloride in all samples due to laboratory contamination as evident by the detection of methylene chloride in the method blanks. The EQL for acetone was raised in sample 0100-96-0136 due to laboratory contamination as evident by the detection of this compound in the method blank. For sample 0100-96-0136, the following target compounds were qualified UJ due to the area count of the last two internal standards being below the acceptance criteria: 1,3-dichloropropane, 2-hexanone, dibromochloromethane, 1,2-dibromoethane, chlorobenzene, 1,1,1,2-tetrachloroethane, ethylbenzene, xylenes (total), styrene, bromoform, bromobenzene, 1,2,3-trichloropropane, 1,1,2,2-tetrachloroethane, n-propylbenzene, 2-chlorotoluene, 4-chlorotoluene, 1,3,5-trimethylbenzene, tert-butylbenzene, 1,2,4-trimethylbenzene, sec-butylbenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 4-isopropylbenzene, n-butylbenzene, and 1,2-dibromo-3-chloropropane. For sample 0100-96-0137, 1,1,1-trichloroethane and tetrachloroethene were qualified J+ due to the percent recovery of the surrogate, 4-bromofluorobenzene (BFB), being above the upper control limit. Finally, 1,1,1-trichloroethane was qualified J in samples 0100-96-0122, 0100-96-0123, 0100-96-0125, 0100-96-0126, 0100-96-0129, and 0100-96-0135 for a detected concentration below the EQL but above 1 ug/kg. Tetrachloroethene was qualified J in samples 0100-96-0122, 0100-96-0127, 0100-96-0131, 0100-96-0132, 0100-96-0135, and 0100-96-0138 for a detected concentration below the EQL but above 1 ug/kg. Toluene was qualified J in sample 0100-96-0136 for a detected concentration below the EQL but above 1 ug/kg. 1,1,1-Trichloroethane and tetrachloroethene were qualified J+ in sample 0100-96-0134 for a high percent recovery of the surrogate, 4-bromofluorobenzene, and a detected concentration below the EQL but above 1 ug/kg. All other data are valid and usable without qualification.

4.2.2 Request 1946

Samples associated with request 1946 were analyzed for SVOCs, VOCs, and organochlorine pesticides/PCBs. All QC criteria associated with the SVOCs and pesticide/PCB analyses were met. For the VOCs analysis, the EQL was raised for methylene chloride in the majority of

samples due to laboratory contamination as evident by the detection of this compound in the method blanks. For sample 0100-96-0348, 1,1,1-trichloroethane and tetrachloroethene were qualified J+ due to the percent recovery of the surrogate, BFB, being above the upper control limit. Additionally the following target compounds were qualified UJ due to the area count of the last internal standard being below the acceptance criteria: 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 4-isopropylbenzene, n-butylbenzene, and 1,2-dibromo-3-chloropropane. For sample 0100-96-0357, methylene chloride, 1,1,1-trichloroethane, and tetrachloroethene were qualified J+ due to the percent recovery of the surrogate, BFB, being above the upper control limit. Additionally the following target compounds were qualified UJ due to the area count of the last internal standard being below the acceptance criteria: 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 4-isopropylbenzene, n-butylbenzene, and 1,2-dibromo-3-chloropropane. Finally, 1,1,1-trichloroethane was qualified J in samples 0100-96-0139 and 0100-96-0355 for a detected concentration below the EQL but above 1 ug/kg. Tetrachloroethene was qualified J in samples 0100-96-0344, 0100-96-0350, and 0100-96-0352 for a detected concentration below the EQL but above 1 ug/kg. Tetrachloroethene and toluene were qualified J+ in samples 0100-96-0345 and 0100-96-0357, respectively, for a high percent recovery of the surrogate, 4-bromofluorobenzene, and a detected concentration below the EQL but above 1 ug/kg.

4.3 Radiochemical Analysis

4.3.1 Request 1943

The duplicate sample analysis for gamma spectroscopy did not meet the required $\pm$ 3 control limit for the following isotopes: neptunium-237, barium-140, thorium-234, cesium-137, cadmium-109, lead-212, and potassium-40. Therefore, data for the seven isotopes were qualified J. Sample data were only qualified when the isotope was present above the method detection limit. All daughters of uranium-235, uranium-238, and thorium-232 were within levels expected from the decay of the parent isotopes.

4.3.2 Request 1948

All QC criteria associated with this request were met. All daughters of uranium-235, uranium-238, and thorium-232 were within levels expected from the decay of the parent isotopes.

5.0 SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 PRSs 0-028(a,b)

5.1.1 History

The Central Wastewater Treatment Plant handled waste from the following sources: TA-1 sanitary drains; the Zia motor pool building and warehouses; C-shop; a septic tank west of Buildings HT and FP; a septic tank that served the latrine at the security vault located Southwest of Delta and Sigma Buildings; a septic tank that served Buildings J and ML; a septic tank southeast of Building Y; five septic tanks at DP Site (TA-0); and residences east of Diamond Drive, south of Canyon Road, and between the treatment plant and the Los Alamos Airport.

The Pueblo Wastewater Treatment Plant managed sanitary waste and may have received radioactive and laboratory chemicals. The Pueblo plant received waste from the medical laboratory in TA-43 until 1983.

Any contaminants in the effluent from the Central and Pueblo wastewater treatment plants may have been released to the environment via percolation or runoff after the effluent was used as irrigation water at the golf course or the North Mesa athletic fields. As a result, contaminants may be present in the soil and or tuff. The contaminant concentrations in these effluents may constitute a release, particularly from the older effluents.

5.1.2 Description

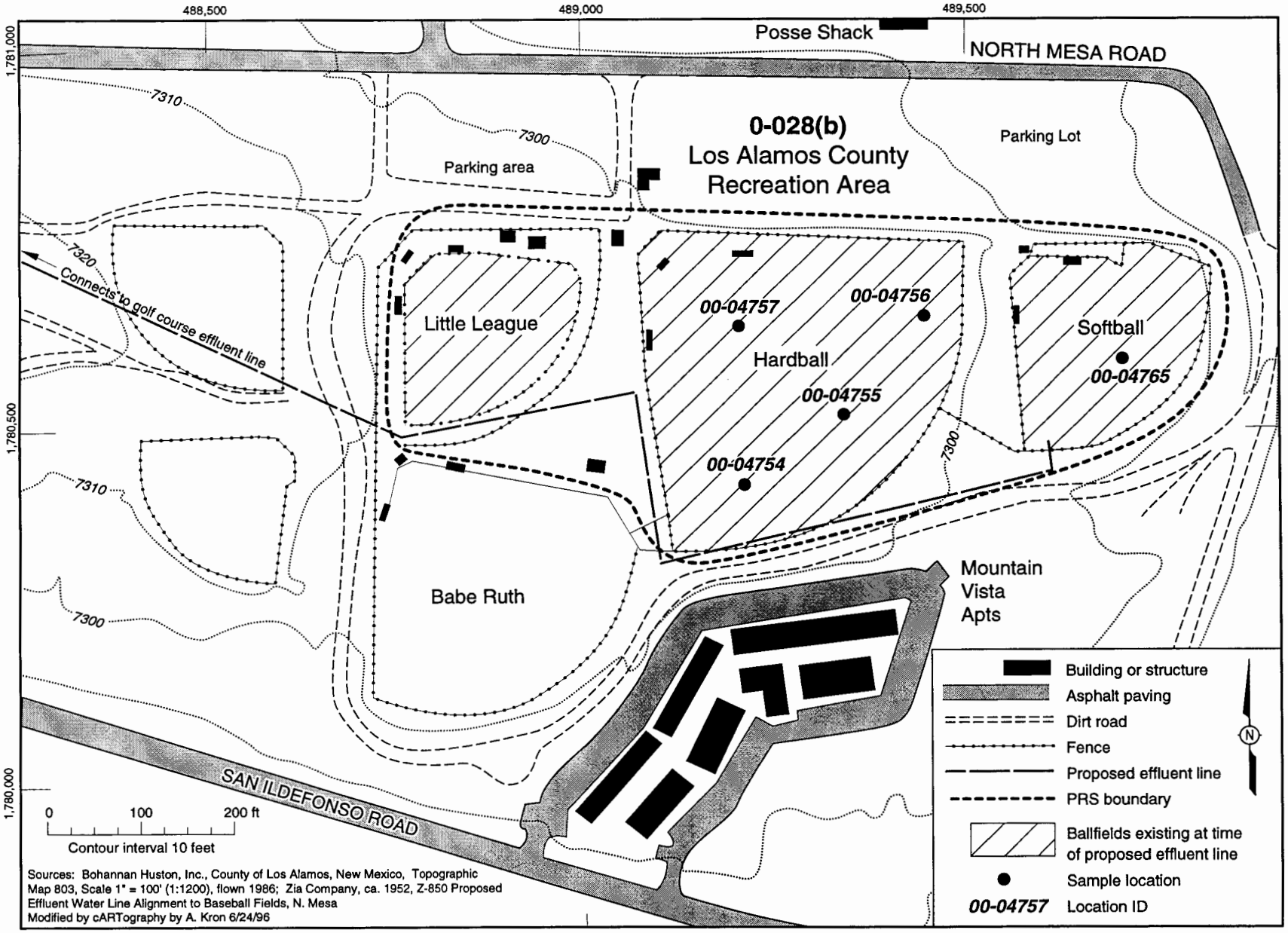
See Section 2.0 for a description of geological setting, soils, and hydrology pertinent to this report.

5.1.3 Previous Investigations

No previous investigations have been conducted in this area.

5.1.4 Field Investigation

Field activities at PRSs 0-028(a,b) consisted of a soil and hand-augered borehole sampling program designed to confirm that no contamination is present in the soil. Samples were collected at the surface, approximately half-way to welded tuff contact, and at the welded tuff interface (Fig. 5.1.4-1 and Fig. 5.1.4-2). The samples were screened by hand-held field instruments for gross gamma/beta and gross alpha contamination. All field activities were conducted in accordance with appropriate LANL ER Project SOPs. Sampling was conducted on April 3 and 4, 1996. A summary of samples collected and analyses performed is presented in Table 5.1.4-1.



Sources: Bohannan Huston, Inc., County of Los Alamos, New Mexico, Topographic Map 803, Scale 1" = 100' (1:1200), flown 1986; Zia Company, ca. 1952, Z-850 Proposed Effluent Water Line Alignment to Baseball Fields, N. Mesa
Modified by cARTography by A. Kron 6/24/96

Fig. 5.1.4-1 Sampling locations at North Mesa ballfields, PRS 0-028(b).

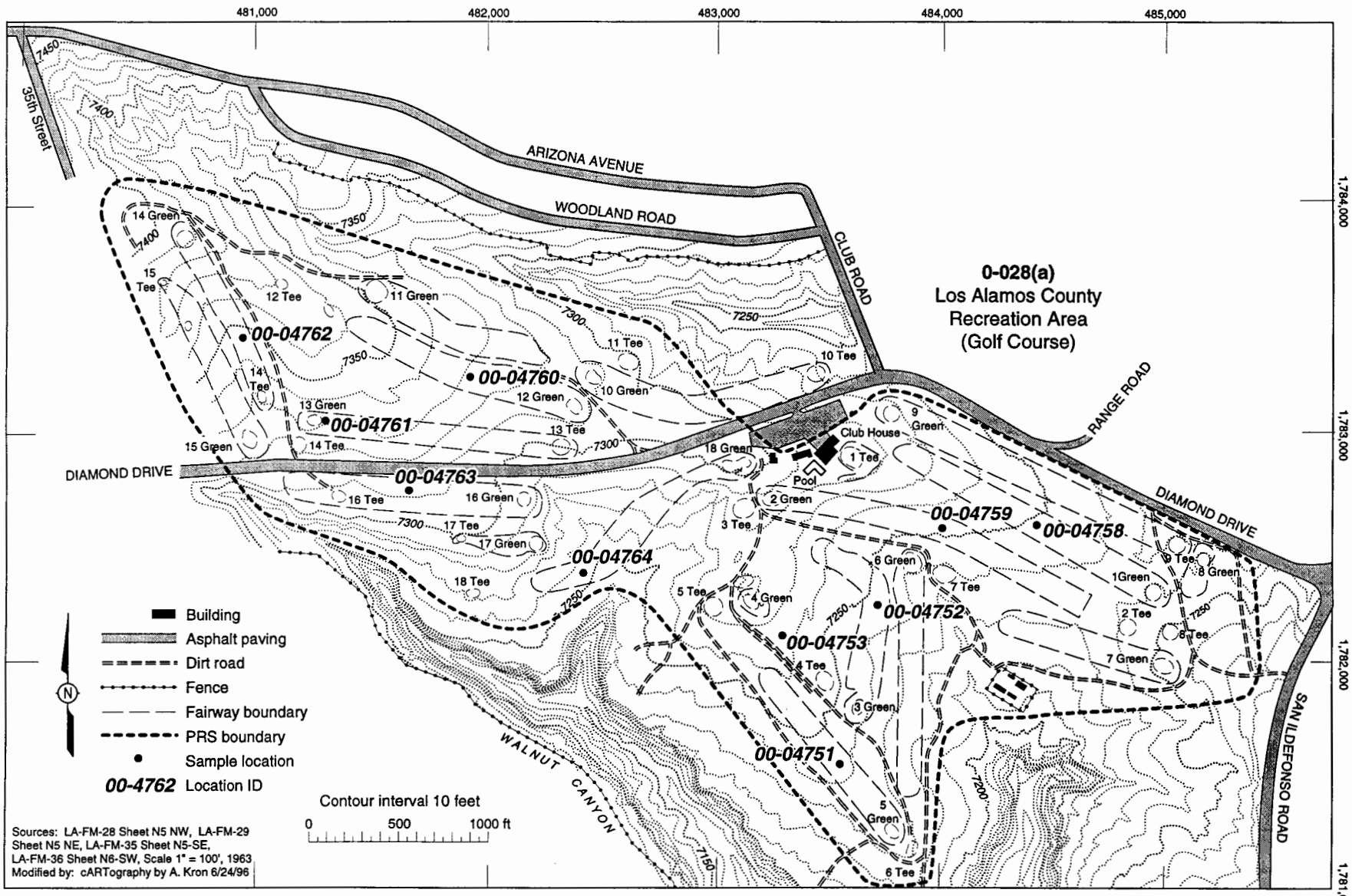


Fig. 5.1.4-2 Sampling locations at Los Alamos County Golf Course, PRS 0-028(a).

TABLE 5.1.4-1

SUMMARY OF SAMPLES COLLECTED AT PRSs 0-028(a,b)

LOCATION ID	SAMPLE ID	DEPTH (ft)	ANALYSES PERFORMED[a]									
			Moisture	GROSS ALPHA, BETA, GAMMA RADIATION	VOCs	SVOCs	METALS	Natural URAMIUM	PESTICIDES	PCB	GAMMA SPECTROSCOPY	ISOTOPIC PLUTONIUM
00-04751	0100-96-0121	0.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04751	0100-96-0122	3.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04751	0100-96-0123	6	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04752	0100-96-0124	0.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04752	0100-96-0125	3.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04752	0100-96-0126	6.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04753	0100-96-0127	0.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04753	0100-96-0128	2.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04753	0100-96-0129	5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04754	0100-96-0130	0.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04755	0100-96-0131	0.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04755	0100-96-0132	3	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04756	0100-96-0133	1	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04756	0100-96-0134	2	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04756	0100-96-0135	5.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04757	0100-96-0136	0.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04757	0100-96-0137	3	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04757	0100-96-0138	4.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04759	0100-96-0139	0.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	
00-04759	0100-96-0140	4	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04758	0100-96-0341	1.3	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04758	0100-96-0342	3	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948

TABLE 5.1.4-1 (CONTINUED)

SUMMARY OF SAMPLES COLLECTED AT PRSs 0-028(a,b)

LOCATION ID	SAMPLE ID	DEPTH (ft)	ANALYSES PERFORMED[a]									
			MOISTURE	GROSS ALPHA, BETA, GAMMA RADIATION	VOCs	SVOCs	METALS	NATURAL URAMIUM	PESTICIDES	PCB	GAMMA SPECTROSCOPY	ISOTOPIC PLUTONIUM
00-04758	0100-96-0343	6	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04760	0100-96-0344	2.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04760	0100-96-0345	2.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04760	0100-96-0346	5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04760	0100-96-0347	5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04761	0100-96-0348	1.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04761	0100-96-0349	3	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04762	0100-96-0350	1.3	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04761	0100-96-0351	5.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04762	0100-96-0352	4	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04762	0100-96-0353	7	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04763	0100-96-0354	1.3	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04763	0100-96-0355	2.5	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04764	0100-96-0356	1	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948
00-04765	0100-96-0357	1	MRAL	MRAL	1941	1941	1942	1942	1946	1946	1943	1948

[a] Four digit numbers indicate request number under which analysis was conducted. MRAL indicates that the analysis was conducted at the Mobile Radiological Analytical Laboratory.

Locations were entered into the FIMAD system. Location identification numbers and state plane coordinates are displayed in Table 5.1.4-2.

TABLE 5.1.4-2

LOCATION IDENTIFICATION NUMBERS AND STATE PLANE COORDINATES

LOCATION IDs	NORTH	EAST	ELEVATION
00-04751	1781550	483550	7242.8
00-04752	1782255	483710	7246.9
00-04753	1782120	483290	7263.5
00-04754	1780423	489212	7306.5
00-04755	1780521	489345	7307.5
00-04756	1780658	489460	7304.1
00-04757	1780645	489205	7307.9
00-04758	1782600	484430	7248.9
00-04759	1782585	484000	7251.6
00-04760	1783250	481935	7327.2
00-04761	1783060	481300	7331.1
00-04762	1783430	480950	7346.4
00-04763	1782760	481665	7311.2
00-04764	1782400	482420	7255.2
00-04765	1780595	489710	7292.7

While collecting soil samples, the field crew collected the following samples for QA/QC using LANL-ER-SOP-01.05, RO, "Field Quality Control Samples" (LANL, 0875).

- Two field duplicates were collected at location 00-04760. Sample 0100-96-0345 was a field duplicate of 0100-96-0344 and sample 0100-96-0347 was a field duplicate of 0100-96-0346.

Sample Screening

Samples were not screened for organic vapors. Samples were screened twice for radioactivity: once in the field to meet worker health and safety requirements and again by the MRAL to meet the requirements of analytical laboratories.

Deviations from the Work Plan

Deviations from the planned approach include the following.

- Sample screening in the field for organic vaposr was omitted. Because samples from both the surface and subsurface had high concentrations of organic detritus, it was deemed ineffective to screen for organic vapors.

This deviation from the planned approach did not affect significantly the field team's ability to meet the objectives of the field activities.

5.1.5 Background Comparisons

Inorganics

Thirty-seven soil samples collected from PRSs 0-028(a,b) were analyzed for TAL metals and total uranium.

Seven inorganics (beryllium, chromium, manganese, mercury, nickel, silver, and sodium) were detected above their respective background screening values. Further background comparisons were performed for beryllium, chromium, manganese, nickel, and sodium. Mercury and silver were not subjected to further background comparisons because the background data for these metals are inadequate to support other statistical tests. Mercury and silver were carried forward to the screening assessment because of the lack of background information.

Because the data for the other five metals (beryllium, chromium, manganese, nickel, and sodium) do not 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 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. These two tests can detect most types of differences between distributions. The Slippage test was also used to detect differences in the upper percentiles because of the small sample size. 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 COMPARISON

ANALYTE	GEHAN TEST P-VALUE	QUANTILE TEST P-VALUE	SLIPPAGE TEST P-VALUE
Beryllium	0.068	0.494	1
Chromium	0	0	0.94
Manganese	0.055	0.12	1
Nickel	0.0002	0.0024	1
Sodium	0	0	0.008

The results for beryllium and manganese are indicative of site concentrations that are not statistically elevated above background. The results for chromium, nickel, and sodium, however, are indicative of site concentrations that are greater than background.

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

TABLE 5.1.5-2

INORGANICS WITH CONCENTRATIONS ABOVE BACKGROUND SCREENING VALUES AT PRSs 0-028(a,b)

LOCATION ID	SAMPLE ID	CHROMIUM (mg/kg)	MERCURY (mg/kg)	NICKEL (mg/kg)	SILVER (mg/kg)	SODIUM (mg/kg)
UTL[a]	N/A[b]	19.3	0.1[c]	15.2	n/a[d]	915
SAL[e]	N/A	210[f]	23	1500	380	n/a
00-04751	0100-96-0121	15.9(J-[g])	0.067	6.29	0.655	1210
00-04751	0100-96-0123	18.6(J-)	0.054(U[h])	16	1.59	695
00-04753	0100-96-0127	14.5(J-)	0.071	6.47	0.661	1530
00-04753	0100-96-0128	17.1(J-)	0.048(U)	8.88	0.731	1560
00-04756	0100-96-0133	8.19(J-)	0.06	6.11	1.07	367
00-04757	0100-96-0137	12.3(J-)	0.053(U)	8.91	3.74	361
00-04759	0100-96-0139	14.1(J[i])	0.041(U)	10.5	0.549(U)	1390
00-04758	0100-96-0341	10.9(J)	0.054(U)	7.79	0.532(U)	974
00-04760	0100-96-0344	13.3(J)	0.053(U)	12.7	1.14	1450
00-04760	0100-96-0345	15.5(J)	0.053(U)	12.7	0.58(U)	1260
00-04760	0100-96-0347	18.5(J)	0.048(U)	16.3	0.57(U)	788
00-04761	0100-96-0348	12.7(J)	0.136	2.76	0.513(U)	612
00-04761	0100-96-0349	11.9(J)	0.063	12.9	0.608(U)	1090
00-04762	0100-96-0352	13.6(J)	0.049(U)	11.2	2.52	678
00-04762	0100-96-0353	37.1(J)	0.05(U)	19.8	0.597(U)	533
00-04763	0100-96-0354	11.4(J)	0.046(U)	9.3	0.537(U)	1810
00-04763	0100-96-0355	18.6(J)	0.057	14	0.55(U)	1910

[a] UTL = Upper tolerance limit.
[b] N/A = Not applicable.
[c] The value presented for this metal is the maximum reported concentration from the LANL site-wide background data set.
[d] n/a = Not available (detection limit was used as a background screening value).
[e] SAL = Screening action level.
[f] SAL for chromium is for total chromium, which assumes that one-sixth of the chromium is in the hexavalent form. This is likely a conservative assumption for PRSs 0-028(a,b), because the hexavalent chromium present in the treatment plant effluent, if any, would be expected to be reduced to the more environmentally stable trivalent form over time.
[g] J- = Estimated quantity biased low.
[h] U = Not detected.
[i] J = Estimated quantity.

Radionuclides

Thirty-seven samples collected from PRSs 0-028(a,b) were analyzed by gamma spectroscopy and nineteen samples were analyzed for isotopic plutonium.

Analyses of radionuclides by gamma spectroscopy often lead to the reporting of concentrations for certain radionuclides that are inappropriate to evaluate as potential site contaminants. These include: short-lived activation/fission products, naturally occurring background radionuclides, and daughter radionuclides of naturally occurring radionuclides. These three classes of radionuclides are generally not considered site contaminants for the reasons discussed below.

- Sixteen short-lived activation/fission products reported at PRSs 0-028(a,b) (barium-140, cadmium-109, cerium-139, cesium-134, cobalt-57, europium-152, lanthanium-140, manganese-54, mercury-203, ruthenium-106, selenium-75, sodium-22, strontium-85, tin-113, yttrium-88, and zinc-65) have half-lives ranging from a few days to 2.6 years. Several of these radionuclides are used as internal standards to measure equipment performance, laboratory background (or contamination), etc. Because there were no releases at this site in the three years before the 1996 sampling campaign, any radionuclide detected with a short half-life would not be attributed to Laboratory activities at these sites.

- Potassium-40 is a naturally-occurring radionuclide that is also routinely reported by the analyst because it is used as an internal standard to measure such things as equipment performance, laboratory background (or contamination), etc. There is no process knowledge of the use of potassium-40 at this PRS, and reported concentrations are generally within known background ranges for potassium-40 (Longmire et al. 1995, 1142 and 1266). Potassium-40 will not be considered a potential radionuclide contaminant at this site.

- Daughters of naturally occurring radionuclides (uranium and thorium) are also reported by gamma-spectroscopy analyses. These daughters (e.g., isotopes of actinium, bismuth, lead, protactinium, radium, radon, thallium, and thorium) are normally present in secular equilibrium concentrations

and are not directly evaluated as potential radionuclide contaminants. QA/QC activities reviewed daughter radionuclides for consistency with parent activities, and any that were not attributed to background concentrations of the parent were retained as potential contaminants.

EQLs and minimum detectable activities are often not available for radionuclides by gamma spectroscopy. A value of three times the measurement uncertainty (3 sigma or one standard deviation) is used to calculate a sample-specific minimum detectable activity, which is then employed in the same manner as a detection limit. This methodology is similar to Currie's method of determining radionuclide maximum detectable activity (Currie 1988, 0792). This 3-sigma screening value takes into account variability due to counting statistics, but does not account for spectral peak identification problems. Thus, this 3-sigma screening is conservative, and may include radionuclides whose presence is spuriously reported because of spectral interferences or misidentifications. Americium-241, cobalt-60, and uranium-235 were eliminated from further consideration based on this criterion.

Of the remaining four radionuclides reported for PRSs 0-028(a,b), cesium-137, plutonium-238, and plutonium-239/240 were eliminated from further consideration based on background screening value criteria. One radionuclide, neptunium-237, does not have an established background screening value and is carried forward to the screening assessment. The detected values for neptunium-237 are presented in Table 5.1.5-3.

TABLE 5.1.5-3

RADIONUCLIDES WITH DETECTED CONCENTRATIONS AT PRSs 0-028(a,b)

LOCATION ID	SAMPLE ID	NEPTUNIUM-237 (pCi/g)
UTL[a]	N/A[b]	n/a[c]
SAL[d]	N/A	1.9
00-04756	0100-96-0135	0.803(J[e])
00-04751	0100-96-0122	0.496(J)
00-04752	0100-96-0124	0.777(J)
00-04753	0100-96-0127	0.565(J)
00-04753	0100-96-0128	1.11(J)
00-04753	0100-96-0129	0.481(J)
00-04754	0100-96-0130	0.911(J)
00-04755	0100-96-0131	0.496(J)
00-04756	0100-96-0134	0.821(J)
00-04757	0100-96-0136	0.46(J)
00-04757	0100-96-0138	1.04(J)
00-04759	0100-96-0139	0.934
00-04758	0100-96-0342	0.813
00-04760	0100-96-0344	0.875
00-04760	0100-96-0345	0.49
00-04762	0100-96-0350	0.777
00-04761	0100-96-0351	0.431
00-04762	0100-96-0352	0.496
00-04762	0100-96-0353	0.813
00-04763	0100-96-0355	0.547
00-04765	0100-96-0357	0.766

[a] UTL = Upper tolerance limit.
[b] N/A = Not applicable.
[c] n/a = Not available (detection limit was used as a background screening value).
[d] SAL = Screening action level.
[e] J = Estimated quantity.

5.1.6 Evaluation of Organic Constituents

Thirty-seven samples collected from PRSs 0-028(a,b) were analyzed for VOCs and SVOCs. Thirty-six samples were analyzed for pesticides and PCBs; one sample, 0100-96-0355, was not analyzed for pesticides and PCBs because of a sample request error.

Ten organics (1,1,1-trichloroethane, acetone, methylene chloride, phenanthrene, tetrachloroethene, toluene, alpha-chlordane, gamma-chlordane, dieldrin, and heptachlor epoxide) were detected in one or more of these samples. The presence of two of these chemicals (i.e., acetone and methylene chloride) is believed to be attributed to laboratory contamination because they were also detected in the method blank (see Section 4.2); therefore, they will not be evaluated further. The remaining eight compounds are carried forward to the screening assessment although, as described below, they are not expected to be associated with historical irrigation using treatment plant effluent.

- Tetrachloroethene, toluene, and 1,1,1-trichloroethane were detected at low concentrations (i.e., well below 1 mg/kg). These compounds are sufficiently volatile such that they would be expected to evaporate during spray irrigation.

- Phenanthrene was detected in a single sample at a concentration well below the EQLs for the remaining samples. The presence of this compound in a single sample may be the result of a field or laboratory artifact.

- Alpha-chlordane, gamma-chlordane, dieldrin, and heptachlor epoxide are pesticides having relatively low solubilities in water. The presence of these compounds is more likely associated with normal maintenance activities at the golf course and athletic fields.

The concentrations for each sample that had at least one detected value for the eight remaining chemicals are presented in Table 5.1.6-1.

TABLE 5.1.6-1

ORGANICS WITH DETECTED CONCENTRATIONS AT PRSs 0-028(a,b)

LOCATION ID	SAMPLE ID	ALPHA-CHLORDANE (mg/kg)	GAMMA-CHLORDANE (mg/kg)	DIELDRIN (mg/kg)	HEPTACHLOR EPOXIDE (mg/kg)	1,1,1-TRICHLOROETHANE (mg/kg)	PHENANTHRENE (mg/kg)	TETRACHLOROETHENE (mg/kg)	TOLUENE (mg/kg)
SAL	N/A	0.34	0.34	0.28	0.49	3000	n/a	7	1900
00-04751	0100-96-0121	0.002(U[e])	0.002(U)	0.004(U)	0.002(U)	0.029	0.37(U)	0.021	0.006(U)
00-04751	0100-96-0122	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.003(J[f])	0.37(U)	0.001(J)	0.006(U)
00-04751	0100-96-0123	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.003(J)	0.37(U)	0.006(U)	0.006(U)
00-04752	0100-96-0124	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.028	0.36(U)	0.011	0.005(U)
00-04752	0100-96-0125	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.003(J)	0.39(U)	0.006(U)	0.006(U)
00-04752	0100-96-0126	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.005(J)	0.43(U)	0.006(U)	0.006(U)
00-04753	0100-96-0127	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.019	0.37(U)	0.002(J)	0.006(U)
00-04753	0100-96-0128	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.018	0.39(U)	0.011	0.006(U)
00-04753	0100-96-0129	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.002(J)	0.38(U)	0.006(U)	0.006(U)
00-04754	0100-96-0130	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.012	0.38(U)	0.017	0.006(U)
00-04755	0100-96-0131	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.007	0.38(U)	0.002(J)	0.006(U)
00-04755	0100-96-0132	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.008	0.4(U)	0.001(J)	0.006(U)
00-04756	0100-96-0133	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.02	0.38(U)	0.013	0.006(U)
00-04756	0100-96-0134	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.002(J+[g])	0.41(U)	0.003(J+)	0.006(U)
00-04756	0100-96-0135	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.005(J)	0.4(U)	0.001(J)	0.006(U)
00-04757	0100-96-0136	0.002(U)	0.002(U)	0.0054	0.002(U)	0.029	0.04(J)	0.016	0.004(J)
00-04757	0100-96-0137	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.01(J+)	0.37(U)	0.01(J+)	0.006(U)
00-04757	0100-96-0138	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.006	0.39(U)	0.003(J)	0.006(U)
00-04759	0100-96-0139	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.005(J)	0.4(U)	0.006	0.006(U)

TABLE 5.1.6-1 (CONTINUED)

ORGANICS WITH DETECTED CONCENTRATIONS AT PRSs 0-028(a,b)

LOCATION ID	SAMPLE ID	ALPHA-CHLORDANE (mg/kg)	GAMMA-CHLORDANE (mg/kg)	DIELDRIN (mg/kg)	HEPTACHLOR EPOXIDE (mg/kg)	1,1,1-TRICHLOROETHANE (mg/kg)	PHENANTHRENE (mg/kg)	TETRACHLOROETHENE (mg/kg)	TOLUENE (mg/kg)
SAL	N/A	0.34	0.34	0.28	0.49	3000	n/a	7	1900
00-04758	0100-96-0341	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.027	0.36(U)	0.016	0.006(U)
00-04760	0100-96-0344	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.006(U)	0.39(U)	0.005(J)	0.006(U)
00-04760	0100-96-0345	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.006(U)	0.39(U)	0.003(J+)	0.006(U)
00-04760	0100-96-0346	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.006(U)	0.39(U)	0.001(J)	0.006(U)
00-04761	0100-96-0348	0.055	0.044	0.004(U)	0.004	0.01(J+)	0.36(U)	0.011(J+)	0.006(U)
00-04762	0100-96-0350	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.006(U)	0.37(U)	0.002(J)	0.006(U)
00-04762	0100-96-0352	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.006(U)	0.4(U)	0.002(J)	0.006(U)
00-04763	0100-96-0355	NA	NA	NA	NA	0.003(J)	0.38(U)	0.006(U)	0.006(U)
00-04765	0100-96-0357	0.002(U)	0.002(U)	0.004(U)	0.002(U)	0.005 (J+)	0.36(U)	0.012(J+)	0.002(J+)

[a] SAL = Screening actin level.
[b] N/A = Not applicable.
[c] Screening action level for total chlordane.
[d] n/a = Not available.
[e] U = Not detected.
[f] J = Estimated quantity.
[g] J+ = Estimated quantity biased high.

Of the organics that were not detected in any sample collected from PRSs 0-028(a,b), 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, twenty-eight 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, 2-methyl-4,6-dinitrophenol, 2-methylnaphthalene, 3-nitroaniline, 4-nitroaniline, 2-nitrophenol, 4-nitrophenol, phenanthrene, and propylbenzene). These 35 organic chemicals generally fall into two general categories: polycyclic aromatic hydrocarbons (PAHs) and other organics. 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 the Laboratory may have resulted in the production of PAHs (e.g., operation of incinerators and automotive maintenance shops); however, these chemicals are relatively insoluble in water and would not be expected to be present in treatment plant effluent. The other organics are used in a wide variety of applications, potentially including degreasing operations and general organic chemistry research. While it is possible that one or more of the organics listed above may have been used at the Laboratory, none are believed to have been used in such large quantities as to still be detectable today. In addition, organics are relatively volatile such that, if present in treatment plant effluent, they would be expected to evaporate during spray irrigation. Therefore, none of the nondetected organics are carried forward to the screening assessment.

5.1.7 Human Health Assessment

5.1.7.1 Screening Assessment

Fourteen chemicals were carried forward from the background and reporting limit comparisons. Two of these chemicals (i.e., phenanthrene and sodium) do not have SALs to which the detected concentrations can be compared. Phenanthrene was detected in a single sample at an estimated concentration of 0.04 mg/kg. This value is significantly lower than the SALs for structurally similar compounds (e.g., 200 mg/kg for pyrene). Sodium occurs naturally in the environment and exposure at environmental levels is not associated with adverse health effects. Therefore, phenanthrene and sodium are not considered further in this screening assessment. None of the remaining 12 analytes was detected at a concentration greater than

its SAL; therefore, these chemicals (i.e., alpha-chlordane, gamma-chlordane, chromium, dieldrin, heptachlor epoxide, mercury, neptunium-237, nickel, silver, tetrachloroethene, toluene, and 1,1,1-trichloroethane) are included in the following multiple chemical evaluation.

A multiple chemical evaluation is performed separately for three classes of analytes: noncarcinogens, carcinogens (non-radioactive), and radionuclides. In this case, all three classes of analytes were identified for the multiple chemical evaluation; however, neptunium-237 is the only radionuclide, meaning that a multiple chemical evaluation based on this health endpoint is not required. Table 5.1.7.1-1 presents the results of the multiple chemical evaluation for PRSs 0-028(a,b). The total normalized values are 0.029 and 0.50 for noncarcinogenic and carcinogenic effects, respectively. These results indicate that the chemicals included in the multiple chemical evaluation should not pose an unacceptable noncarcinogenic or carcinogenic health risk. Therefore, none are identified as COPCs.

TABLE 5.1.7-1

PRSs 0-028(a,b) MULTIPLE CHEMICAL EVALUATION FOR SOIL

ANALYTE	LOCATION ID	SAMPLE ID	SAMPLE VALUE (mg/kg)	SOIL SAL[a] (mg/kg)	NORMALIZED VALUE
Noncarcinogenic Effects					
Mercury	00-04761	0100-96-0348	0.136	23	0.0059
Nickel	00-04762	0100-96-0353	19.8	1500	0.013
Silver	00-04757	0100-96-0137	3.74	380	0.0098
Toluene	00-04757	0100-96-0136	0.004 (J)[b]	1900	0.0000021
1,1,1-Trichloroethane	00-04751/ 00-04757	0100-96-0121/ 0100-96-0136	0.029	3000	0.0000097
				Total:	**0.029**
Carcinogenic Effects					
alpha-Chlordane	00-04761	0100-96-0348	0.055 (J-)[c]	0.34[d]	0.16
gamma-Chlordane	00-04761	0100-96-0348	0.044 (J-)	0.34	0.13
Chromium	00-04762	0100-96-0353	37.1	210[e]	0.18
Dieldrin	00-04757	0100-96-0136	0.0054 (J-)	0.28	0.019
Heptachlor expoxide	00-04761	0100-96-0348	0.004 (J-)	0.49	0.0082
Tetrachloroethene	00-04751	0100-96-0121	0.021	7	0.0030
				Total:	**0.50**

[a] SAL = Screening Action Level.
[b] (J) = Estimated quantity.
[c] (J-) = Estimated quantity biased low.
[d] SAL is for total chlordane.
[e] SAL for chromium is for total chromium, which assumes that one-sixth of the chromium is in the hexavalent form. This is likely a conservative assumption for PRSs 0-028(a,b), because the hexavalent chromium present in the treatment plant effluent, if any, would be expected to be reduced to the more environmentally stable trivalent form over time.

5.1.7.2 Risk Assessment

No human health risk assessment was performed for PRSs 0-028(a,b).

5.1.8 Ecological Assessment

No ecological risk assessment was performed for PRSs 0-028(a,b).

5.1.9 Extent of Contamination

Sampling was designed to support the screening assessment with samples collected in areas that received effluent.

5.1.10 Conclusions and Recommendations

No chemicals were retained as COPCs following the screening assessment process for PRSs 0-028(a,b). Therefore, these PRSs are recommended for NFA. Based on LANL's No Further Action Criteria Policy Criterion 4 (which states the PRS has been characterized in accordance with current state or federal regulations, and that COPCs are not present in concentrations that would pose an unacceptable risk under the most conservative assumption of residential future land use), a Class III permit modification will be requested to remove PRSs 0-028(a,b) from the Hazardous and Solid Waste Ammendments Module of LANL's RCRA operating permit (Environmental Project 1995, 1173).

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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 0-028(a,b)."

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APPENDIX B DATA QUALITY EVALUATION TABLE

TABLE B-1

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1941	0100-96-0121	Soil	SVOCs[a]	All data valid without qualification.
1941	0100-96-0121	Soil	VOCs[b]	Blank contamination caused EQL to be raised for methylene chloride. Two target compounds were qualified J for a reported concentration,less than EQL but greater than 1 ug/kg.
1941	0100-96-0121	Soil	Pesticides/PCBs[c]	All data valid without qualification.
1941	0100-96-0122	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0122	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a the reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0122	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0123	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0123	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0123	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0124	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0124	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1941	0100-96-0124	Soil	Pesticides/PCB	All data valid without qualification.
1941	0100-96-0125	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0125	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0125	Soil	Pesticides/PCB	All data valid without qualification.
1941	0100-96-0126	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0126	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0126	Soil	Pesticides/ PCB	All data valid without qualification.
1941	0100-96-0127	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0127	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0127	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0128	Soil	SVOCs	All data valid without qualification.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1941	0100-96-0128	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1941	0100-96-0128	Soil	Pesticides/PCB	All data valid without qualification.
1941	0100-96-0129	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0129	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0129	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0130	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0130	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1941	0100-96-0130	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0131	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0131	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0131	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0132	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0132	Soil	VOCs	One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0132	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0133	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0133	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1941	0100-96-0133	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0134	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0134	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. Two target compounds were qualified +J for high surrogate recovery and a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0134	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0135	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0135	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. Two target compounds were qualified J for reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0135	Soil	Pesticides/PCBs	All analytes qualified UJ for low surrogate recovery.
1941	0100-96-0136	Soil	SVOCs	One target compound was qualified +J for a reported concentration less than EQL but greater than 1 ug/kg.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1941	0100-96-0136	Soil	VOCs	Blank contamination caused EQL to be raised for acetone and methylene chloride. Twenty-seven target compounds qualified UJ for low internal standard areas. One target compound was qualified +J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0136	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0137	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0137	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. Two target compounds qualified +J for high surrogate recovery.
1941	0100-96-0137	Soil	Pesticides/PCBs	All data valid without qualification.
1941	0100-96-0138	Soil	SVOCs	All data valid without qualification.
1941	0100-96-0138	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1941	0100-96-0138	Soil	Pesticides/PCBs	All data valid without qualification.
1942	0100-96-0121	Soil	TAL metals[d]	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0121	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0122	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0122	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0123	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0123	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0124	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0124	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0125	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0125	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0126	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0126	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0127	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0127	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0128	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0128	Soil	Total uranium	All data valid without qualification.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1942	0100-96-0129	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0129	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0130	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0130	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0131	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0131	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0132	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0132	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0133	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0133	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0134	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0134	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0135	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0135	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0136	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0136	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0137	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0137	Soil	Total uranium	All data valid without qualification.
1942	0100-96-0138	Soil	TAL metals	Chromium qualified -J for low recovery in matrix spike sample.
1942	0100-96-0138	Soil	Total uranium	All data valid without qualification.
1943	0100-96-0121	Soil	RAD[e]	Cadmium-109, lead-212, barium-140, potassium-40, and cesium-137 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0122	Soil	RAD	Neptunium-237, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0123	Soil	RAD	Cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0124	Soil	RAD	Neptunium-237, barium-140, thorium-234, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1943	0100-96-0125	Soil	RAD	Barium-140, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0126	Soil	RAD	Cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0127	Soil	RAD	Neptunium-237, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0128	Soil	RAD	Neptunium-237, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0129	Soil	RAD	Neptunium-237, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0130	Soil	RAD	Neptunium-237, thorium-234, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0131	Soil	RAD	Neptunium-237, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0132	Soil	RAD	barium-140, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0133	Soil	RAD	barium-140, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0134	Soil	RAD	Neptunium-237, barium-140, thorium-234, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0135	Soil	RAD	Neptunium-237, thorium-234, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0136	Soil	RAD	Neptunium-237, thorium-234, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0137	Soil	RAD	Neptunium-237, barium-140, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.
1943	0100-96-0138	Soil	RAD	Neptunium-237, thorium-234, cesium-137, cadmium-109, lead-212, and potassium-40 qualified J for duplicate sample results not within the 3 sigma agreement.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1946	0100-96-0139	Soil	SVOCs	All data valid without qualification
1946	0100-96-0139	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1946	0100-96-0139	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0140	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0140	Soil	VOCs	All data valid without qualification.
1946	0100-96-0140	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0341	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0341	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1946	0100-96-0341	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0342	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0342	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1946	0100-96-0342	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0343	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0343	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1946	0100-96-0343	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0344	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0344	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1946	0100-96-0344	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0345	Soil	SVOCs	All data valid without qualification
1946	0100-96-0345	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified +J for high surrogate recovery and a reported concentration less than EQL but greater than 1 ug/kg.
1946	0100-96-0345	Soil	Pesticides/PCBs	All data valid without qualification
1946	0100-96-0346	Soil	SVOCs	All data valid without qualification
1946	0100-96-0346	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1946	0100-96-0346	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0347	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0347	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1946	0100-96-0347	Soil	Pesticides/PCBs	All data valid without qualification
1946	0100-96-0348	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0348	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. Two target compounds were qualified +J for high BFB recovery. Six target compounds were qualified UJ for low internal standard area count.
1946	0100-96-0348	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0349	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0349	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1946	0100-96-0349	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0350	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0350	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1946	0100-96-0350	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0351	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0351	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1946	0100-96-0351	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0352	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0352	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.
1946	0100-96-0352	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0353	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0353	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1946	0100-96-0353	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0354	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0354	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride.
1946	0100-96-0354	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0355	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0355	Soil	VOCs	Blank contamination caused EQL to be raised for methylene chloride. One target compound was qualified J for a reported concentration less than EQL but greater than 1 ug/kg.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1946	0100-96-0356	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0356	Soil	VOCs	All data valid without qualification.
1946	0100-96-0356	Soil	Pesticides/PCBs	All data valid without qualification.
1946	0100-96-0357	Soil	SVOCs	All data valid without qualification.
1946	0100-96-0357	Soil	VOCs	Two target compounds qualified +J for high BFB recovery. Six target compounds qualified UJ for low internal standard area count. One target compound was qualified +J for high surrogate recovery and a reported concentration less than EQL but greater than 1 ug/kg.
1946	0100-96-0357	Soil	Pesticides/PCBs	All data valid without qualification.
1947	0100-96-0139	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0139	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0140	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0140	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0341	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0341	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0342	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0342	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0343	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0343	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0344	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0344	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0345	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0345	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0346	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.

TABLE B-1 (CONTINUED)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1947	0100-96-0346	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0347	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0347	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0348	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0348	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0349	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-965-0349	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0350	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0350	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0351	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0351	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0352	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0352	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0353	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0353	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0354	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0354	Soil	Total uranium	All data valid without qualification.
1947	0100-965-0355	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0355	Soil	Total uranium	All data valid without qualification.
1947	0100-96-0356	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0356	Soil	Total uranium	All data valid without qualification.

TABLE B-1 (CONTINUED)
SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR PRS 0-028(a,b)

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
1947	0100-96-0357	Soil	TAL metals	Aluminum, barium, chromium, lead, and manganese qualified J for high RPD in duplicate sample.
1947	0100-96-0357	Soil	Total uranium	All data valid without qualification.
1948	0100-96-0139	Soil	RAD	All data valid without qualification.
1948	0100-96-0140	Soil	RAD	All data valid without qualification.
1948	0100-96-0341	Soil	RAD	All data valid without qualification.
1948	0100-96-0342	Soil	RAD	All data valid without qualification.
1948	0100-96-0343	Soil	RAD	All data valid without qualification.
1948	0100-96-0344	Soil	RAD	All data valid without qualification.
1948	0100-96-0345	Soil	RAD	All data valid without qualification.
1948	0100-96-0346	Soil	RAD	All data valid without qualification.
1948	0100-96-0347	Soil	RAD	All data valid without qualification.
1948	0100-96-0348	Soil	RAD	All data valid without qualification.
1948	0100-96-0349	Soil	RAD	All data valid without qualification.
1948	0100-96-0350	Soil	RAD	All data valid without qualification.
1948	0100-96-0351	Soil	RAD	All data valid without qualification.
1948	0100-96-0352	Soil	RAD	All data valid without qualification.
1948	0100-96-0353	Soil	RAD	All data valid without qualification.
1948	0100-96-0354	Soil	RAD	All data valid without qualification.
1948	0100-96-0355	Soil	RAD	All data valid without qualification.
1948	0100-96-0356	Soil	RAD	All data valid without qualification.
1948	0100-96-0357	Soil	RAD	All data valid without qualification.

[a] SVOCs = Semivolatile organic compounds.
[b] VOCs = Volatile organic compounds.
[c] Pesticides/PCB = Organochlorine pesiticides and polychlorinated biphenyls.
[d] TAL metals = Target analyte list metals.
[e] RAD = gamma scan.
[f] BFB = 4-bromafluorobenzine.
[g] RPD = Relative percent difference.

APPENDIX C RISK ASSESSMENT CALCULATIONS

No risk assessment was performed for PRSs 0-028(a,b).

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CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title: Submittal of RFI Report for PRS(s) 0-028(a, b) in TA-0

Name: _____ Date: 7-24-96

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