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Date: August 21, 1997
Refer to: EM/ER:97-332

AUG 1997
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Mr. Benito Garcia
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P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: SUBMITTAL OF THE RFI REPORT FOR PRSs 21-013(a) AND 21-026(a—c) IN TA-21 (FORMER OU 1106)

Dear Mr. Garcia:

Enclosed are two copies of the Los Alamos National Laboratory's Resource Conservation and Recovery Act Facility Investigation Report for Potential Release Sites 21-013(a) and 21-026(a—c) in Technical Area 21. One report is for your information and the second should go to your technical branch.

If you have any questions, please contact Garry Allen at (505) 667-3394 or Bonnie Koch at (505) 667-5794.

Sincerely,

Jorg Jansen, Program Manager
LANL/ER Project

Sincerely,

for Theodore J. Taylor, Program Manager
DOE/LAAO

JJ/TT/ss

Enclosures: (1) RFI Report for PRSs 21-013(a) and 21-026(a—c) in TA-21
(2) Certification

10304

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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: RFI Report for PRSs 21-013(a) and 21-026(a—c) in TA-21

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RFI Report for Potential Release Sites

21-013(a) and 21-026(a–c)

(located in former Operable Unit 1106)

Environmental
Restoration
Project

August 1997

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-97-589

EXECUTIVE SUMMARY

This report presents the results of the Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) conducted at Technical Area (TA) 21 at Los Alamos National Laboratory (LANL). This report specifically addresses Potential Release Sites (PRSs) 21-013(a) and 21-026(a–c). Included in this report are the data assessment and analysis approach used in this investigation, and the site-specific results, conclusions, and recommendations regarding RCRA chemicals for the PRSs listed above. Although radionuclides are regulated by the Department of Energy (DOE) and are not regulated under RCRA, it is more efficient and cost effective to investigate all types of potential contamination during a single site characterization. Therefore, radiochemical concerns are addressed in this report.

PRS 21-013(a) is a former surface disposal area for waste sand from a series of sand filter/sludge drying beds [PRS 21-026(b)] associated with the sewage treatment plant [PRS 21-026(a)]. PRS 21-013(a) covers approximately 45 ft^2. Use of the area for sand disposal ceased in 1991, and possibly earlier. Any contamination at PRS 21-013(a) is attributable to contaminated wastes that potentially entered the PRS 21-026(a) sewage treatment plant through sanitary, floor, and storm water drains.

The objective of the RFI at PRS 21-013(a) was to determine whether contaminants are present at the site and, if so, to determine the extent of contamination. During the RFI at PRS 21-013(a), thirteen surface soil samples were collected from nine locations from depths ranging from 0–18 in. All samples were screened in the field for radioactivity and volatile organic compounds (VOCs), and selected samples were submitted for fixed-laboratory analysis for radionuclides, VOCs, semivolatile organic compounds (SVOCs), and metals. Results of field screening indicate that no sample had radiation levels exceeding the action levels defined in the Site-Specific Health and Safety Plan (SSHASP), and no sample contained VOCs at levels greater than the detection limit. Background comparison and screening assessment of the fixed laboratory analytical results indicate that no chemicals are present at the site at levels that pose an unacceptable risk to human health. Therefore, PRS 21-013(a) is proposed for no further action (NFA) based on Criterion 5 of LANL's NFA Criteria Policy.

PRSs 21-026(a–c) are considered together in this report because they are in close proximity, and they are expected to have the same chemicals of potential concern (COPCs) because they were all part of the sewage treatment process at TA-21. These PRSs are described individually below.

- PRS 21-026(a) is an extended aeration sanitary waste treatment facility consisting of a grit chamber, digester, aeration tank, and clarifier. Wastes were treated at this sewage treatment plant from 1966 until 1990, when treatment operations stopped. Currently, the sewage treatment plant collects and stores sanitary wastes and cooling water from TA-21 facilities until they are trucked to the LANL Sanitary Waste Systems Consolidation (SWSC) Facility for treatment.

- PRS 21-026(b) is a series of four sand filter/sludge drying beds, each 14.5-ft wide x 23-ft long x 4-ft deep, that were built in 1966. All four beds were used until 1990 as sludge drying beds. In 1990, the two western-most beds were converted to sand filters for effluent from the dosing siphon chamber. When treatment operations ceased at the sewage treatment plant, the four beds were filled with clean sand.

- PRS 21-026(c) is a dosing siphon chamber that was built in 1966 as part of the sewage treatment plant. The chamber consists of a 5-ft wide x 7-ft long x 8-ft deep concrete tank that was originally used as a chlorine contact chamber where waste water was treated with chlorine disinfectant. In 1990, when chlorine treatment was no longer needed, the chamber was converted to a dosing siphon chamber. The dosing siphon chamber received effluent until the chamber was full, and then the effluent was pumped to the two sand filter beds. When treatment operations stopped at the sewage treatment plant, the dosing siphon chamber was abandoned.

Any contamination at PRSs 21-026(a–c) is attributable to contaminated wastes that potentially entered the sewage treatment plant through sanitary, floor, and storm water drains.

The objective of the RFI at PRSs 21-026(a–c) was to determine whether contaminants are present at the site and, if so, to determine the extent of contamination. During the RFI at PRSs 21-026(a–c), four boreholes were drilled and 39 samples were collected. Samples were screened in the field for radioactivity and VOCs, and submitted to LANL's Chemical Science and Technology Division for analysis of chlorate and nitrate content. The results of field

screening for radiation and organic vapors indicate that no sample had radiation or organic vapor levels exceeding the action levels defined in the SSHASP. Chlorate and nitrate results were used to determine which samples would be sent to a laboratory for analysis based on the assumption that elevated levels indicate areas contaminated by leaks from the sewage treatment plant. Based on these results, 16 samples were sent to a fixed laboratory for analysis for radionuclides, VOCs, SVOCs, and metals. Background comparison and screening assessment of the fixed laboratory analytical results indicate that no chemicals are present at the site at levels that pose an unacceptable risk to human health. Therefore, PRSs 21-026(a–c) are proposed for NFA based on Criterion 5 of LANL's NFA Criteria Policy, NFA Criterion 5. The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

Based on the results of this RFI, a request for Class III permit modification will be submitted to remove PRSs 21-013(a) and 21-026(a–c) from the Hazardous and Solid Waste Amendments (HSWA) Module of LANL's Hazardous Waste Facility Permit.

TABLE ES-1

SUMMARY OF PROPOSED ACTIONS

			PROPOSED ACTION				
PRS NUMBER	HSWA[a]	RADIONUCLIDE COMPONENT[b]	NFA CRITERION	FURTHER ACTION[c]	ADD TO HSWA MODULE[d]	RATIONALE	SECTION NUMBER
21-013(a)	X	X	5			RCRA and radionuclide contamination are below SALs.	5.1
21-026(a)	X	X	5			RCRA and radionuclide contamination are below SALs.	5.2
21-026(b)	X	X	5			RCRA and radionuclide contamination are below SALs.	5.2
21-026(c)	X	X	5			RCRA and radionuclide contamination are below SALs.	5.2

[a] An X in this column indicates that the site is listed on the Hazardous and Solid Waste Amendments HSWA Module (Module VIII) of LANL's RCRA operating permit.
[b] An X in this column indicates that the site has a radionuclide component.
[c] VCA, EC, further investigation, or CMS.
[d] An X in this column indicates that hazardous constituents were confirmed at a site not already listed on the HSWA Module. The site requires further action; therefore, the site needs to be added to the Module.

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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) conducted at Technical Area (TA) 21 at Los Alamos National Laboratory (LANL). The Potential Release Sites (PRSs) discussed in this report are PRSs 21-013(a) and 21-026(a–c). Included in this report are the data assessment and analysis approach used in this investigation, and the site-specific results, conclusions, and recommendations regarding RCRA chemicals for the PRSs listed above. Although radionuclides are regulated by the Department of Energy (DOE) and are not regulated under RCRA, it is more efficient and cost effective to investigate all types of potential contamination during a single site characterization. Therefore, radiochemical concerns are addressed in this report.

1.1 General Site History

TA-21 is located on DP Mesa, on the northern LANL boundary immediately east-southeast of the Los Alamos town site (Figs. 1.1-1, 1.1-2, and 1.1-3). TA-21 was used primarily for plutonium research, metal production, and related activities from 1945 to 1978. Since 1978, administrative and various other activities have been conducted at TA-21. Chemicals used historically at TA-21 include radionuclides, organic compounds, and inorganic compounds. Additional background information is presented in Chapter 3 of the TA-21 Operable Unit (OU) RFI Work Plan (LANL 1991, 0689).

This report specifically addresses four PRSs: PRS 21-013(a) (a surface disposal area), PRS 21-026(a) (a sewage treatment plant), PRS 21-026(b) (a series of sand filter/sludge drying beds), and 21-026(c) (a dosing siphon chamber). These PRSs are considered together because they are in close proximity, and they are expected to have the same chemicals of potential concern (COPCs) because they were all part of the sewage treatment process at TA-21. The outfall for the sewage treatment plant [PRS 21-026(d)] was investigated in 1992 and was proposed for no further action (NFA) in the TA-21 OU RFI Phase Report 1C, Outfalls Investigation, which is currently the subject of a notice of deficiency (NOD) (LANL 1994, 01-0010).

1.2 RFI Overview

The conceptual models assumed for PRSs 21-013(a) and 21-026(a–c) are presented in Chapter 5.1 of the TA-21 OU RFI Work Plan (LANL 1991, 0689). For PRS 21-013(a), the conceptual model assumes surface contamination and near-surface liquid releases. For PRSs 21-026(a–c), the conceptual model assumes surface contamination, near-surface liquid

releases, and deep liquid releases. The objective of the RFI, as stated in Chapter 14.8 of the TA-21 OU RFI Work Plan, was to determine whether contaminants are present at the site and, if so, to determine the extent of contamination (LANL 1991, 0689).

1.3 Field Activities

Field activities at PRSs 21-013(a) and 21-026(a–c) were conducted in August and September 1994. These activities were conducted according to Chapter 14.8 of the TA-21 OU RFI Work Plan, and they included the following (LANL 1991, 0689).

- A geodetic survey was conducted to establish the sampling grid at PRS 21-013(a) and to document borehole locations at PRSs 21-026(a–c).
- A radiological survey was conducted at PRS 21-013(a).
- At PRS 21-013(a), thirteen surface soil samples were collected from nine locations.
- At PRSs 21-026(a–c), four boreholes were drilled and a total of 39 samples were collected.

All applicable LANL Environmental Restoration (ER) standard operating procedures (SOPs) were followed (LANL, 0875).

2.0 ENVIRONMENTAL SETTING

The environmental setting of the Laboratory is described in Section 2.4 of the ER Installation Work Plan (IWP) (LANL 1995, 1275). A detailed discussion of the environmental setting for TA-21, including climate, geology, hydrology, and a conceptual hydrogeologic model for the area and its surroundings, is presented in the TA-21 OU RFI Work Plan (LANL 1991, 0689). A summary is presented in the following sections.

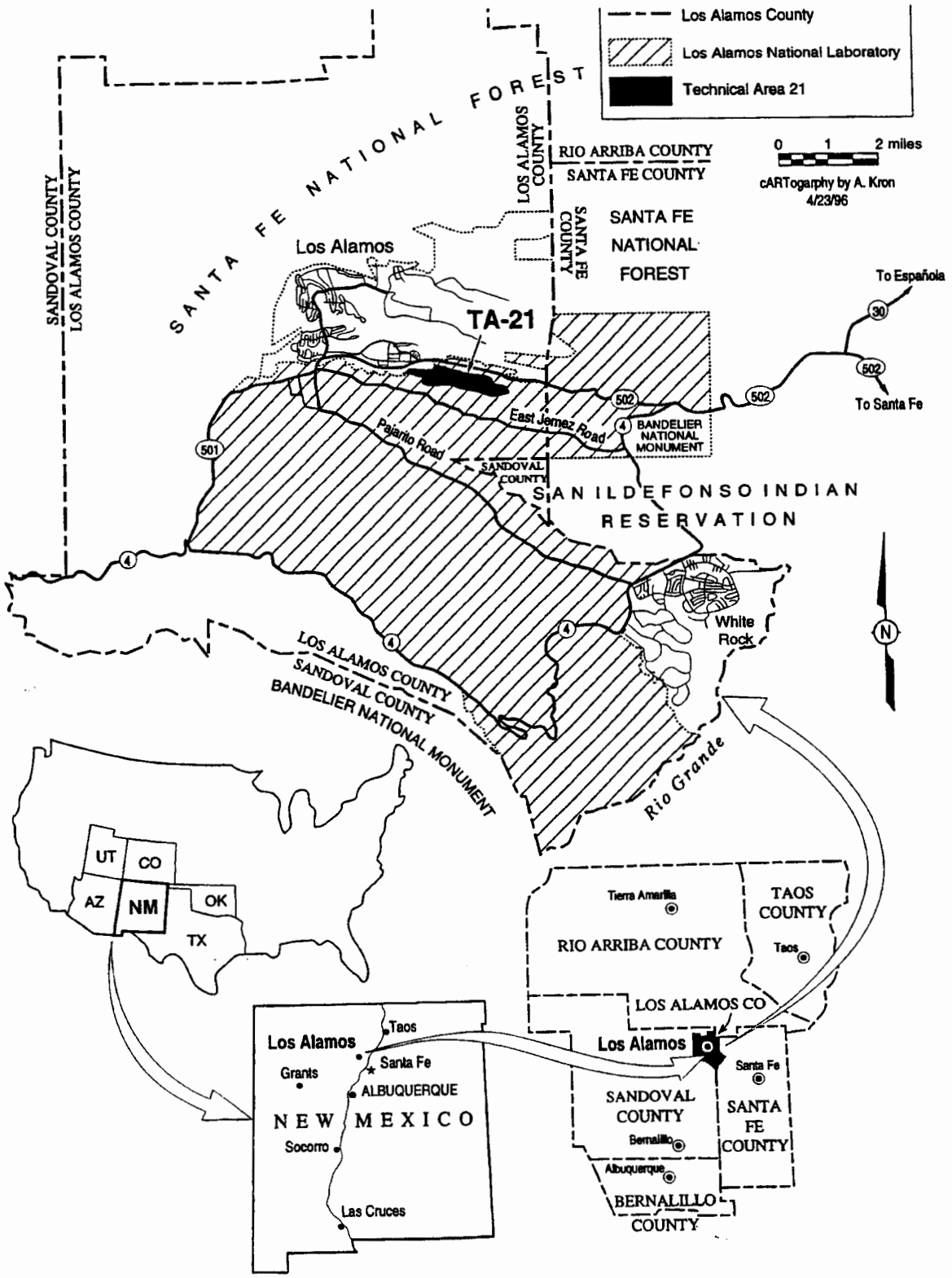

Fig. 1.1-1 Location of TA-21 within Los Alamos National Laboratory, Los Alamos County, New Mexico.

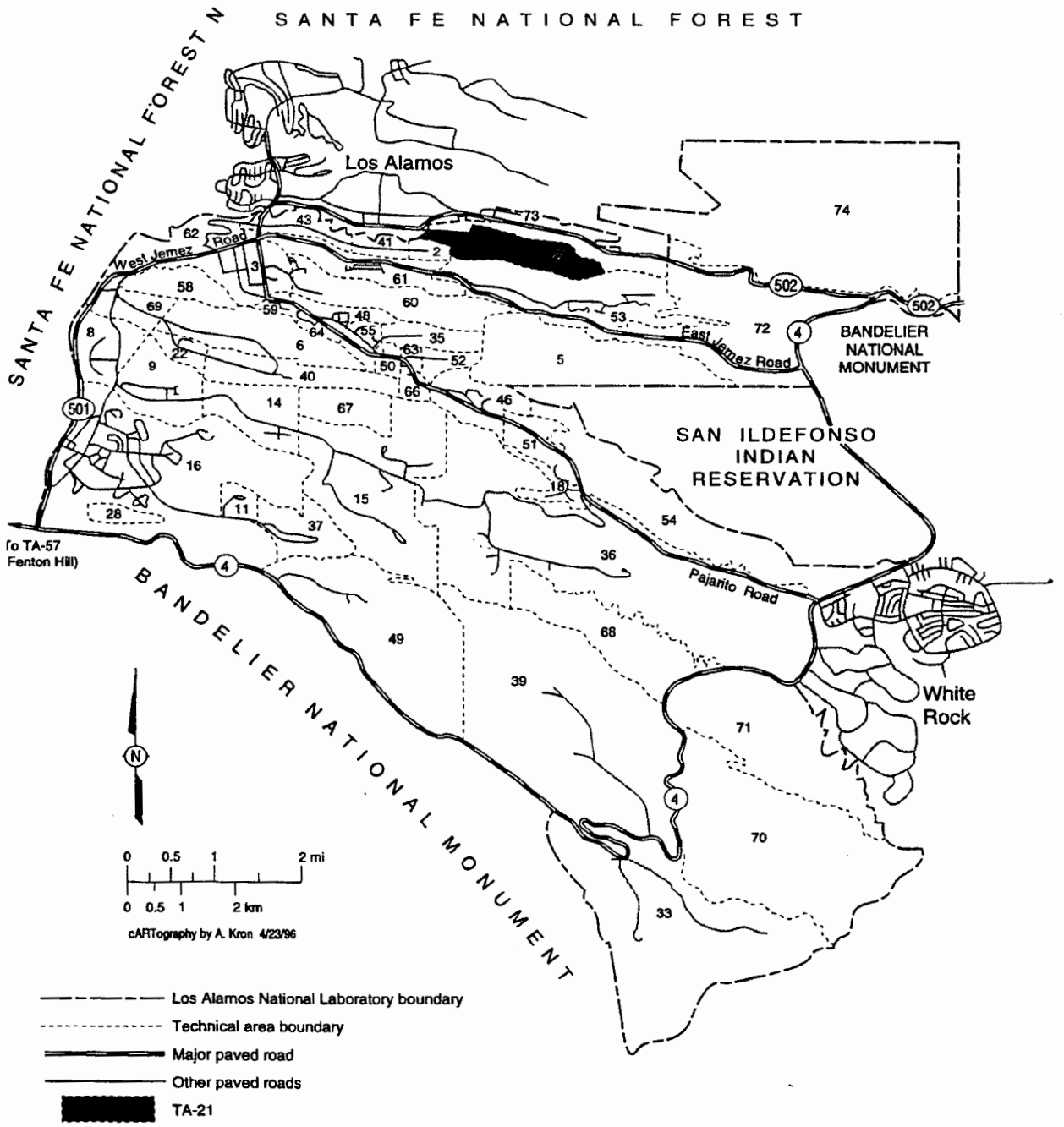

Fig. 1.1-2 Location of TA-21 with respect to Laboratory TAs and surrounding land holdings.

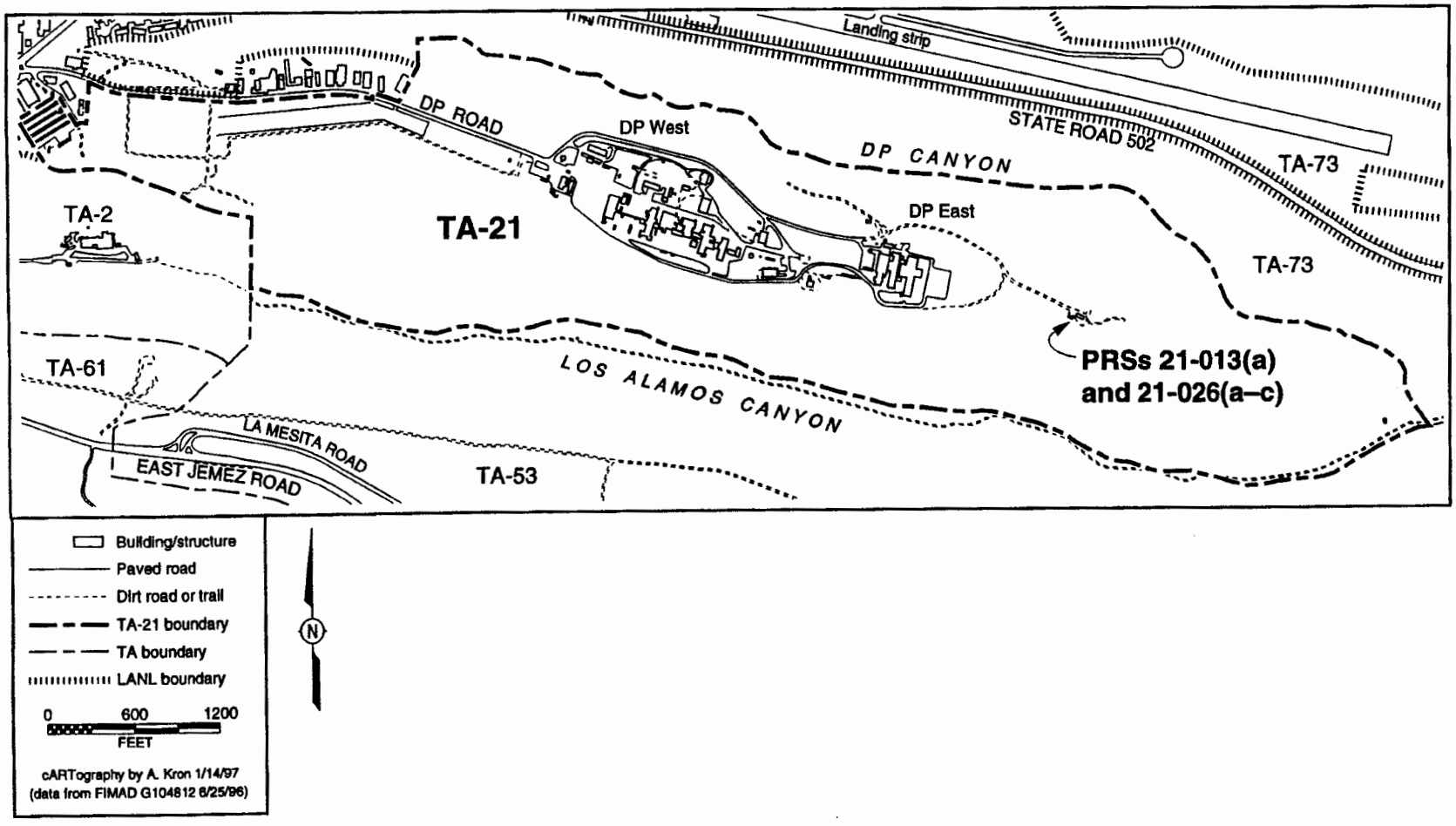

Fig. 1.1-3 Location of PRSs 21-013(a) and 21-026(a–c) at TA-21.

2.1 Climate

Los Alamos County has a semiarid, temperate, mountain climate. Summers are generally sunny with moderate, warm days and cool nights. High altitude, light winds, clear skies, and dry atmosphere allow summer temperatures to range from 50°F to 90°F. During the winter, temperatures typically range from 15°F to 50°F. Normal annual precipitation in Los Alamos, including rainfall and water-equivalent snowfall, is 18 in. Of this total, approximately 40% occurs as brief, intense thunderstorms during July and August. Stream flow in canyons can occur as a result of these storms. Spring snowmelt runoff may also induce stream flow in area canyons. Winter snowfall averages 51 in. annually (ESG 1989, 0308). 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. Strong winds occur mainly in the spring. 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 Los Alamos area can be found in Section 2.5.1.3 of the IWP (LANL 1995, 1275). Reports of geological studies at TA-21 are presented in Earth Science Investigations for Environmental Restoration–Los Alamos National Laboratory (Broxton and Eller 1995, 1162). A summary of that information, emphasizing conditions relevant to PRSs 21-013(a) and 21-026(a–c) is presented below.

TA-21 is located on DP Mesa at an elevation of 7 120–7 150 ft, 1 200 ft above the main aquifer. The area is bounded on the north by DP Canyon and on the south by Los Alamos Canyon. The generalized stratigraphy of TA-21 is presented in Fig. 2.2.1-1. PRSs 21-013(a) and 21-026(a–c) are located near the east end of DP Mesa. The geology underlying these PRSs consists of a soil of various thickness and maturity (more mature toward the mesa center) underlain by Unit 3 of the Bandelier Tuff. The near-surface unit is the Otowi member, which is poorly welded and rather easily eroded. Units exposed lower on the canyon walls on either side of TA-21 are strongly welded cliff-forming units. Whereas the welded units exhibit well-developed fracturing, the Otowi near-surface unit does not. No faults crossing TA-21 have been observed.

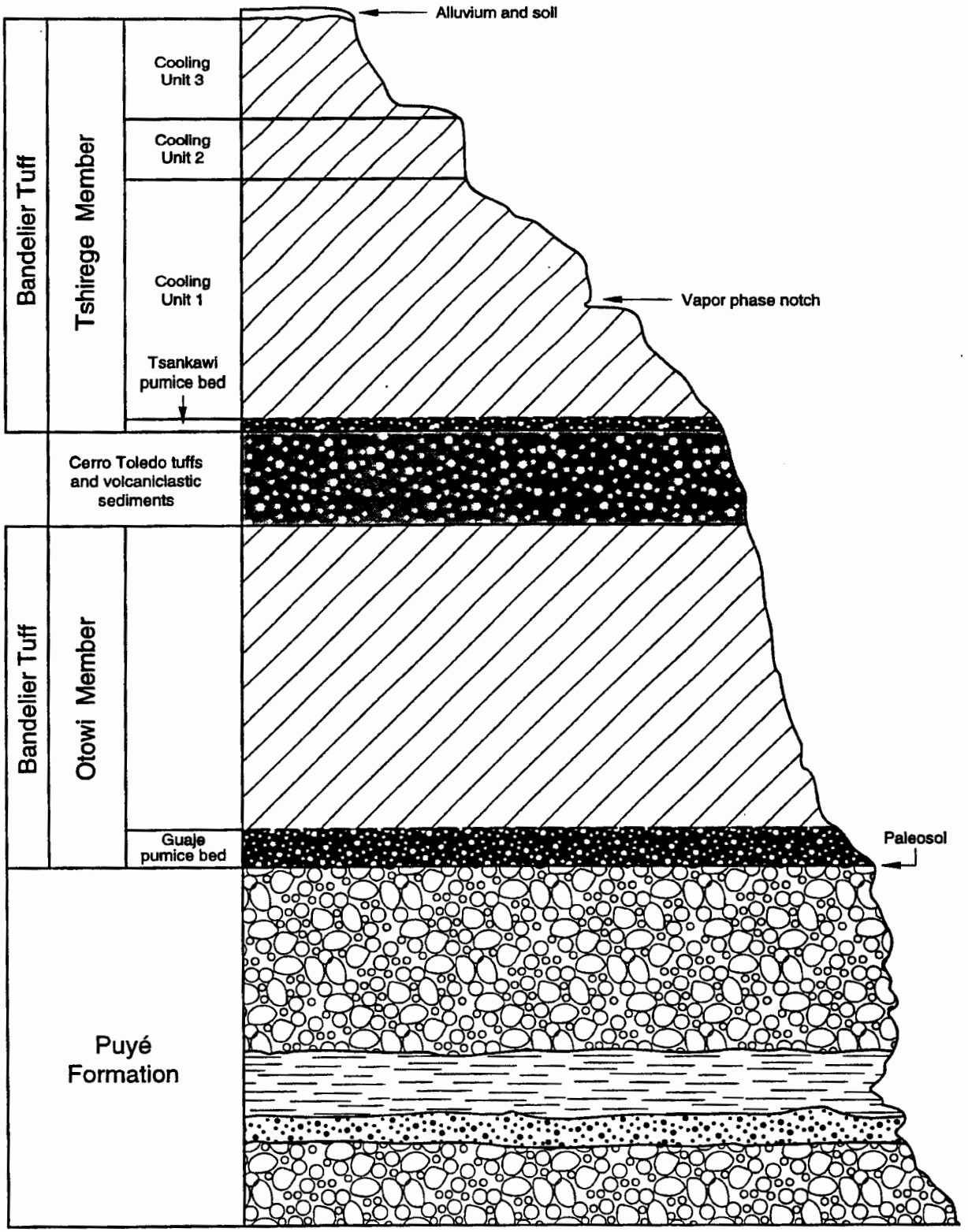

Fig. 2.2.1-1 Generalized stratigraphy of TA-21.

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, 1275). A summary of the information specific to TA-21 is presented below.

At undisturbed areas at TA-21, the soil is composed of moderately to well-developed soils developed on Bandelier Tuff and alluvium. Soils 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 gravelly sandy loam to clay loam. In the TA-21 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.

Most of TA-21 has been disturbed by construction and 40 years of site operations, with the result that natural soil profiles are, in general, not well preserved. In some cases, soil has been removed or buried by fill during construction of pads for buildings, parking lots, and waste pits.

2.3 Hydrology

The hydrology of the Pajarito Plateau is summarized in Section 2.5.2 of the IWP (LANL 1995, 1275). Site-specific conditions are summarized below.

2.3.1 Surface water

The hydrogeology of TA-21 is described in detail in Section 4.1.4 of the TA-21 OU RFI Work Plan (LANL 1991, 0689). PRSs 21-013(a) and 21-026(a–c) are located near the east end of DP Mesa where any surface drainage from the site would flow north into a small tributary channel of DP Canyon (Fig. 2.3.1-1). This tributary is an abandoned paleochannel that is presently filled with eolian and sheetwash sands, as discussed in "Geomorphic Studies at DP Mesa and Vicinity," which is included in Earth Science Investigations for Environmental Restoration (Broxton and Eller 1995, 1162). Any contaminants present in runoff into this channel would quickly absorb to these fine sands. It is therefore highly unlikely that any surface runoff from PRSs 21-013(a) and 21-026(a–c) will carry contaminants beyond the tributary to the floor of DP Canyon. There is no indication that normal runoff from PRSs 21-013(a) and 21-026(a–c) carries any contaminants into the paleochannel.

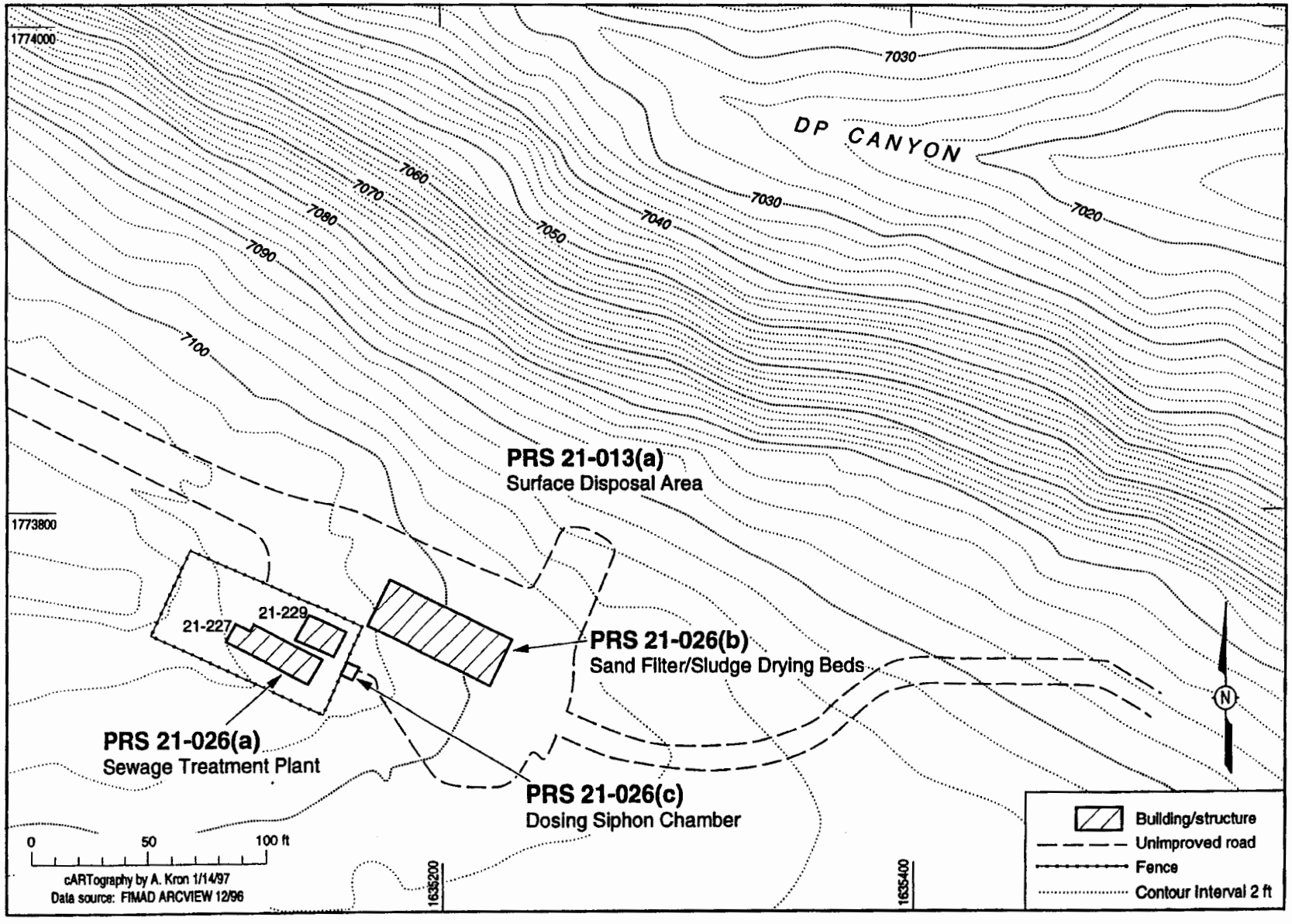

Fig. 2.3.1-1 Topography of TA-21.

2.3.2 Groundwater

The main aquifer beneath TA-21 is at an elevation of approximately 5 900 ft. chiefly within sediments of the Puyé and Tesuque Formations (Purtymun 1995, 1293; Broxton and Eller 1995, 1162). The elevation of the aquifer was determined in Test Well 2 in Pueblo Canyon (several miles north of TA-21), and in Otowi 4 in Los Alamos Canyon, (approximately 1/2 mile east of TA-21). Thus, for mesa-top sites at TA-21, more than 1 200 ft of tuff and volcaniclastic sediments separate the surface from the main aquifer. In addition to the main aquifer, two perched aquifers exist at TA-21. Shallow alluvial aquifers are present in sediments of both Los Alamos Canyon and in DP Canyon. These aquifers were intercepted by drill holes LADP 3 (approximately 1/2 mile west of TA-21 in Los Alamos Canyon), and LAUZ-1 and LAUZ-2 (approximately 1/2 mile west of TA-21 in DP Canyon). A second perched aquifer, encountered in drill hole LADP-3, is present in the Guaje pumice bed at the base of the Bandelier Tuff, approximately 325 ft below the floor of Los Alamos Canyon (Broxton and Eller 1995, 1162). Unpublished information from drill cores at TA-10 shows that the top of the Puyé Formation is a weakly to moderately developed paleosol (old soil profile) containing a significant amount of clay. The clay content of the paleosol apparently reduces the permeability enough for water, if available, to perch on top of the Puyé Formation within the overlying Guaje Pumice Bed (Fig. 2.2.1-1). That is, the paleosol at the top of the Puyé acts as an aquitard. Based on data from borehole LADP-4 (approximately 1/2 mile west of TA-21 in DP Canyon), the aquifer at the base of the Bandelier Tuff is known not to be present in DP Canyon approximately 1 200 ft north of LADP-3. This suggests that the aquifer probably does not underlie TA-21. Data from well LAOI(A)-1.1 indicate that the perched aquifer continues up the canyon at least 0.62 mile, but the lateral continuity of the aquifer in other directions beyond TA-21 is not known.

A perennial spring (DP Spring), located on the north side of lower DP Canyon 0.62 mile east-northeast of LADP-4, discharges at a rate of 1–4 gal. per minute (Broxton and Eller 1995, 1162; Purtymun 1995, 1293). The source of the water that emerges at DP Spring is possibly alluvial groundwater in DP Canyon. No perched zone within the Bandelier Tuff was encountered in LADP-4. The study of DP Spring is ongoing.

Because any contaminants released from PRSs 21-013(a) and 21-026(a–c) would be quickly absorbed by the fine sand of the paleochannel in the DP Canyon tributary (see Section 2.3.1), they would not reach the floor of DP Canyon. Therefore, any contaminants from these PRSs are highly unlikely to impact any springs, perched alluvial aquifers, or the main aquifer in this area.

2.4 Biological Surveys

Biological resource field surveys have been conducted in the area of PRSs 21-013(a) and 21-026(a–c) for compliance with 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).

The complete results of the biological surveys and the habitat description for PRSs 21-013(a) and 21-026(a–c) will be included in the ecological RFI report prepared by the Ecological Risk Assessment Team for the ecological exposure unit in which these PRSs are located.

2.5 Cultural Surveys

As required by the National Historic Preservation Act of 1966 (amended), a cultural resource survey was conducted at OU 1106 during the summer of 1991 (LANL 1992, 01-0037). The methods and techniques used for this survey conform to those specified in the Secretary of the Interior's standards and guidelines for archeology and historic preservation.

There are no archeological sites in the area of PRSs 21-013(a) and 21-026(a–c) that are eligible for inclusion in the National Register of Historic Places under Criterion D.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSES

The approach to data assessment used by the ER Project is described in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297). The approach includes:

- sampling and analysis design,
- field investigation and collection of field and quality assurance (QA) samples,
- chemical and radiochemical analyses of samples and reporting of analytical data,
- baseline verification and validation of analytical data,
- organization of field and analytical data into PRS-specific data sets,
- exploratory data analysis,

- focused validation when necessary to further assess questionable data,
- comparison of validated analytical results with LANL background data,
- comparison of validated analytical results with screening action levels (SALs),
- evaluation of sufficiency of data sets to support site decisions, and
- assessment of human health risk.

The following subsections provide overviews of the methods used to complete the steps listed above for the PRSs discussed in this RFI report.

3.1 Sample Analyses

Samples were collected in accordance with the sampling design specified in the TA-21 OU RFI Work Plan (LANL 1991, 0689). Borehole samples were analyzed by LANL's Chemical Science and Technology (CST) Division for chlorate and nitrate to determine which samples would be submitted for additional chemical and radiochemical analyses. Borehole samples and surface soil samples were submitted to the sample management office (SMO) and to the mobile radiological analysis laboratory (MRAL) for radiological screening. In addition, surface soil samples were submitted to the mobile chemical analysis laboratory (MCAL) to be screened for volatile organic compounds (VOCs).

3.1.1 Analytical Methods

The following analytical suites were used for the sample analyses in this RFI report: radionuclides, VOCs, semivolatile organic compounds (SVOCs), metals, chlorates, and nitrates. A list of the target analytes for which analyses were performed for the purpose of this report is located in Appendix A.

All samples were analyzed by contract analytical laboratories using methods specified in ER SMO analytical subcontracts (LANL 1995, 1278). The allowed methods are current Environmental Protection Agency (EPA) SW-846 and Contract Laboratory Program (CLP) methods or equivalent for radionuclides, VOCs, SVOCs, metals, chlorates, and nitrates. Before analysis for inorganic chemicals, solid samples were digested according to EPA SW-846 method 3050 or equivalent (EPA 1992, 1207). The subcontracts specify LANL-approved methods for radiochemical analyses according to the technologies identified in the subcontract (e.g., americium-241 by alpha spectroscopy, tritium by liquid scintillation, or

multiple gamma-emitting isotopes by gamma spectroscopy). Analytical method selection is described in Appendix IV of the ER Project Quality Assurance Project Plan Requirements for Sampling and Analysis (QAPP), which is included as Chapter 4 of the LANL IWP (LANL 1996, 1379). For each analyte, quantitation or detection limits are specified as contract-required estimated quantitation limits (EQLs) for organic chemicals and radionuclides, and estimated detection limits (EDLs) for inorganic chemicals. These limits are included in Appendix III of the ER Project QAPP along with the target analytes for each analytical suite.

3.1.2 Data Validation

Data verification and baseline validation procedures were used to determine whether data packages received from the analytical laboratory were generated according to specifications and contain the information necessary to determine data sufficiency for decision-making. For analytical data used for decisions discussed in this RFI report, baseline data validation under the ER protocol was performed as described in the QAPP (LANL 1996, 1379).

This process produced validation reports with data qualifiers designating potential deficiencies for affected results. Each data qualifier is accompanied by a reason code that provides information about the deficiency which led to qualification of the data. The validation reports were used in the decision-making process and to direct the focused validations required to evaluate the usability of the data for this report.

Data were qualified (i.e., a marker was attached to the data results) for a variety of reasons during the baseline validation process. The baseline validation procedure used for routine analytical services provides information about the reason the qualifier was applied and its potential impact on the affected data. The purpose is not to reject data but rather to ensure that the relative quality of the data is understood so that the data may be used appropriately.

Data qualifiers used in the LANL ER Project baseline validation process are as follows.

- "A" signifies that the data required for data review and evaluation are not available.
- "U" signifies that the analyte was not positively identified in the sample, and the associated value is the sample-specific EQL/EDL.
- "J" signifies that the analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.

- "J+" signifies that the analyte was positively identified, and the result is likely to be biased high.
- "J-" signifies that the analyte was positively identified, and the result is likely to be biased low.
- "UJ" signifies that the analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific EQL/EDL.
- "RPM" signifies that without further review of the raw data, the sample results are unusable because of serious deficiencies in the ability to analyze the sample and meet quality control criteria. Presence or absence cannot be verified. Any results qualified as RPM must be evaluated for relevance to data use.
- "P" signifies that professional judgment should be applied to using the data in decision-making.
- "PM" signifies that professional judgment should be applied to using the data in decision-making. A manual review of raw data is recommended to determine whether the defect impacts data use for decision-making.
- "R" signifies that the data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

A focused data validation may be required as a follow-up to the baseline validation. The purpose of a focused validation is to determine the technical adequacy of measurement data when:

- The data are qualified as deficient or as requiring professional judgment during the verification/baseline validation process. For example, when holding times are exceeded or interferences are present, a focused validation may be required to assist in determining data adequacy for the intended use.
- The data quality assessment process requires additional information about 1) the variability or uncertainty of the reported data, or 2) data quality before making a data-use decision because of anomalies detected in a data set.

Details of quality assurance/quality control activities are presented in Section 4.0 of this RFI report. Qualifiers resulting from baseline and focused validation are shown in the analytical results tables included in Section 5.0 of this report. Summaries of data quality evaluations and focused validation of analytical data relevant to this report are given in Appendix B. The RPM, P, and PM qualifiers do not appear in Section 5.0 data tables, nor in Appendix B, because they are replaced during focused validation according to the data use.

3.2 Process for the Identification of COPCs

3.2.1 Inorganic Chemicals

Detected inorganic chemicals are compared with natural background distributions to determine whether they should be retained as COPCs or eliminated from further consideration. The inorganic background data used in this RFI report are from the following source:

- soil samples collected throughout Los Alamos County for which chemical analyses were performed for certain inorganic (metal) chemicals (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266).

The RFI data considered in this report were collected from fill material and the Unit 3 Tshirege Member of the Bandelier Tuff (referred to as Unit 3). The ER Project procedure is to make comparisons of PRS data to the most geologically relevant subset of the LANL-wide background data. Comparisons between site data and background data are initially performed by comparing each observed concentration datum with a chemical-specific background screening value that is the upper tolerance limit (UTL), the maximum reported concentration, or, in the case of nondetected chemicals, the detection limit. These background screening values are derived from LANL-wide soil background data, and details on the calculation of these values are presented in Longmire et al. (1995, 1266). Certain inorganic chemicals in certain media have no LANL-wide background data. For these exceptions, PRS sample-specific detection limits are used as nominal background screening values. In this report, silver is the only inorganic that lacks background data.

Further statistical tests are used for background comparisons when sufficient data are available. When site data contain several nondetects and/or do not appear to satisfy normality assumptions, nonparametric tests are used for further background comparisons. The Gehan modification to the Wilcoxon Rank Sum test and the Quantile test, both of which account for

nondetects, are used for these evaluations. The Gehan test is best suited for assessing complete shifts in distribution in a statistically robust manner, whereas the Quantile test is better suited for assessing shifts of a subset of the data. Between the two tests, most types of differences between distributions can be captured. Detailed information on selecting statistical tests is presented in the guidance document Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics, EM/ER:96-PCT-010 (Project Consistency Team, 1210; Ryti et al. 1996, 1298). Observed significance levels (p-values) for these tests are presented in Sections 5.1.5 and 5.2.5 of this report. If a p-value is less than a specified probability, typically 0.05 or 5%, then there is some reason to suspect that there is a difference between the background and site distributions; otherwise, no difference is indicated. The results of these statistical tests, when available, are used in addition to the results of the comparison with background screening values to determine whether a chemical is considered greater than background.

3.2.2 Radionuclides

Comparing reported radiochemical results with minimum detectable activities and background data is necessary to determine the presence of radionuclides and to distinguish concentrations of radionuclides associated with Laboratory operations from those attributable to global fallout and/or to naturally occurring radionuclides.

The LANL ER Project requires that radiochemical data be reported by a laboratory on the basis of a detection test. Therefore, as part of the data validation/data assessment, reported results must be evaluated to ensure that only those results that represent detections be used to classify a radionuclide as a COPC. This is typically done by comparing the reported value with the associated minimum detectable activity if one is reported. When the minimum detectable activity is not available or does not meet the data quality needs of the ER Project, the reported value will be tested against an estimated minimum detectable activity. This estimated value is based on instrument counting error. The counting error is typically reported as the analytical uncertainty at a value of 1-sigma (i.e., one standard deviation), and the estimated minimum detectable activity is computed as 3-sigma.

Detected radionuclides are retained as COPCs or eliminated from further consideration based on a comparison with natural or anthropogenic background distributions. The radionuclide background data used in this RFI report are from the following sources:

- soil samples collected throughout Los Alamos County for which chemical analyses were performed for certain naturally occurring radioactive chemicals (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266), and
- 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).

These two sources apply only to surface data. Certain radionuclides in certain media have no LANL-wide background data. For these exceptions, PRS sample-specific minimum detectable activities are used as nominal background screening values.

3.2.3 Organic Chemicals

Background data are not available for organic chemicals. Organic chemicals positively identified in one or more samples are carried forward in the screening assessment process. Chemicals not detected in any sample are removed from further consideration.

3.2.4 Risk-Based Screening Assessment

Inorganic chemicals and radionuclides that exceed background and organic chemicals positively identified in one or more samples require further evaluation if they also exceed SALs. SALs for nonradioactive chemicals are based on EPA Region 9 preliminary remediation goals (PRGs) for residential soil. 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.

If more than one COPC is present at the site, a multiple chemical evaluation (MCE) is performed to determine whether the potentially additive effect of chemicals detected below SALs warrants additional investigation. The method for performing an MCE is summarized in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297). These comparisons are the last quantitative steps in the screening assessment process for human health concerns. If COPCs remain after this step, then further evaluation is required. If no COPCs remain after this step and the data set is sufficient to support the decision, an NFA recommendation may be proposed based on human health concerns.

If COPCs remain after the screening assessment, several options exist for the PRS. A risk assessment may be conducted to determine whether the remaining COPCs present an unacceptable human health risk. Further site-specific evaluation may lead to eliminating a COPC without going into a formal risk assessment. The site may be proposed for further sampling to more completely characterize the site or for remediation if it is cost effective to proceed without a risk assessment.

3.3 Human Health Assessment

3.3.1 Risk Due to Naturally Occurring Inorganic Chemicals in Soils (Background)

Risk is associated with exposure to inorganic chemicals naturally occurring in soil. 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 to background rather than default values, i.e., a cancer risk of 10^{-6} or a hazard index of 1. Background risks can also affect decisions at sites that have chemicals for which there is a toxicity threshold. For some inorganic chemicals, background intakes may be near a toxicity threshold such that incremental intakes associated with contamination may be unacceptable.

Background risk estimates provided in Table 3.3.1-1 were calculated using 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. The background soil data used for these calculations were collected from several soil horizons at geographically diverse locations. Background risks are estimated for two statistics. One statistic is the median, which represents the midpoint in the concentration range (technically, the median is the concentration value that divides the results into two equal groups or where half of the data are above and half are below this value). The second statistic represents the upper range on background concentration values, and is either a calculated UTL or a maximum concentration value. (UTLs and maximum concentration values are identical to those described in Section 3.2.1, Inorganic Chemicals.)

The background risks based on the LANL SAL residential exposure model are provided in Table 3.3.1-1. Risks due to background concentration are presented for both noncarcinogenic and carcinogenic outcomes. The potential for adverse noncarcinogenic health effects is estimated by a hazard quotient. A chemical intake leading to a hazard quotient of up to 1 is 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, exposure to naturally occurring manganese is not expected to have significant health consequences because of the unlikely occurrence of the UTL concentration over an entire exposure area, the conservative assumptions used in the exposure assessment, and the margin of safety incorporated into the reference dose.

Three of the background inorganic chemicals provided in Table 3.3.1-1 are also carcinogens. Applying the default exposure assumptions used for SALs, the lifetime cancer risks due to residential soil exposure to background concentrations (UTL column) are estimated at approximately 1 excess case of cancer in 100 000 people for beryllium, 2 in 100 000 for arsenic, and 2 in 1 000 000 000 for cadmium (carcinogenic only by inhalation). EPA uses a range of 1 excess case of cancer in 10 000 people to 1 in 1 000 000 as a guidance for an acceptable range of cancer risk (EPA 1990, 0559).

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

3.3.2 Risk Assessment

No human health risk assessments were performed for PRSs 21-013(a) and 21-026(a–c).

3.4 Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the LANL ER Project is developing an approach for ecological risk assessment. Further discussion of ecological risk assessment methodology will be deferred until the ecological exposure unit methodology being developed has been approved.

TABLE 3.3.1-1

RISK DUE TO BACKGROUND CONCENTRATIONS OF INORGANIC CHEMICALS IN SOIL ASSUMING A RESIDENTIAL SCENARIO[a]

INORGANIC CHEMICAL	BACKGROUND SOIL CONCENTRATION[b] (mg/kg)		HAZARD QUOTIENT		LIFETIME CANCER RISK	
	MEDIAN	UTL	MEDIAN	UTL	MEDIAN	UTL
Aluminum	10 000	38 700	0.1	0.5	NC[c]	NC
Antimony	0.6	1[d]	0.02	0.03	NC	NC
Arsenic	4	7.82	0.2	0.4	1×10^{-5}	1×10^{-5}
Barium	130	315	0.03	0.06	NC	NC
Beryllium	0.895	1.95	0.003	0.006	6×10^{-6}	1×10^{-5}
Cadmium[e]	0.2	2.6[d]	0.005	0.07	1×10^{-10}	2×10^{-9}
Chromium[f]	8.6	19.3	9.0×10^{-5}	0.0002	NC	NC
Cobalt	6	19.2	0.001	0.004	NC	NC
Copper	5.75	15.5	0.002	0.01	NC	NC
Lead[g]	12	23.3	0.03	0.06	NC	NC
Manganese	320	714	0.8	1.9	NC	NC
Mercury	0.05	0.1[d]	0.002	0.004	NC	NC
Nickel	7	15.2	0.005	0.01	NC	NC
Selenium	0.3	1.7[d]	0.0008	0.005	NC	NC
Thallium	0.2	1[d]	0.03	0.2	NC	NC
Uranium	0.9	1.87	0.004	0.008	NC	NC
Vanadium	21	41.9	0.04	0.08	NC	NC
Zinc	30.7	50.8	0.001	0.002	NC	NC

[a] Risk estimates are based on reference doses, slope factors, and EPA Region 9 default exposure assumptions effective April 1996.
[b] Background concentrations taken from the Longmire et al. all-soil-horizons data set (1995, 1142).
[c] NC = Noncarcinogen
[d] Maximum detected background value.
[e] Cancer risks for cadmium are based solely on inhalation of resuspended dust.
[f] Naturally occurring chromium is assumed to exist in a trivalent state.
[g] Hazard quotient based on biokinetic uptake model.

4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

4.1 Quality Assurance/Quality Control Results for PRS 21-013(a)

4.1.1 Inorganic Analyses

Soil samples were analyzed for target analyte list (TAL) metals in request 19596. There were two QC problems with this request. First, potassium had a high recovery in the QC sample (142%). Therefore, all detected potassium values are qualified J+ for possible high bias. Second, the soil samples exceeded the recommended holding time for mercury. Therefore, all mercury data for this request are qualified J- or UJ. All other data for this request are valid and usable without qualification.

Two water samples were analyzed for TAL metals in request 19392. All data for these samples are valid and usable without qualification.

4.1.2 Organic Analyses

Soil and water samples were analyzed for volatiles in requests 18777 and 18922. There were no QC problems with these requests, and all data are valid and usable without qualification.

Soil and water samples were analyzed for semivolatiles in requests 18777 and 18922. There were no QC problems with these requests, and all data are valid and usable without qualification.

4.1.3 Radiochemistry Analyses

In request 19855, soil samples were analyzed for isotopic plutonium using alpha spectroscopy, total uranium using kinetic phosphorescence analysis (KPA), strontium-90 using gas proportional counting, tritium using liquid scintillation, percent moisture using gravimetric procedures, and americium-241 and cesium-137 using gamma spectroscopy. A number of QC problems occurred during these analyses.

First, for isotopic plutonium, there was a low recovery (27%) of the internal tracer for sample AAB9097. Therefore, plutonium data for this sample are qualified J. Second, all data for americium-241 in this request are qualified J+ for a high recovery in the laboratory control sample (LCS) (122%). Third, all uranium data in this request are qualified J for a low recovery in the QC soil sample (64%) and a high recovery in the matrix spike sample (138%). Lastly, all tritium data in this request are qualified J- for a low recovery in the blind QC sample (87%). All other data in this request are valid and usable without qualification.

In request 19860, one water sample was analyzed for isotopic plutonium using alpha spectroscopy, total uranium using KPA, strontium-90 using gas proportional counting, tritium using liquid scintillation, and americium-241 and cesium-137 using gamma spectroscopy. There was a low recovery (70%) for strontium-90 in the LCS for this request. Therefore, all strontium-90 data for this request are qualified J-. All other data in this request are valid and usable without qualification.

4.2 Quality Assurance/Quality Control Results for PRSs 21-026(a–c)

4.2.1 Inorganic Analyses

Soil and water samples were analyzed for TAL metals in request 20245. There were two QC problems with this request. First, the following analytes had low recoveries in the QC sample: aluminum (74%), iron (74%), chromium (66%), and vanadium (59%). Therefore, data for these analytes are qualified J- or UJ for possible low bias. Second, the soil and water samples exceeded the holding time for mercury. The water samples exceeded the required holding time by 51 days. Therefore, all mercury data for the water samples are qualified R. The soil samples exceeded the recommended holding time by 50–52 days. Therefore, all mercury data for the soil samples are qualified J- or UJ. All other data for this request are valid and usable without qualification.

4.2.2 Organic Analyses

Soil and water samples were analyzed for volatiles in request 19372. There were several QC problems with this request. First, there were significant problems with internal standards for many of the samples. For samples AAB9828, AAB9834, AAB9836, AAB9837, AAB9838, AAB9841, AAB9847, AAB9850, AAB9852, AAB9873, and AAB9876, one internal standard (1,4-dichlorobenzene-d4) was outside allowed limits. Therefore, all associated analytes are qualified UJ (there were no detects). For sample AAB9845, three internal standards were outside allowed limits (1,4-dichlorobenzene-d4, pentafluorobenzene, and chlorobenzene-d5). Therefore, all associated analytes are qualified UJ (there were no detects). For sample AAB9846, all internal standards were outside allowed limits, and all analytes are therefore qualified UJ. Another problem was that the water samples exceeded their holding time by 13 days. Therefore, all analytes for the water samples are qualified UJ (there were no detects). All other data for this request are valid and usable without qualification.

Soil and water samples were analyzed for semivolatiles in request 19372. There were several QC problems with this request. First, 1,2-dichlorobenzene, 2-methylphenol, and hexachloroethane were not detected in the soil QC sample (false negatives). Because of this, these analytes are qualified R for all soil samples in this request. Another QC problem was that seven analytes (anthracene, benzo(a)pyrene, di-n-octylphthalate, naphthalene, pentachlorophenol, 1,2,4-trichlorobenzene, and 2,4,6-trichlorobenzene) had recoveries between 10 and 50% in the soil QC sample. Data for these analytes are qualified UJ in all of the soil samples in this request. Lastly, the water samples in this request exceeded their holding time by 13 days. Because of the missed holding time, all analytes for these water samples are qualified UJ (there were no detects). All other data for this request are valid and usable without qualification.

4.2.3 Radiochemistry Analyses

In request 20094, soil samples were analyzed for isotopic plutonium using alpha spectroscopy, total uranium using KPA, strontium-90 using gas proportional counting, tritium using liquid scintillation, percent moisture using gravimetric procedures, americium-241, cesium-137, and other gamma-emitting radionuclides using gamma spectroscopy. There were a number of QC problems with these analyses.

First, all data for strontium-90 are qualified J for low recoveries in the LCSs (70–74%). Second, all uranium data are qualified J for a low recovery in the matrix spike sample (54%). Lastly, all tritium data are qualified J for a low recovery in the matrix spike sample (75%) and a high recovery in the LCS (122%). All other data for this request are valid and usable without qualification.

5.0 SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 PRS 21-013(a)

PRS 21-013(a) is a former surface disposal area for sand from a series of sand filter/sludge drying beds. No chemicals were retained as COPCs after the risk-based screening assessment for this site. PRS 21-013(a) is therefore recommended for NFA.

5.1.1 History

PRS 21-013(a) is described in detail in Chapter 14.8 of the TA-21 OU RFI Work Plan (LANL 1991, 0689). This PRS is a former surface disposal area for sand from a series of sand filter/sludge drying beds associated with the PRS 21-026(a) sewage treatment plant. These beds are designated PRS 21-026(b). PRS 21-013(a) covers approximately 45 ft^2. Use of the area for sand disposal ceased in 1991, and possibly earlier. In 1990, a visible pile of sand was used to identify the site, but the pile was no longer visible at the time of the RFI. Any contamination at PRS 21-013(a) would be attributable to contaminated wastes that potentially entered the PRS 21-026(a) sewage treatment plant through sanitary, floor, and storm water drains. The COPCs identified for this site include small amounts of plutonium, uranium, americium, tritium, cesium, strontium, organic compounds, and inorganic compounds.

5.1.2 Description

PRS 21-013(a) is located near the east end of DP Mesa on the northern LANL boundary immediately east-southeast of the Los Alamos town site. This PRS is a mesa-top site in a developed, industrialized area. For further descriptive information about this PRS, refer to Section 2.0 of this report.

5.1.3 Previous Investigation

No previous investigations have been conducted at PRS 21-013(a). However, results of analyses of effluent and sludge from the sewage treatment plant, PRS 21-026(a), are summarized below and detailed in Chapter 14.8 of the TA-21 OU RFI Work Plan (LANL 1991, 0689). Although these results do not accurately reflect chemical levels expected in sand from the sand filter/sludge drying beds (chemicals are more concentrated in effluent and sludge from the sewage treatment plant), they may be indicative of the types of COPCs, if any, expected at PRS 21-013(a).

Effluent collected from PRS 21-026(a) from 1976 to 1989 was analyzed for radioactivity. The average values were 6.5 pCi/L for gross alpha radiation, 12 pCi/L for gross beta radiation, 270 pCi/L for gross gamma radiation, and 2 600 pCi/L for tritium. Background data for water were not available. Sludge collected in the drying beds [PRS 21-026(b)] from 1976 to 1985 was analyzed for radioactivity and inorganic compounds. The average radioactivity values were 1 600 pCi/g for gross alpha radiation, 71 pCi/g for gross beta radiation, and 240 pCi/g for gross

gamma radiation. Only the gross gamma radiation results were compared to background, and they were noted as significantly elevated relative to background levels in area soils. Inorganic results for most samples indicated that arsenic, boron, chromium, copper, lead, mercury, nickel, and zinc concentrations were significantly elevated relative to background concentrations for area soils. For further information regarding these results, refer to Chapter 14.8 of the TA-21 OU RFI Work Plan (LANL 1991, 0689).

5.1.4 Field Investigations

The conceptual model for PRS 21-013(a) assumes surface contamination and near-surface liquid releases. The objective of the RFI was to determine whether contaminants were present at the site and, if so, to determine the extent of contamination. Field activities at PRS 21-013(a) were conducted in August and September 1994. These activities were conducted according to Chapter 14.8 of the TA-21 OU RFI Work Plan (LANL 1991, 0689). As discussed in Section 1.3, activities at PRS 21-013(a) included a geodetic survey, a radiological survey, and surface soil sampling. These activities are discussed in detail below.

A geodetic survey was conducted to establish the sampling grid at PRS 21-013(a). Based on this survey, the site was divided into nine 15-ft x 15-ft grid squares, and one sampling location was established for each grid square. All sampling locations were recorded in New Mexico state plane coordinates, and location identification numbers were assigned so that data could be entered into the Facility for Information Management and Display (FIMAD).

A radiological survey was conducted in the nine grid squares using hand-held instruments. A Ludlum 43-1 zinc sulfide scintillation detector was used to survey for alpha radiation; two sodium iodide scintillation detectors, a Ludlum 44-10 and a Ludlum 19 μR meter, were used to survey for gamma radiation; and a Bicron G-5 field instrument for the detection of low-energy radiation (FIDLER) sodium iodide scintillation detector was used to survey for low-energy gamma radiation. The results of the radiological survey are presented in Table 5.1.4-1. Although some results are greater than the upper limit of background radiation, the data do not suggest significant contamination.

TABLE 5.1.4-1

RESULTS OF THE RADIOLOGICAL SURVEY AT PRS 21-013(a)

LOCATION	ALPHA DETECTOR RESULTS (cpm)	GAMMA DETECTOR RESULTS		
		LUDLUM 44-10 (cpm)	LUDLUM 19 (μR/hr)	BICRON FIDLER (cpm)
BACKGROUND	5[a]	19 000[b]	20[b]	19 000[a]
21-2112	6	18 000	18	21 000
21-2113	11	18 000	17	20 000
21-2114	2	18 000	19	21 000
21-2115	5	18 000	17	19 000
21-2116	7	19 000	18	20 000
21-2117	8	18 000	18	19 000
21-2118	9	18 000	17	20 000
21-2119	5	18 000	18	20 000
21-2120	3	17 000	16	18 000

[a] Upper limit of background radiation measured onsite.
[b] Upper limit of background radiation measured at several Los Alamos locations outside LANL boundaries.

Thirteen surface soil samples were collected from the nine locations established in the geodetic survey. At six of these locations, samples were collected only from the 0–6 in. interval. At location 21-2118, samples were collected at the 0–6 in., 6–12 in., and 12–18 in. intervals. At location 21-2119, samples were collected at the 0–6 in. and 6–9 in. intervals, and the hand auger met refusal at approximately 9 in. At location 21-2120, samples were collected at the 0–6 in. and 6–10 in. intervals, and the hand auger met refusal at a depth of approximately 10 in. In addition, one field blank, one rinsate blank, and one trip blank were collected for quality assurance purposes. Information about the depth, analyses conducted, and request numbers for each sample collected at PRS 21-013(a) is summarized in Table 5.1.4-2. Sample locations are presented on Fig. 5.1.4-1.

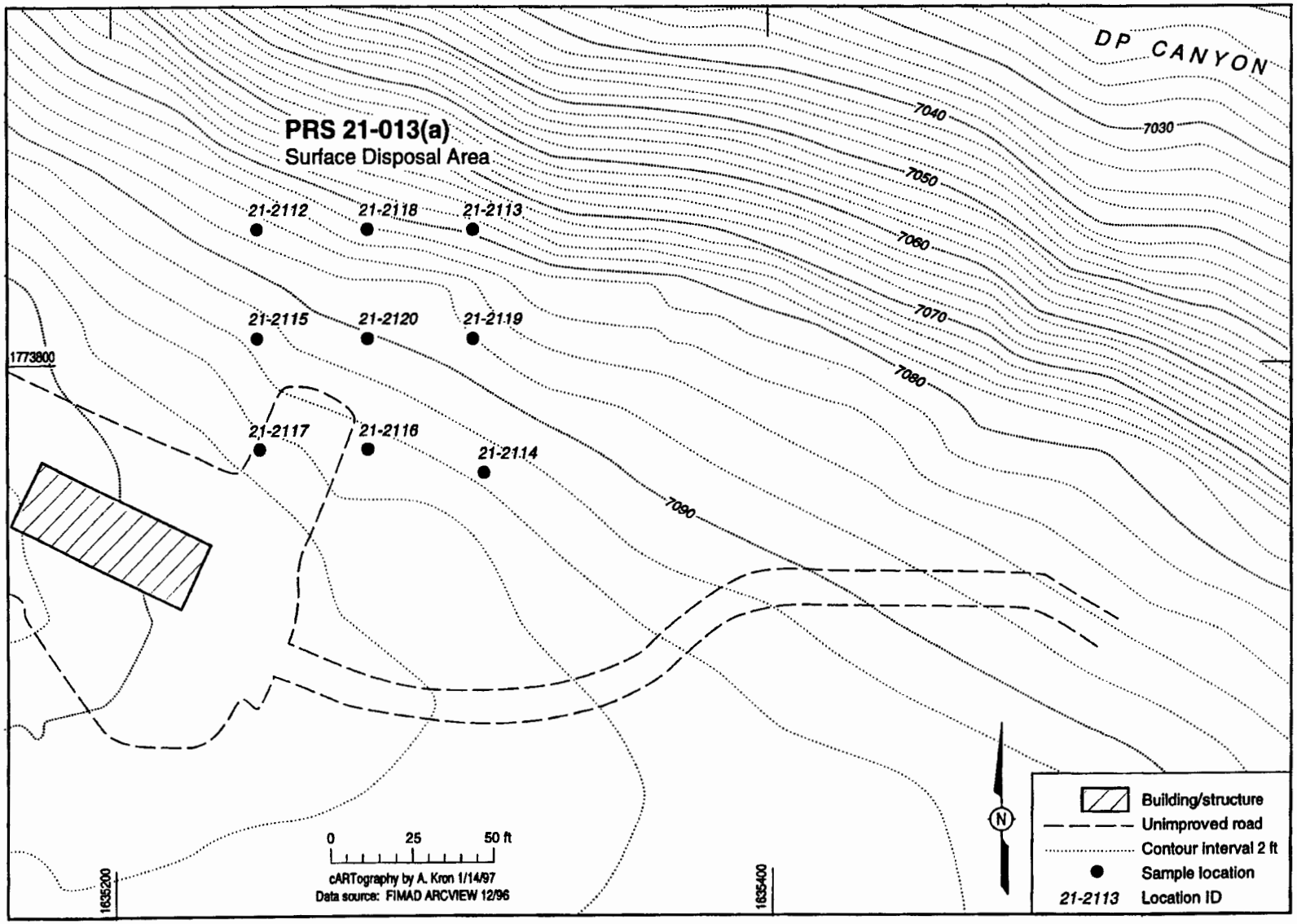

Fig. 5.1.4-1 Locations of samples collected at PRS 21-013(a).

TABLE 5.1.4-2

SUMMARY OF SAMPLES COLLECTED AT PRS 21-013(a)

LOCATION ID	SAMPLE ID	DEPTH (in.)	MEDIUM	RAD SCREENING[a]	RADIONUCLIDES	VOCs	SVOCs	METALS
				REQUEST NUMBER				
NA[b]	AAB7373	Trip blank	Water	NR[c]	NR	NR	NR	NR
21-2112	AAB9083	0–6	Soil	21366	NR	NR	NR	NR
21-2113	AAB9084	0–6	Soil	21366	19855	18922	18922	19596
21-2114	AAB9085	0–6	Soil	21366	NR	NR	NR	NR
21-2115	AAB9086	0–6	Soil	21366	NR	NR	NR	NR
21-2116	AAB9087	0–6	Soil	21366	NR	NR	NR	NR
21-2117	AAB9088	0–6	Soil	21366	NR	NR	NR	NR
21-2118	AAB9089	0–6	Soil	21366	19855	18922	18922	19596
21-2118	AAB9090	6–12	Soil	21366	19855	NR	18922	19596
21-2118	AAB9091	12–18	Soil	21366	NR	18922	NR	NR
21-2119	AAB9093	0–6	Soil	21366	19855	18922	18922	19596
21-2119	AAB9094	6–12	Soil	21366	19855	18922	18922	19596
21-2120	AAB9097	0–6	Soil	21366	19855	18922	18922	19596
21-2120	AAB9098	6–12	Soil	21366	NR	NR	NR	NR
21-2112	AAB9102	Rinsate blank	Water	NR	19860	NR	18777	19392
21-2112	AAB9103	Field blank	Water	NR	NR	18777	18777	19392

[a] Rad screening = Radiological screening. Analysis was conducted at the Mobile Radiological Analytical Laboratory and includes moisture content analysis.
[b] NA = Not applicable.
[c] NR = Not requested.

All samples were screened in the field for radioactivity to ensure worker health and safety and screened at the MRAL to meet transportation and analytical laboratory acceptance criteria. Eight samples were screened at the MCAL for VOCs. The results of screening for radiation indicated that no sample had radiation levels exceeding the action levels defined in the Site-Specific Health and Safety Plan (SSHASP) (alpha radiation was less than 500 cpm, beta/gamma radiation was less than 5 000 cpm, and gamma radiation was less than 5 000 μR/hr) (LANL 1995, 1306). The results of screening for VOCs indicated that no sample contained VOCs at levels greater than the detection limit. Based on these results, six samples were selected from a variety of locations and depths, and were submitted for analysis for radionuclides, VOCs, SVOCs, and metals.

Wastes generated during this investigation, including personal protective equipment, were placed in 55 gal. drums with similar wastes from other sites. A small amount of water from decontamination activities was also produced and stored in 55 gal. drums. In 1995, the drums containing solid wastes were disposed of as low-level radioactive waste at TA-54, and the drums containing liquids were disposed of at TA-50.

In general, the planned activities outlined in the TA-21 OU RFI Work Plan were completed (LANL 1991, 0689). However, the following deviations occurred.

- Visual inspection was not adequate to identify the boundaries of the disposal area as anticipated. Therefore, the location of the PRS had to be estimated from maps in the TA-21 OU RFI Work Plan (LANL 1991, 0689). This deviation did not affect achievement of the objectives because any contaminated sand that had once been in the area had already been removed.

- Tuff was encountered at approximately 9–10 in. at two near-surface sample locations. As a result, samples could not be collected beyond the 10-in. depth as prescribed in the work plan. This deviation did not affect achievement of the objectives because all other radiological results from the area were at or near the upper limit of background radiation.

- The trip blank from PRS 21-013(a) (Sample AAB7373) was not analyzed. The reason for this lack of analysis is unknown. This deviation did not affect achievement of the objectives because the only organic compound detected in soil samples from PRS 21-013(a) was found at levels well below SAL (see Section 5.1.7). Therefore, there was no need to rely on a trip blank to determine whether soil samples were inadvertently contaminated during transport.

- Only eight of the 13 samples collected were sent to the MCAL to be screened for VOCs. This deviation did not affect achievement of the objectives because VOCs were not expected in surface samples and none were detected in those samples submitted for VOC analysis.

5.1.5 Evaluation of Inorganics

Six soil samples collected in 1994 at PRS 21-013(a) were analyzed for TAL metals and total uranium. Six inorganics (calcium, chromium, copper, lead, mercury, and zinc) exceeded their respective background screening values in at least one sample.

Further background comparisons were not conducted because the site data for these metals are inadequate to support other statistical tests. Therefore, calcium, chromium, copper, lead, mercury, and zinc are carried forward to the screening assessment. The data for each sample that had at least one concentration above its background screening value for these analytes are shown in Table 5.1.5-1. Fig. 5.1.5-1 shows the locations of all inorganic analytes detected at levels greater than background UTLs.

The qualifiers shown in the table were assigned during baseline validation. As discussed in Section 4.2.1, mercury data were qualified because the soil samples exceeded the recommended holding time. The J- qualifier indicates that the analyte was positively identified, and the result may be biased low. Only one sample had a detected concentration of mercury and this detected quantity was above the background screening value for mercury. Even if this result is biased low, it is still above the background screening value. Therefore mercury will be carried forward to the screening assessment for further evaluation.

TABLE 5.1.5-1

INORGANICS WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES AT PRS 21-013(a)[a]

SAMPLE ID	DEPTH (in.)	CALCIUM (mg/kg)	CHROMIUM (mg/kg)	COPPER (mg/kg)	LEAD (mg/kg)	MERCURY (mg/kg)	ZINC (mg/kg)
UTL	N/A[b]	6 120	19.3	15.5	23.3	0.1[c]	50.8
SAL	N/A	n/a[d]	211	2 800	400	23	23 000
AAB9084	0–6	**15 300**	**20.7**	**16.7**	**46.1**	0.15 UJ	**82.7**
AAB9093	0–6	3 190	5.2	3.2 U	8.3	**0.29** J-	17.8

[a] Outlined cells indicate values greater than background UTLs.
[b] N/A = Not applicable.
[c] Value represents the maximum reported background concentration in soil.
[d] n/a = Not available.

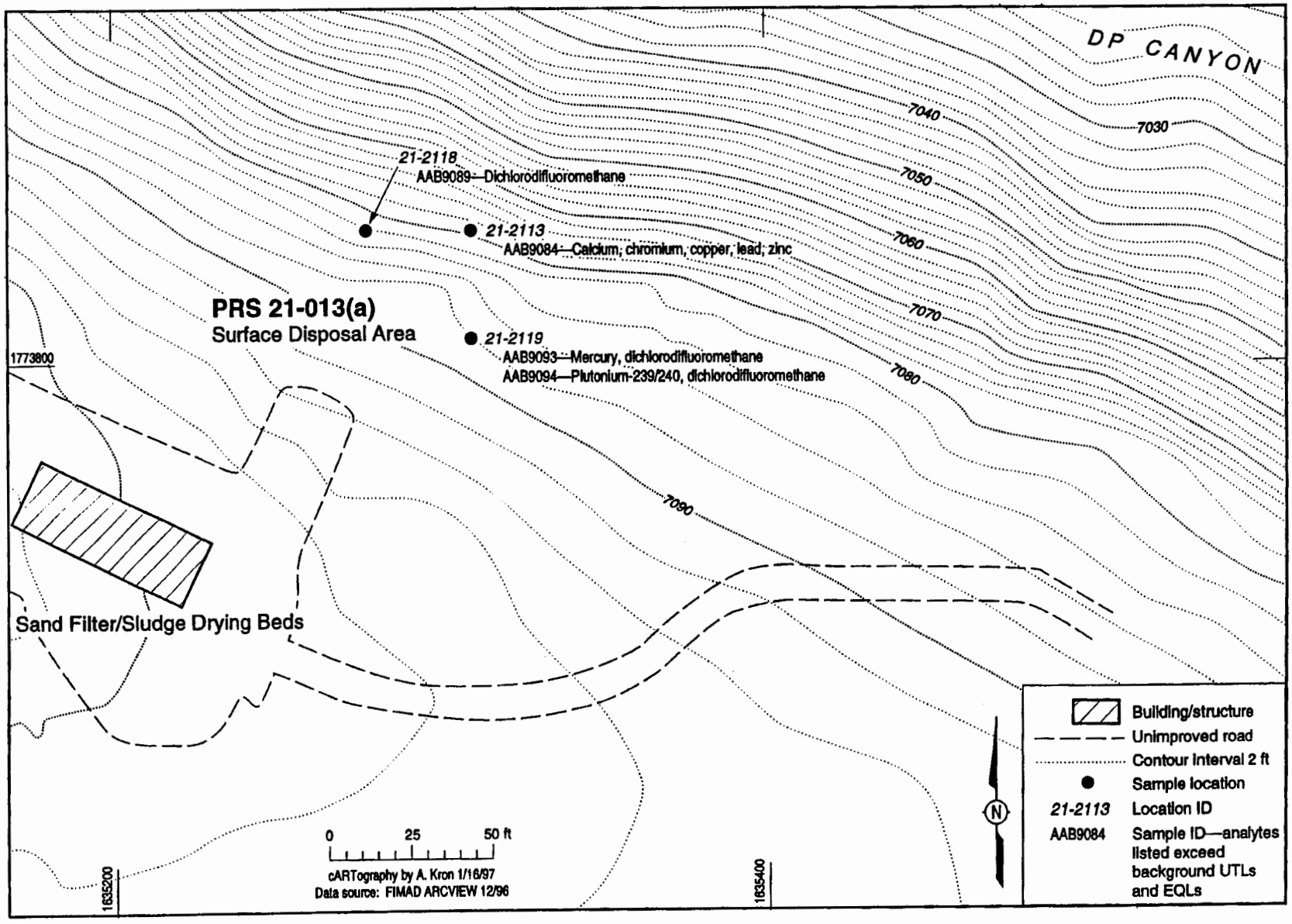

Fig. 5.1.5-1 Locations of analytes that exceed background (UTLs and EQLs) at PRS 21-013(a).

TABLE 5.1.7-1

DETECTED ORGANIC CONCENTRATIONS AT PRS 21-013(a)[a]

SAMPLE ID	DEPTH (in.)	DICHLORODIFLUOROMETHANE (mg/kg)
SAL	N/A[b]	94
AAB9089	0–6	**0.034**
AAB9093	0–6	**0.038**
AAB9094	6–12	**0.11**

[a] Outlined cells indicate values greater than detection limits.
[b] N/A = Not applicable.

5.1.8 Risk-Based Screening Assessment

This subsection discusses the comparison with SALs for COPCs detected at levels greater than background screening values or with no background data for comparison at PRS 21-013(a). The chemicals included in the screening assessment include six inorganics (calcium, chromium, copper, lead, mercury, and zinc), one organic (dichlorodifluoromethane), and one radionuclide (plutonium-239/240).

Greater than or equal to SAL. No chemicals were detected at concentrations greater than their respective SALs.

No SAL. Calcium, which has no SAL, was detected at concentrations greater than the UTL. Calcium has no SAL because it is an essential nutrient. The recommended daily minimum requirement for calcium is 800 mg/day for a child 1–10 years old, and 1 200 mg/day for people 11–24 years old (National Research Council 1989, 1251). Using the highest concentration of calcium in site soil (15 300 mg/kg) and the standard soil ingestion rates for children 1–10 years old (200 mg per day) and adults (100 mg per day), the amount of calcium ingested daily from site soil would be 3.06 mg for children and 1.53 mg for adults. Because the amount of calcium that would be ingested from site soil is approximately 260–800 times less than the recommended minimum requirement, calcium is eliminated as a COPC.

Less than SAL. Seven COPCs (chromium, copper, dichlorodifluoromethane, lead, mercury, plutonium-239/240, and zinc) were detected at concentrations less than their SALs.

To evaluate multiple chemical effects for this data set, a multiple chemical evaluation was conducted. COPCs detected at concentrations less than their SALs were grouped according to their toxicological effects (carcinogenic, noncarcinogenic, or radionuclide). Concentrations for all chemicals were then normalized with respect to SAL and summed as described in the

PRS 21-013(a). PRS 21-013(a) is therefore proposed for NFA based on Criterion 5 of LANL's NFA Criteria Policy. This criterion states that the PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use. A Class III permit modification will be requested to remove this site from the Hazardous and Solid Waste Amendments (HSWA) Module of LANL's Hazardous Waste Facility Permit.

5.2 PRSs 21-026(a–c)

PRS 21-026(a) is a sewage treatment plant (Building TA-21-227) that currently collects and stores sanitary wastes and cooling water from TA-21 facilities, but is not currently used for treatment. PRS 21-026(b) is a series of inactive sand filter/sludge drying beds consisting of four sand-filled concrete structures. PRS 21-026(c) is an abandoned dosing siphon chamber (formerly a chlorine contact chamber) that was used to treat or pump waste water from the sewage treatment plant. The outfall for the sewage treatment plant [PRS 21-026(d)] was investigated in 1992 and was proposed for NFA in the TA-21 Operable Unit RFI Report 1C, Outfalls Investigation, which is currently the subject of an NOD (LANL 1994, 01-0010). No chemicals were retained as COPCs after the risk-based screening assessment for PRSs 21-026(a–c). These PRSs are therefore recommended for NFA.

5.2.1 History

PRSs 21-026(a–c) are described in detail in Chapter 14.8 of the TA-21 OU RFI Work Plan (LANL 1991, 0689). These PRSs are described individually below.

PRS 21-026(a) is an extended aeration sanitary waste treatment facility consisting of a grit chamber, digester, aeration tank, and clarifier. Waste is carried to this PRS by a sanitary waste line, which may also collect wastes from some of the floor drains in TA-21 buildings and some storm water drains. The possibility of a connection to the storm water system is based on anecdotal evidence from treatment plant operators who indicated that the plant had to be pumped one or two times per day in dry weather, and up to five times per day in periods of heavy rain or snow melt. While storm water systems are not typically connected to sewage treatment plants, and engineering drawings that illustrate such a connection can not be located, an undocumented connection between the storm water system and the sewage treatment system is the most logical explanation for the relationship between runoff events and the pumping needs of the sewage treatment plant. The sewage treatment plant and waste line were built in

5.2.3 Previous Investigation

No previous investigations have been conducted at PRSs 21-026(a–c). However, results of analyses of effluent from the sewage treatment plant [PRS 21-026(a)] and sludge from the associated drying beds [PRS 21-026(b)] were summarized in Section 5.1.3 of this report. Although these results do not accurately reflect chemical levels expected in soil from beneath sewage treatment facilities (chemicals are more concentrated in effluent and sludge from the sewage treatment plant), they may be indicative of the types of COPCs, if any, at PRSs 21-026(a–c).

5.2.4 Field Investigations

The conceptual model for PRSs 21-026(a–c) assumes surface liquid releases, near-surface liquid releases, and deep liquid releases. The objective of the RFI was to determine whether elevated levels of chemicals are present at the site and, if so, to determine the extent of contamination. Field activities at PRSs 21-026(a–c) were conducted in August and September 1994. These activities were conducted according to Chapter 14.8 of the TA-21 OU RFI Work Plan (LANL 1991, 0689). As discussed in Section 1.3, activities at PRSs 21-026(a–c) included a geodetic survey, borehole drilling, and subsurface sampling. These activities are discussed in detail below.

A geodetic survey was conducted to document the four borehole locations at PRSs 21-026(a–c). All sampling locations were recorded in New Mexico state plane coordinates. Location identification numbers were assigned for entry into FIMAD.

The four boreholes for PRSs 21-026(a–c) were drilled and sampled as follows:

- At PRS 21-026(a), one angled borehole (location 21-2550) was drilled at an approximate 24° angle from vertical beneath the south edge of Building TA-21-227. Ten samples were collected from this borehole, one from every 5-ft interval to a depth of 47 ft.

- At PRS 21-026(b), two angled boreholes (locations 21-2551 and 21-2552) were drilled at approximate 27° angles from vertical beneath the south and north edges, respectively, of the sand filter/sludge drying beds. Eleven samples were collected from each of these boreholes, one from every 5-ft interval to a depth of 52.5 ft. In addition, one field duplicate was collected.

- At PRS 21-026(c), one vertical borehole (location 21-2565) was drilled at the south side of the dosing siphon chamber. Six samples were collected from this borehole, one from every 5-ft interval to a depth of 30 ft.

A total of 39 samples (including one field duplicate) were collected from the four borehole locations. In addition, one field blank, one rinsate blank, and three trip blanks were collected for quality assurance purposes.

Samples were screened in the field for radioactivity and organic vapors to ensure worker health and safety. Samples were also analyzed by the MRAL to meet transportation and analytical laboratory acceptance criteria and to determine moisture content. In addition, samples were analyzed by LANL's CST Division for chlorate and nitrate content. The results of screening for radiation and organic vapors indicated that no sample had radiation or organic vapor levels exceeding the action levels defined in the SSHASP (alpha radiation was less than 500 cpm, beta/gamma radiation was less than 5 000 cpm, gamma radiation was less than 5 000 μR/hr, and organic vapors were less than 0.5 units above background levels) (LANL 1995, 1306). The results for moisture, chlorate, and nitrate are shown in Table 5.2.4-1. These results were used to determine which samples would be sent to a laboratory for analysis based on the assumption that elevated levels from any of these results would indicate areas contaminated by leaks from the sewage treatment plant. Based on these results, 16 samples were sent to a laboratory for analysis for radionuclides, VOCs, SVOCs, and metals. These 16 samples, which account for approximately 40% of the total number of samples collected, included the samples with the greatest moisture, chlorate, and nitrate values and additional samples with a range of chlorate and nitrate values.

Information about the depth, analyses conducted, and request numbers for each sample collected at PRSs 21-026(a–c) is summarized in Table 5.2.4-2. Sample locations are presented on Fig. 5.2.4-1.

All boreholes were grouted with a cement-bentonite mixture to the ground surface. In addition, a fence south of the sewage treatment plant was replaced. No other site restoration was necessary. Wastes generated during this investigation, including personal protective equipment, were placed in 55 gal. drums with similar wastes from other sites. A small amount of water from decontamination activities was also produced and stored in 55 gal. drums. In 1995, the drums containing solid waste were disposed of as low-level radioactive waste at TA-54, and the drums containing liquids were disposed of at TA-50.

In general, the planned activities outlined in the TA-21 OU RFI Work Plan were completed (LANL 1991, 0689). However, the following deviations occurred.

TABLE 5.2.4-1

RESULTS OF MOISTURE, CHLORATE, AND NITRATE ANALYSES AT PRSs 21-026(a–c)

LOCATION	SAMPLE	SAMPLE DEPTH (ft)	CHLORATE (mg/kg ± uncertainty)	NITRATE (mg/kg ± uncertainty)	MOISTURE (% by weight)	SENT FOR FURTHER ANALYSIS
PRS 21-026(a)						
21-2550	AAB9827	0–5	8 ± 2.5	0.2 ± 0	0.69 ± 1	No
21-2550	AAB9828	5–10	9 ± 2.5	0.2 ± 0	2.08 ± 1	Yes
21-2550	AAB9829	10–15	7 ± 2.5	0.2 ± 0	4.41 ± 1	No
21-2550	AAB9830	15–20	8 ± 2.5	0.2 ± 0	7.01 ± 1	No
21-2550	AAB9831	20–25	8 ± 2.5	0.28 ± 0.2	5.57 ± 1	Yes
21-2550	AAB9832	25–30	8 ± 2.5	0.34 ± 0.2	6.21 ± 1	No
21-2550	AAB9833	30–35	8 ± 2.5	0.43 ± 0.2	6.58 ± 1	No
21-2550	AAB9834	35–40	11 ± 2.5	0.42 ± 0.2	9.95 ± 1	Yes
21-2550	AAB9835	40–45	12 ± 2.5	0.3 ± 0.2	7.23 ± 1	No
21-2550	AAB9836	45–47	14 ± 2.5	0.5 ± 0.2	5.13 ± 1	Yes
PRS 21-026(b)						
21-2551	AAB9837	0–5	7 ± 2.5	0.36 ± 0.2	13.91 ± 1	Yes
21-2551	AAB9838	5–10	8 ± 2.5	1.2 ± 0.1	10.05 ± 1	Yes
21-2551	AAB9839	10–15	7 ± 2.5	0.78 ± 0.2	8.12 ± 1	No
21-2551	AAB9840	15–20	7 ± 2.5	1.5 ± 0.1	7.49 ± 1	No
21-2551	AAB9841	20–25	9 ± 2.5	2.1 ± 0.2	8.27 ± 1	Yes
21-2551	AAB9842	25–30	8 ± 2.5	0.95 ± 0.2	7.29 ± 1	No
21-2551	AAB9843	30–35	9 ± 2.5	2.1 ± 0.2	8.14 ± 1	No
21-2551	AAB9844	35–40	9 ± 2.5	2 ± 0.2	6.64 ± 1	No
21-2551	AAB9845	40–45	9 ± 2.5	5 ± 0.5	11.61 ± 1	Yes
21-2551	AAB9846	45–50	9 ± 2.5	7 ± 0.7	7.21 ± 1	Yes
21-2551	AAB9847	50–52	9 ± 2.5	3.6 ± 0.4	8.31 ± 1	Yes
21-2552	AAB9848	0–5	8 ± 2.5	0.2 ± 0	1.26 ± 1	No
21-2552	AAB9849	5–10	9 ± 2.5	2.65 ± 0.3	4.7 ± 1	No
21-2552	AAB9850	10–15	9 ± 2.5	2.6 ± 0.3	3.32 ± 1	Yes
21-2552	AAB9851	15–20	9 ± 2.5	1.4 ± 0.1	3.5 ± 1	No
21-2552	AAB9852	20–25	11 ± 2.5	4.1 ± 0.4	5.95 ± 1	Yes

TABLE 5.2.4-1 (CONTINUED)

RESULTS OF MOISTURE, CHLORATE, AND NITRATE ANALYSES AT PRSs 21-026(a–c)

LOCATION	SAMPLE	SAMPLE DEPTH (ft)	CHLORATE (mg/kg ± uncertainty)	NITRATE (mg/kg ± uncertainty)	MOISTURE (% by weight)	SENT FOR FURTHER ANALYSIS
PRS 21-026(b) continued						
21-2552	AAB9853	25-30	9 ± 2.5	2.9 ± 0.3	7.12 ± 1	No
21-2552	AAB9854	30–35	9 ± 2.5	2.2 ± 0.2	7.14 ± 1	No
21-2552	AAB9855	35–40	9 ± 2.5	2.4 ± 0.2	6.94 ± 1	No
21-2552	AAB9856	40–45	9 ± 2.5	1.8 ± 0.2	6.34 ± 1	No
21-2552	AAB9857	45–50	9 ± 2.5	2.4 ± 0.2	6 ± 1	No
21-2552	AAB9858	50–52	10 ± 2.5	3.1 ± 0.3	6.27 ± 1	Yes
21-2552	AAB9859[a]	50–52	10 ± 2.5	3.6 ± 0.4	6.13 ± 1	Yes
PRS 21-026(c)						
21-2565	AAB9872	0–5	8 ± 2.5	0.2 ± 0	0	No
21-2565	AAB9873	5–10	2.5 ± 0	0.2 ± 0	2.1 ± 1	Yes
21-2565	AAB9874	10–15	8 ± 2.5	0.2 ± 0	2.61 ± 1	No
21-2565	AAB9875	15–20	8 ± 2.5	0.2 ± 0	3.86 ± 1	No
21-2565	AAB9876	20–25	10 ± 2.5	0.2 ± 0	7.58 ± 1	Yes
21-2565	AAB9877	25–30	7 ± 2.5	0.2 ± 0	1.44 ± 1	No

[a] Field duplicate of sample AAB9858.

- Borehole 21-2550 was drilled beneath the south edge of Building TA-21-227, not under the north edge as planned. The borehole was originally planned for the north based on ease of drilling, and it was moved because overhead power lines on the north side would have made drilling difficult. This deviation did not affect achievement of the objectives because the likelihood of intercepting potential contaminants was expected to be the same, and the volume of soil beneath the building that was sampled did not change.

- One trip blank from PRSs 21-026(a–c) (Sample AAC0077) was not analyzed because it did not reach the analytical laboratory (the sample jar was broken). This deviation did not affect achievement of the objectives because two other trip blanks from PRSs 21-026(a–c) (Samples AAB9108 and AAB9817) were analyzed.

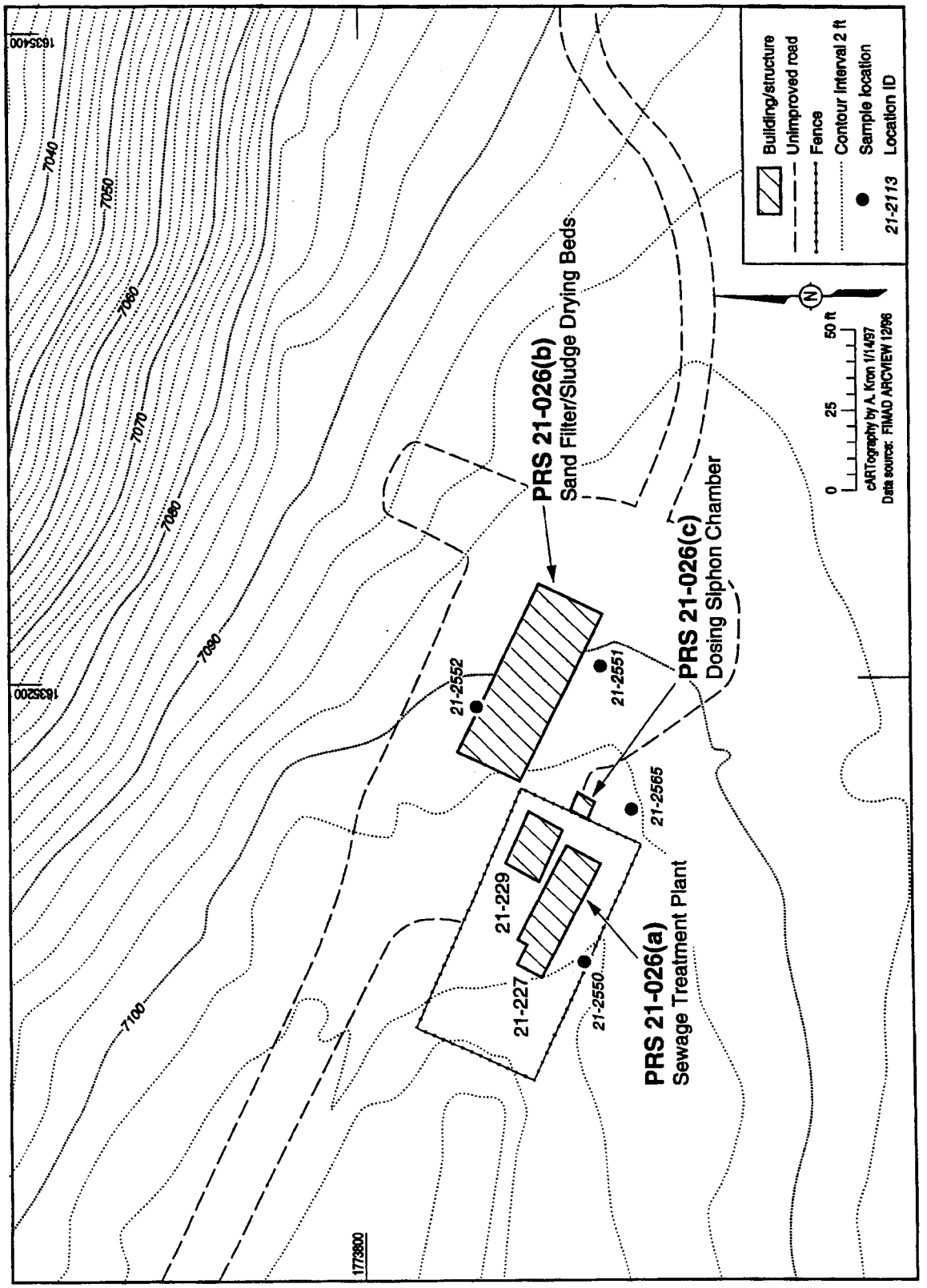

Fig. 5.2.4-1 Locations of samples collected at PRSs 21-026(a–c).

TABLE 5.2.4-2

SUMMARY OF SAMPLES COLLECTED AT PRSs 21-026(a–c)

LOCATION ID	SAMPLE ID	DEPTH[a] (ft)	MEDIUM	RAD SCREENING[b]	CHLORATE[c]	NITRATE[c]	RADIONUCLIDES	VOCs	SVOCs	METALS
				REQUEST NUMBER						
PRS 21-026(a)										
21-2550	AAB9827	0–5	Core	21344	19196	19196	NR[d]	NR	NR	NR
21-2550	AAB9828	5–10	Core	21344	19196	19196	20094	19372	19372	20245
21-2550	AAB9829	10–15	Core	21344	19196	19196	NR	NR	NR	NR
21-2550	AAB9830	15–20	Core	21344	19196	19196	NR	NR	NR	NR
21-2550	AAB9831	20–25	Core	21344	19196	19196	20094	19372	19372	20245
21-2550	AAB9832	25–30	Core	21344	19196	19196	NR	NR	NR	NR
21-2550	AAB9833	30–35	Core	21344	19196	19196	NR	NR	NR	NR
21-2550	AAB9834	35–40	Core	21344	19196	19196	20094	19372	19372	20245
21-2550	AAB9835	40–45	Core	21344	19196	19196	NR	NR	NR	NR
21-2550	AAB9836	45–47	Core	21344	19196	19196	20094	19372	19372	20245
PRS 21-026(b)										
21-2551	AAB9837	0–5	Core	21316	19196	19196	20094	19372	19372	20245
21-2551	AAB9838	5–10	Core	21316	19196	19196	20094	19372	19372	20245
21-2551	AAB9839	10–15	Core	21316	19196	19196	NR	NR	NR	NR
21-2551	AAB9840	15–20	Core	21316	19196	19196	NR	NR	NR	NR
21-2551	AAB9841	20–25	Core	21316	19196	19196	20094	19372	19372	20245
21-2551	AAB9842	25–30	Core	21316	19196	19196	NR	NR	NR	NR
21-2551	AAB9843	30–35	Core	21316	19196	19196	NR	NR	NR	NR
21-2551	AAB9844	35–40	Core	21316	19196	19196	NR	NR	NR	NR
21-2551	AAB9845	40–45	Core	21316	19196	19196	20094	19372	19372	20245
21-2551	AAB9846	45–50	Core	21316	19196	19196	20094	19372	19372	20245
21-2551	AAB9847	50–52	Core	21316	19196	19196	20094	19372	19372	20245
21-2552	AAB9848	0–5	Core	21316	19196	19196	NR	NR	NR	NR
21-2552	AAB9849	5–10	Core	21316	19196	19196	NR	NR	NR	NR
21-2552	AAB9850	10–15	Core	21316	19196	19196	20094	19372	19372	20245
21-2552	AAB9851	15–20	Core	21316	19196	19196	NR	NR	NR	NR
21-2552	AAB9852	20–25	Core	21316	19196	19196	20094	19372	19372	20245
21-2552	AAB9853	25–30	Core	21316	19196	19196	NR	NR	NR	NR
21-2552	AAB9854	30–35	Core	21316	19196	19196	NR	NR	NR	NR
21-2552	AAB9855	35–40	Core	21316	19196	19196	NR	NR	NR	NR
21-2552	AAB9856	40–45	Core	21316	19196	19196	NR	NR	NR	NR
21-2552	AAB9857	45–50	Core	21316	19196	19196	NR	NR	NR	NR

TABLE 5.2.4-2 (CONTINUED)

SUMMARY OF SAMPLES COLLECTED AT PRSs 21-026(a–c)

LOCATION ID	SAMPLE ID	DEPTH[a] (ft)	MEDIUM	RAD SCREENING[b]	CHLORATE[c]	NITRATE[c]	RADIONUCLIDES	VOCs	SVOCs	METALS
				REQUEST NUMBER						
PRS 21-026(b)										
21-2552	AAB9858	50–52	Core	21316	19196	19196	20094	19372	19372	20245
21-2552	AAB9859[e]	50–52	Core	21316	19196	19196	20094	19372	19372	20245
21-2552	AAB9862	Rinsate blank	Water	NR	NR	NR	NR	19372	19372	20245
21-2552	AAB9864	Field blank	Water	NR	NR	NR	NR	19372	19372	20245
NA[f]	AAC0077	Trip blank	Water	NR	NR	NR	NR	NR	NR	NR
PRS 21-026(c)										
NA	AAB9108	Trip blank	Water	NR	NR	NR	NR	19023/ 19129	NR	NR
NA	AAB9817	Trip blank	Water	NR	NR	NR	NR	19023/ 19129	NR	NR
21-2565	AAB9872	0–5	Core	21316	19196	19196	NR	NR	NR	NR
21-2565	AAB9873	5–10	Core	21316	19196	19196	20094	19372	19372	20245
21-2565	AAB9874	10–15	Core	21316	19196	19196	NR	NR	NR	NR
21-2565	AAB9875	15–20	Core	21316	19196	19196	NR	NR	NR	NR
21-2565	AAB9876	20–25	Core	21316	19196	19196	20094	19372	19372	20245
21-2565	AAB9877	25–30	Core	21316	19196	19196	NR	NR	NR	NR

[a] Sample depths at locations 21-2550, 21-2551, and 21-2552 are the drilled depth of angled boreholes.
[b] Rad screening = Radiological screening. Analyses were conducted at the Mobile Radiological Analytical Laboratory and included moisture content analysis.
[c] Analysis was conducted at the LANL CST Division Laboratory.
[d] NR = Not requested.
[e] Field duplicate of Sample AAB9858.
[f] NA = Not applicable.

5.2.5 Evaluation of Inorganics

Sixteen soil samples collected in 1994 at PRSs 21-026(a–c) were analyzed for TAL metals and total uranium. Of these sixteen samples, one sample was collected at the surface and fifteen samples were collected from the Unit 3 Tshirege Member of the Bandelier Tuff (referred to as Unit 3). Each inorganic result was compared to the geologically appropriate background screening value (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266). Some analyses included a laboratory replicate. For the purposes of this screening assessment, the highest detected value was used for samples for which a laboratory replicate was analyzed.

Fourteen inorganics (aluminum, barium, cadmium, calcium, chromium, copper, lead, magnesium, mercury, nickel, potassium, silver, vanadium, and zinc) exceeded their respective background screening values in at least one of the geologic units.

Further background comparisons were conducted for aluminum, barium, calcium, chromium, copper, lead, magnesium, nickel, potassium, silver, vanadium, and zinc. Cadmium and mercury were not subjected to further background comparisons because the background data for these metals are inadequate to support other statistical tests. Cadmium and mercury are carried forward to the screening assessment.

Because the Unit 3 data for the other twelve metals (aluminum, barium, calcium, chromium, copper, lead, magnesium, nickel, potassium, silver, vanadium, and zinc) 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. For further information on these statistical tests, see Section 3.2.1. Observed significance levels (p-values) for these tests are presented in Table 5.2.5-1. If a p-value is less than some small probability, 0.05, then there is reason to suspect that there is a difference between the background and site distributions; otherwise, no difference is indicated.

The results for aluminum, barium, copper, lead, magnesium, nickel, potassium, silver, vanadium, and zinc are indicative of site concentrations that are not statistically elevated above background. The results for calcium and chromium indicate that site concentrations may be statistically elevated above background.

TABLE 5.2.5-1

STATISTICAL TESTS FOR BACKGROUND COMPARISON

ANALYTE	GEHAN TEST P-VALUE	QUANTILE TEST P-VALUE
Aluminum	0.83	0.18
Barium	0.99	0.87
Calcium	0.002	0.001
Chromium	<0.00005	0.0004
Copper	0.66	0.86[a]
Lead	0.76	0.37
Magnesium	0.86	0.39
Nickel	0.44	0.61[b]
Potassium	0.99	0.98
Silver	0.37	NA[c]
Vanadium	0.99	0.98
Zinc	0.61	0.66

[a] The quantile test was run for site data above the 90th percentile.
[b] The quantile test was run for site data above the 95th percentile.
[c] NA = Not applicable because the data contain too many nondetects.

Based on the background comparisons and further statistical tests performed to compare site and background data, calcium, chromium, cadmium, and mercury are carried forward to the screening assessment. The data for each sample that had at least one concentration above its background screening value for these chemicals are shown in Table 5.2.5-2. Fig. 5.2.5-1 shows the locations of all inorganic analytes detected at levels greater than background UTLs.

The qualifiers shown in the table were assigned during baseline validation. As discussed in Section 4.2.1 mercury data were qualified because the soil samples exceeded the recommended holding time, and chromium data were qualified because the QC sample had a low recovery. The J- qualifier indicates that the analyte was positively identified, and the result may be biased low. Only two samples had detected concentrations of mercury and these concentrations were above the background screening value for mercury. Chromium was also detected at levels above the background screening level. Even if these results are biased low, they are still above the background screening value. Therefore, mercury and chromium will be carried forward to the screening assessment for further evaluation.

TABLE 5.2.5-2

INORGANICS WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES AT PRSs 21-026(a–c)[a]

SAMPLE ID	DEPTH (ft)	CADMIUM (mg/kg)	CALCIUM (mg/kg)	CHROMIUM (mg/kg)	MERCURY (mg/kg)
SOIL SAMPLES					
Soil UTL	N/A[b]	2.6[c]	6 120	19.3	0.1[c]
SAL	N/A	38	n/a[d]	211	23
AAB9837	0–5	0.85 (U)	10 200	4.6 (J-)	0.12 (UJ)
UNIT 3 SAMPLES					
Unit 3 UTL	N/A	n/a	1 520	2.1	n/a
AAB9828[e]	5–10	0.72 (U)	14 399	9.2 (J-)	0.11 (UJ)
AAB9831	20–25	0.77 (U)	2 650	8.4 (J-)	0.13 (UJ)
AAB9834	35–40	1.4	8 950	10.5 (J-)	0.14 (UJ)
AAB9836	45–47	0.85 (U)	1 150 (U)	3.9 (J-)	0.14 (UJ)
AAB9838	5–10	0.8 (U)	8 250	4.1 (J-)	0.17 (J-)
AAB9841	20–25	0.87 (U)	1 270 (U)	6.3 (J-)	0.12 (UJ)
AAB9845	40–45	0.88 (U)	11 100	4.8 (J-)	0.14 (UJ)
AAB9846	45–50	0.65 (U)	793 (U)	1.9 (UJ)	0.11 (J-)
AAB9847	50–52	0.86 (U)	1 090 (U)	2.9 (J-)	0.14 (UJ)
AAB9850	10–15	0.62 (U)	986 (U)	2.9 (J-)	0.11 (UJ)
AAB9852	20–25	1.3 (U)	1 630 (U)	7.9 (J-)	0.17 (UJ)
AAB9858	50–52	0.68 (U)	1 080	2.8 (J-)	0.11 (UJ)
AAB9859	50–52	0.67 (U)	1 290	2.8 (J-)	0.11 (UJ)
AAB9873	5–10	0.63 (U)	708 (U)	2.4 (J-)	0.1 (UJ)
AAB9876	20–25	1.1 (U)	3 780	12.8 (J-)	0.11 (UJ)

[a] Outlined cells indicate values greater than background UTLs.
[b] N/A = Not applicable.
[c] Value represents the maximum reported background concentration in soil.
[d] n/a = Not available.
[e] Value represents the maximum of a sample concentration and it's laboratory duplicate.

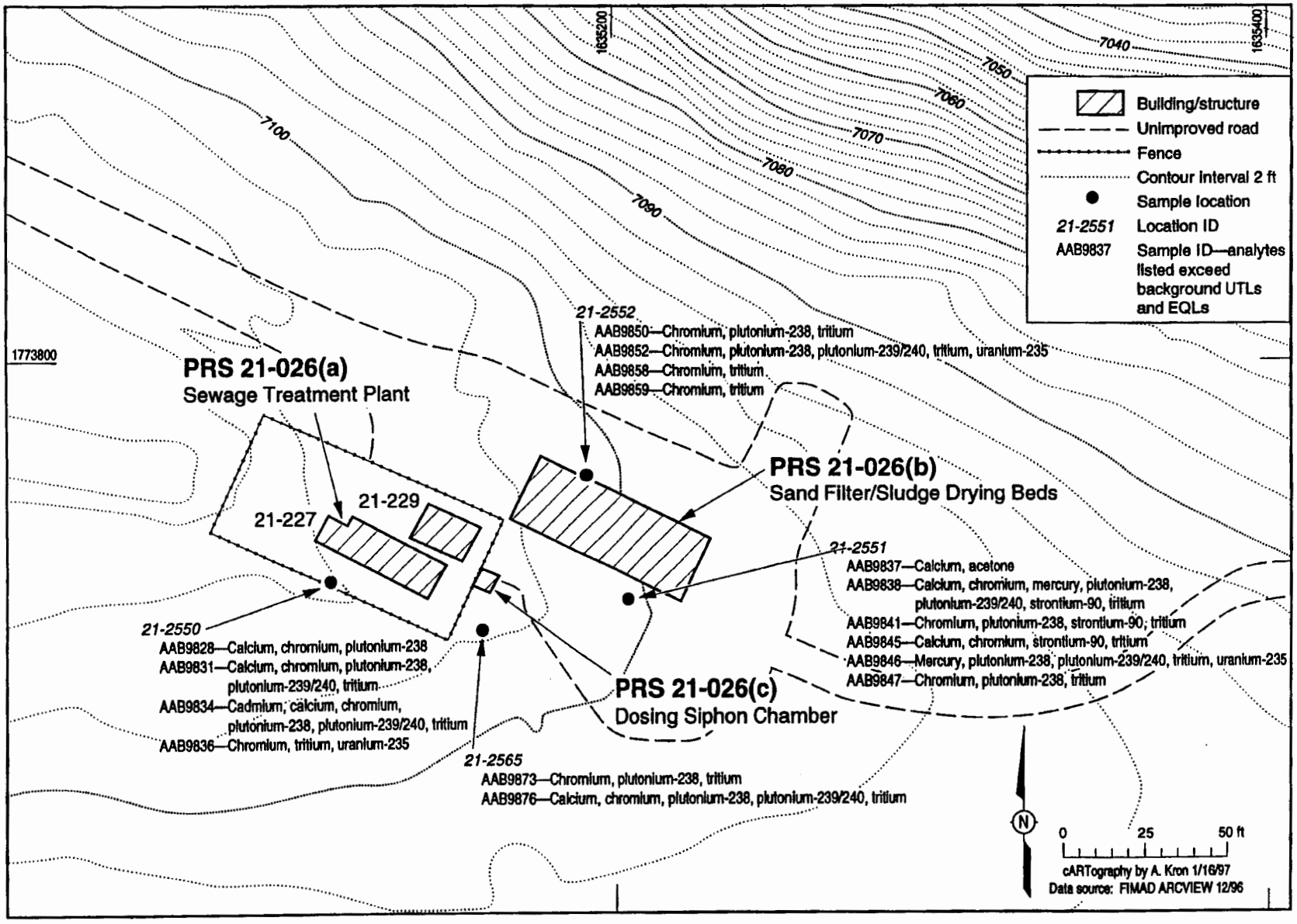

Fig. 5.2.5-1 Locations of analytes that exceed background (UTLs and EQLs) at PRSs 21-026(a–c).

- Daughters of naturally occurring radionuclides (uranium and thorium) include isotopes of actinium, bismuth, lead, protactinium, radium, radon, thallium, and thorium. These daughter radionuclides are normally present in activities equal to their parent radionuclides and are not directly evaluated as potential radionuclide contaminants. QA/QC activities review daughter radionuclides for consistency with parent activities, and any that can not be attributed to background concentrations of the parent are retained as potential contaminants.

EQLs and minimum detectable activities are often not available for radionuclides analyzed by gamma spectroscopy. A value of three times the measurement uncertainty (3 sigma or three standard deviations) 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 minimum 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 may include radionuclides whose presence is spuriously reported due to spectral interferences or misidentifications. Americium-241, cerium-144, cesium-137, and cobalt-60 were eliminated from further consideration based on comparison to the minimum detectable activity.

Of the remaining five radionuclides reported for PRSs 21-026(a–c), plutonium-238, plutonium-239/240, strontium-90, tritium, and uranium-235 were all detected in subsurface samples. The data for these five radionuclides are presented in Table 5.2.6-1. Fig. 5.2.5-1 shows the locations of all radionuclides detected at levels greater than background UTLs or minimum detectable activities. Plutonium-238, plutonium-239/240, strontium-90, tritium, and uranium-235 are carried forward to the screening assessment.

TABLE 5.2.6-1

RADIONUCLIDES WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES AT PRSs 21-026(a–c)[a]

SAMPLE ID	DEPTH (ft)	PLUTONIUM-238 pCi/g	PLUTONIUM-239/240 pCi/g	STRONTIUM-90 pCi/g	TRITIUM pCi/g	URANIUM-235 pCi/g
SOIL SAMPLES						
Soil UTL	N/A[b]	0.104[c]	0.092[c]	1[c]	2.13[c]	0.084
SAL	N/A	27	24	4.4	260	10
AAB9837	0–5	0.049	0.038	0.341 (UJ)	0.101 (J)	0.21 (U)
UNIT 3 SAMPLES[d]						
AAB9828	5–10	0.115	0.012 (U)	0.027 (UJ)	0.023 (U)	-0.182 (U)
AAB9838	5–10	0.025	0.007	0.772 (J)	0.076 (J)	0.226 (U)
AAB9873	5–10	0.045	0.005 (U)	-0.085 (UJ)	0.054 (J)	0.107 (U)
AAB9850	10–15	0.019	0.001 (U)	0.366 (UJ)	0.667 (J)	-0.012 (U)
AAB9831	20–25	0.012	0.014	0.146 (UJ)	0.060 (J)	0.001 (U)
AAB9852	20–25	0.033	0.008	0.216 (UJ)	0.86 (J)	0.267
AAB9876	20–25	0.062	0.013	0.585 (UJ)	0.094 (J)	0.070 (U)
AAB9841	20–25	0.119	0.001[e] (U)	0.964 (J)	0.150 (J)	-0.233 (U)
AAB9834	35–40	0.074	0.015	-0.754[e] (UJ)	0.083 (J)	0.349 (U)
AAB9845	40–45	0.003 (U)	0 (U)	1.4 (J)	0.315 (J)	0.0794 (U)
AAB9836	45–47	0.005 (U)	0 (U)	-0.149 (UJ)	0.087 (J)	0.188
AAB9846	45–50	0.027	0.007	0.08 (UJ)	0.338 (J)	0.268
AAB9858	50–52	0.007 (U)	0.001 (U)	0.24 (UJ)	0.118 (J)	-0.262 (U)
AAB9859	50–52	0.009 (U)	0.001 (U)	-0.97 (UJ)	0.150 (J)	0.378 (U)
AAB9847	50–52	0.008	0.001 (U)	-1.54 (UJ)	0.283 (J)	0.323 (U)

[a] Outlined cells indicate values greater than background UTLs.
[b] N/A = Not applicable.
[c] Background screening value represents the maximum reported background concentration of 13 pCi/mL from the Environmental Surveillance reports (Purtymun et al. 1987, 0211; ESG 1988, 0408; ESG 1989, 0308; Environmental Protection Group 1990, 0497; Environmental Protection Group 1992, 0740), which was converted to pCi/g using the highest moisture content of all PRSs 21-026(a–c) samples (14.1%).
[d] There is no Unit 3-specific background screening value available. Therefore, the minimum detectable activity was used as a background screening value.
[e] Value is not greater than background screening value. Cell outlining is a result of surrounding cells.

The qualifiers shown in the table were assigned during baseline validation. As discussed in Section 4.2.3, strontium-90 data were qualified for low recoveries in the laboratory control samples, and tritium data were qualified for a low recovery in the matrix spike sample. The J qualifier indicates that the analyte was positively identified, and associated results are estimated to be more uncertain than would be expected for that analysis. Two samples had detected results of strontium-90, and one result was detected above the background screening value for strontium-90. In addition, tritium was detected in the Unit 3 samples at levels above the minimum detectable activity (which was used as a background screening value). Therefore, strontium-90 and tritium will be carried forward to the screening assessment for further evaluation.

5.2.7 Evaluation of Organic Chemicals

Sixteen soil samples collected in 1994 at PRSs 21-026(a–c) were analyzed for a suite of VOCs and SVOCs. Acetone was the only organic chemical detected. The detected concentration for this organic chemical is presented in Table 5.2.7-1. Fig. 5.2.5-1 shows the location where acetone was detected. Acetone is carried forward to the screening assessment.

TABLE 5.2.7-1

DETECTED ORGANIC CONCENTRATIONS AT PRSs 21-026(a–c)[a]

SAMPLE ID	DEPTH (ft)	ACETONE (mg/kg)
SAL	N/A[b]	2 100
AAB9837	0–5	**0.076**

[a] Outlined cells indicate values greater than detection limits.
[b] N/A = Not applicable.

5.2.8 Risk-Based Screening Assessment

This subsection discusses the comparison with SALs for COPCs detected at levels greater than background screening values or with no background data for comparison at PRSs 21-026(a–c). The chemicals included in the screening assessment include four inorganics (cadmium, calcium, chromium, and mercury), one organic (acetone), and five radionuclides, (plutonium-238, plutonium-239/240, strontium-90, tritium, and uranium-235).

Greater than or equal to SAL. No chemicals were detected at concentrations greater than their respective SALs.

No SAL. Calcium, which has no SAL, was detected at concentrations greater than the UTL. Calcium has no SAL because it is an essential nutrient. The recommended daily minimum requirement for calcium is 800 mg/day for a child 1–10 years old, and 1 200 mg/day for people 11–24 years old (National Research Council 1989, 1251). Using the highest concentration of calcium in site soil (11 100 mg/kg) and the standard soil ingestion rates for children 1–10 years old (200 mg per day) and adults (100 mg per day), the amount of calcium ingested daily from site soil would be 2.2 mg for children and 1.1 mg for adults. Because the amount of calcium that would be ingested from site soil is 360 to 1 000 times less than the recommended minimum requirement, calcium is eliminated as a COPC.

Less than SAL. Nine chemicals (acetone, cadmium, chromium, mercury, plutonium-238, plutonium-239/240, strontium-90, tritium, and uranium-235) were detected at concentrations less than their SALs.

To evaluate multiple chemical effects for this data set, a multiple chemical evaluation was conducted. COPCs detected at concentrations less than their SALs were grouped according to their toxicological effects (carcinogenic, noncarcinogenic, or radionuclide). Concentrations for all chemicals were then normalized with respect to SAL and summed as described in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297). Because there are no COPCs in the carcinogen category, an evaluation of multiple chemical effects was not conducted for this category. The results of the multiple chemical evaluations for noncarcinogenic chemicals and radionuclides are both less than one, indicating that potential resultant adverse human health effects from exposure are unlikely (Table 5.2.8-1). Therefore, all chemicals with concentrations less than their SALs are eliminated as COPCs.

At the conclusion of this screening assessment, no chemicals are retained as COPCs.

5.2.9 Human Health Risk Assessment

No human health risk assessment was conducted for PRSs 21-026(a–c) because no chemicals were carried forward from the screening assessment.

5.2.10 Preliminary Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the Laboratory ER Project is developing an approach for ecological risk assessment. Further ecological risk assessment at PRSs 21-026(a–c) will be deferred until the site can be assessed as part of the ecological exposure unit methodology currently being developed.

TABLE 5.2.8-1

MULTIPLE CHEMICAL EVALUATION FOR SOIL SAMPLES AT PRSs 21-026(a–c)

CHEMICAL	LOCATION ID	SAMPLE ID	MAXIMUM SAMPLE VALUE	SOIL SAL	NORMALIZED VALUE
Noncarcinogenic Effects (mg/kg)					
Acetone	21-2551	AAB9837	0.076	2 100	3.6×10^{05}
Cadmium	21-2550	AAB9834	1.4	38	0.04
Mercury	21-2551	AAB9838	0.17	23	0.007
Normalized Sum					0.04
Carcinogenic Effects of Radionuclides (pCi/g)					
Plutonium-238	21-2551	AAB9841	0.119	27	0.004
Plutonium-239/240	21-2551	AAB9837	0.038	24	0.002
Strontium-90	21-2551	AAB9845	1.4	4.4	0.3
Tritium	21-2552	AAB9852	0.86	260	0.003
Uranium-235	21-2551	AAB9846	0.268	10	0.03
Normalized Sum					0.34

5.2.11 Conclusions and Recommendations

Based on the results of the evaluations of inorganic chemicals, radionuclides, and organic chemicals, and the risk-based screening assessment, no analytes are retained as COPCs PRSs 21-026(a–c). PRSs 21-026(a–c) are therefore proposed for NFA based on Criterion 5 of LANL's NFA Criteria Policy. This criterion states that the PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use. A Class III permit modification will be requested to remove these sites from the HSWA Module of LANL's Hazardous Waste Facility Permit.

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APPENDIX A ANALYTICAL SUITES

Analytical results for Potential Release Sites (PRSs) 21-013(a) and 21-026(a–c) can be found in the Facility for Information Management, Analysis, and Display (FIMAD). Hard copies of supporting information will be provided upon request.

Chemicals that are reported by analytical laboratories as nondetects have not been included in the tables of this report. Nonetheless, nondetected chemicals are often part of the decision-making process, and it is important to note that analyses for these chemicals were performed. This appendix provides a list of the target analytes in each analytical suite for which samples were taken (see Tables 5.1.4-2 and 5.2.4-2).

Radiochemical Suite

Actinium-228
Americium-241
Annihilation radiation
Barium-140
Bismuth-211
Bismuth-212
Bismuth-214
Cadmium-109
Cerium-139
Cerium-144
Cesium-134
Cesium-137
Cobalt-57
Cobalt-60
Europium-152
Iodine-129
Lanthanum-140
Lead-210
Lead-211
Lead-212
Lead-214
Manganese-54
Mercury-203
Neptunium-237
Plutonium-238
Plutonium-239/240
Potassium-40
Protactinium-234m
Protactinium-231
Protactinium-233
Radium-223
Radium-224
Radium-226
Radium-228
Radon-219
Ruthenium-106
Selenium-75
Sodium-22
Strontium-85
Strontium-90
Thallium-208
Thorium-227
Thorium-228, 230, & 232
Thorium-234
Tin-113
Tritium
Uranium-234, 235, & 238
Yttrium-88
Zinc-65

Volatile Organic Suite

Acetone
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
2-Butanone
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
2-Chlorotoluene
4-Chlorotoluene
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
Dibromomethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
c-1,2-Dichloroethene
t-1,2-Dichloroethene
1,2-Dichloropropane
1,3-Dichloropropane
2,2-Dichloropropane
1,1-Dichloropropene
c-1,3-Dichloropropene
t-1,3-Dichloropropene
Ethylbenzene
2-Hexanone
Iodomethane
Isopropylbenzene
p-Isopropyltoluene
4-Methyl-2-pentanone
Methylene chloride
n-Propylbenzene
Styrene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2,2,-Tetrachloroethane
Tetrachloroethene
Toluene
Trichlorotrifluoroethane
Trichloroethene
Trichlorofluoromethane
1,2,3-Trichloropropane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Vinyl chloride
o,m,p-Xylene (mixed)

Semivolatile Organic Suite

Acenaphthene	1,2-Dichlorobenzene	2-Methylphenol
Acenaphthylene	1,3-Dichlorobenzene	4-Methylphenol
Aniline	1,4-Dichlorobenzene	Naphthalene
Azobenzene	3,3'-Dichlorobenzidine	2-Nitroaniline
Anthracene	2,4-Dinitrophenol	3-Nitroaniline
Benzo(a)anthracene	Diethylphthalate	4-Nitroaniline
Benzoic acid	Dimethyl phthalate	Nitrobenzene
Benzo(b)fluoranthene	2,4-Dimethylphenol	2-Nitrophenol
Benzo(k)fluoranthene	2,4-Dichlorophenol	4-Nitrophenol
Benzo(g,h,i)perylene	Di-n-butylphthalate	N-Nitroso-di-n-propylamine
Benzo(a)pyrene	4,6-Dinitro-2-methylphenol	N-Nitrosodimethylamine
Benzyl alcohol	2,4-Dinitrotoluene	N-Nitrosodiphenylamine
Bis(2-chloroethoxy)methane	2,6-Dinitrotoluene	2,2'-oxybis(1-Chloropropane)
Bis(2-chloroethyl)ether	Di-n-octylphthalate	Pentachlorophenol
4-Bromophenylphenyl ether	Bis(2-ethylhexyl)phthalate	Phenanthrene
Butylbenzylphthalate	Fluoranthene	Phenol
4-Chloroaniline	Fluorene	Pyrene
4-Chloro-3-methylphenol	Hexachlorobenzene	2,4,5-Trichlorophenol
2-Chloronaphthalene	Hexachlorobutadiene	1,2,4-Trichlorobenzene
2-Chlorophenol	Hexachlorocyclopentadiene	2,4,6-Trichlorophenol
4-Chlorophenylphenyl ether	Hexachloroethane	
Chrysene	Indeno(1,2,3-cd)pyrene	
Dibenzo(a,h)anthracene	Isophorone	
Dibenzofuran	2-Methylnaphthalene	

Inorganic Suite (Metals)

Aluminum	Calcium	Magnesium	Silver
Antimony	Chromium	Manganese	Sodium
Arsenic	Cobalt	Mercury	Thallium
Barium	Copper	Nickel	Vanadium
Beryllium	Iron	Potassium	Zinc
Cadmium	Lead	Selenium	

APPENDIX B DATA VALIDATION

TABLE B-1

DATA VALIDATION TABLE FOR PRS 21-013(a) SAMPLES

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
19596	AAB9084	Soil	TAL metals[a]	Mercury data qualified J- (estimated detected) or UJ (estimated undetected) because samples exceeded the recommended holding time. Potassium data qualified J+ (estimated, biased high) for a high recovery in the QC sample (142%).
19596	AAB9089	Soil	TAL metals	Mercury data qualified J- or UJ because samples exceeded the recommended holding time.
19596	AAB9090	Soil	TAL metals	Mercury data qualified J- or UJ because samples exceeded the recommended holding time.
19596	AAB9093	Soil	TAL metals	Mercury data qualified J- or UJ because samples exceeded the recommended holding time.
19596	AAB9094	Soil	TAL metals	Mercury data qualified J- or UJ because samples exceeded the recommended holding time.
19596	AAB9097	Soil	TAL metals	Mercury data qualified J- or UJ because samples exceeded the recommended holding time.
19855	AAB9084	Soil	Radiological[b]	Uranium data qualified J for high matrix spike recovery (138%) and low blind QC recovery (65%). Americium-241 data qualified J+ for high recovery in the laboratory control sample (122%). Tritium data qualified J- (estimated, biased low) for low recovery in QC sample (87%).
19855	AAB9089	Soil	Radiological	Uranium data qualified J for high matrix spike recovery (138%) and low blind QC recovery (65%). Americium-241 data qualified J+ for high recovery in the laboratory control sample (122%). Tritium data qualified J- for low recovery in QC sample (87%).
19855	AAB9090	Soil	Radiological	Uranium data qualified J for high matrix spike recovery (138%) and low blind QC recovery (65%). Americium-241 data qualified J+ for high recovery in the laboratory control sample (122%). Tritium data qualified J- for low recovery in QC sample (87%).
19855	AAB9093	Soil	Radiological	Uranium data qualified J for high matrix spike recovery (138%) and low blind QC recovery (65%). Americium-241 data qualified J+ for high recovery in the laboratory control sample (122%). Tritium data qualified J- for low recovery in QC sample (87%).
19855	AAB9094	Soil	Radiological	Uranium data qualified J for high matrix spike recovery (138%) and low blind QC recovery (65%). Americium-241 data qualified J+ for high recovery in the laboratory control sample (122%). Tritium data qualified J- for low recovery in QC sample (87%).
19855	AAB9097	Soil	Radiological	Uranium data qualified J for high matrix spike recovery (138%) and low blind QC recovery (65%). Americium-241 data qualified J+ for high recovery in the laboratory control sample (122%). Tritium data qualified J- for low recovery in QC sample (87%). Plutonium data qualified J for low tracer recovery (27%).
19860	AAB9102	Water	Radiological	Strontium-90 data qualified J- for low recovery in the laboratory control sample (70%).

[a] TAL metals = Target analyte list metals.
[b] Radiological = Americium-241, gamma scan, tritium, percent moisture, plutonium-238, plutonium-239, strontium-90, and total uranium.

TABLE B-2

DATA VALIDATION TABLE FOR PRS 21-026(a–c) SAMPLES

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
19372	AAB9828	Soil	SVOCs[a]	Data for three analytes qualified R (rejected) for false positive in QC sample. Data for seven analytes qualified UJ (estimated undetected) for recoveries between 10 and 50% in the QC sample.
19372	AAB9831	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9834	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9836	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9837	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9838	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9841	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9845	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9846	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9847	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9850	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9852	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9858	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9859	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.

TABLE B-2 (CONTINUED)

DATA VALIDATION TABLE FOR PRS 21-026(a–c) SAMPLES

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
19372	AAB9862	Water	SVOCs	All data are qualified UJ (there were no detects) because holding times were exceeded by 13 days.
19372	AAB9864	Water	SVOCs	All data qualified UJ (there were no detects) because holding times were exceeded by 13 days.
19372	AAB9873	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9876	Soil	SVOCs	Data for three analytes qualified R for false positive in QC sample. Data for seven analytes qualified UJ for recoveries between 10 and 50% in the QC sample.
19372	AAB9828	Soil	VOCs[b]	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9834	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9836	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9837	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9838	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9841	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9845	Soil	VOCs	All internal standards were outside allowed limits. All analytes are qualified UJ.
19372	AAB9846	Soil	VOCs	Four internal standards were outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9847	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9850	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9852	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9862	Water	VOCs	All data are qualified UJ (there were no detects) because holding times were exceeded by 13 days.
19372	AAB9864	Water	VOCs	All data are qualified UJ (there were no detects) because holding times were exceeded by 13 days.
19372	AAB9873	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
19372	AAB9876	Soil	VOCs	One internal standard was outside allowed limits. All associated analytes are qualified UJ.
20245	AAB9828	Soil	TAL metals[c]	Mercury data are qualified J- (estimated detected) or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.

TABLE B-2 (CONTINUED)

DATA VALIDATION TABLE FOR PRS 21-026(a–c) SAMPLES

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
20245	AAB9828	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9831	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9834	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9836	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9837	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9838	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9841	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9845	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9846	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9847	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9850	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9852	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.

TABLE B-2 (CONTINUED)

DATA VALIDATION TABLE FOR PRS 21-026(a–c) SAMPLES

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
20245	AAB9858	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9859	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9862	Water	TAL metals	Mercury data are qualified R because samples exceeded required holding times by 51 days.
20245	AAB9864	Water	TAL metals	Mercury data are qualified R because samples exceeded required holding times by 51 days.
20245	AAB9873	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20245	AAB9876	Soil	TAL metals	Mercury data are qualified J- or UJ because samples exceeded recommended holding times. Aluminum, chromium, iron, and vanadium data are qualified J- or UJ for recoveries of less than 75% in the QC sample.
20094	AAB9828	Soil	Radiological[d]	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9831	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9834	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9836	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9837	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9838	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).

TABLE B-2 (CONTINUED)

DATA VALIDATION TABLE FOR PRS 21-026(a–c) SAMPLES

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
20094	AAB9841	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9845	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9846	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9847	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9850	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9852	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9858	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9859	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).

TABLE B-2 (CONTINUED)

DATA VALIDATION TABLE FOR PRS 21-026(a–c) SAMPLES

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
20094	AAB9873	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).
20094	AAB9876	Soil	Radiological	Strontium-90 data are qualified J for low recoveries in the laboratory control sample (70–74%). Uranium data are qualified J for a low matrix spike recovery (54%). Tritium data are qualified J for a low matrix spike recovery (75%) and a high laboratory control sample recovery (122%).

[a] SVOCs = Semivolatile organic compounds.
[b] VOCs = Volatile organic compounds.
[c] TAL metals = Target analyte list metals.
[d] Radiological = Americium-241, gamma scan, tritium, percent moisture, plutonium-238, plutonium-239, strontium-90, and total uranium.

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APPENDIX C RISK ASSESSMENT CALCULATIONS

No risk assessment was conducted for PRSs 21-013(a) and 21-026(a–c).

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