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JAN 2000
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Date: January 18, 2000
Refer to: E/ER:00-006

Mr. John Kieling
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: SUBMITTAL OF RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) REPORT FOR POTENTIAL RELEASE SITE (PRS) 21-005 AT TECHNICAL AREA (TA)-21

Dear Mr. Kieling:

Enclosed please find the Certification and two copies of the *RFI Report for PRS 21-005*. Our investigation was conducted in accordance with the Los Alamos National Laboratory's Environmental Restoration (ER) Project's Fact Sheet for PRS 21-005 dated April 15, 1999. The ER Project Telephone Communication Record documenting your approval of the investigation approach and the corresponding fact sheet are enclosed.

If you have any questions, please contact Deba Daymon at (505) 667-9021 or Joe Mose at (505) 667-5808.

Sincerely,

Julie A. Canepa, Program Manager
Los Alamos National Laboratory
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Department of Energy
Los Alamos Area Office

TC

10563

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Enclosure:
1) Certification
2) RFI Report for PRS 21-005
3) ER Project Telephone Communication Record

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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 Potential Release Site 21-005*

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RFI Report for Potential Release Site 21-005

Environmental Restoration Project
A Department of Energy Environmental Cleanup Program
ER19990099

Los Alamos
NATIONAL LABORATORY
Los Alamos, NM 87545

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EXECUTIVE SUMMARY

This report addresses the Resource Conservation and Recovery Act (RCRA) facility investigation of Potential Release Site (PRS) 21-005, the former nitric acid pit, located in Technical Area (TA) 21. The PRS (TA-21-70) is located adjacent to Buildings TA-21-30 and TA-21-31. The acid pit was a 3-ft-square by 4-ft-deep reinforced concrete box with a plate steel cover in which classified documents were dissolved with nitric acid. The pit was used from 1946 to 1967, when it was partially removed. PRS 21-005 is currently beneath an asphalt parking lot used to park grounds maintenance equipment. The PRS was never connected to any other structure.

The location of the former acid pit was first estimated based on Laboratory technical drawings. Excavation with a backhoe revealed that the bottom of the pit had been left in place and covered with fill material. Thus, the exact location of the former acid pit was known. The bottom of the pit was removed from the excavation, and drilling and sampling was performed for the characterization of the PRS.

Five boreholes were drilled and sampled to a depth of 20 ft. Samples were collected from the cores approximately every 5 ft. One biased sample was collected from an area of altered tuff, and one field duplicate sample was collected for a total of 22 samples.

Analytical results indicate that a release may have occurred from the bottom of the pit. Concentrations of several inorganic chemicals (aluminum, barium, nickel, and selenium) were found above their background values (BVs) for tuff beneath the pit in sample MD21-99-0052 (9.5–10.0 ft). However, two samples collected beneath MD21-99-0052 did not contain any inorganic chemicals above BVs for tuff, and these chemicals were not detected above BVs for tuff in the four surrounding boreholes. Therefore, nature and extent for the inorganic chemicals assumed to be the result of a release from the PRS were determined.

Antimony was detected above the tuff BV at location 21-11045 (2.5–5 ft) outside the footprint of the former pit. Three organic compounds were also detected outside of the footprint of the pit. Benzene was detected at a depth of 14.5 ft in borehole 21-11047, trichloroethene was detected at a depth of 4.0 ft in borehole 21-11046, and toluene was detected at a depth of 9.5 ft at location 21-11046. Antimony was not detected above the tuff BV beneath the former pit and is assumed not to be from a release from the PRS. Similarly, none of the organic compounds were detected beneath the former pit and are also assumed not to be from a release from the PRS. No radionuclides were detected above BVs in any samples.

A human health screening assessment, ecological screening assessment, and surface water assessment were conducted for the samples. The human health screening assessment indicated that chemicals of potential concern retained by the data review did not pose an unacceptable risk to human health. The ecological screening assessment did not identify any chemicals of potential ecological concern. The surface water assessment indicated a low potential for erosion. No groundwater or underground storage tank assessments were conducted at this site.

No further action (NFA) is recommended for PRS 21-005 based on Criterion 5, "The PRS has been characterized or remediated in accordance with current and applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected land use." The PRS is summarized in Table ES-1.

Table ES-1
Summary of Proposed Actions

PRS Number	PRS Description	HSWA[a]	Radionuclide Component	Proposed Action	Rationale for Recommendation	Section Number
21-005	Nitric Acid Pit	Yes	No	NFA Criterion 5[b]	Human health and ecological assessments indicate an acceptable level of risk under current and projected future land use.	2

[a] HSWA = Hazardous and Solid Waste Amendments of 1984. The site is listed in Module VIII of the Laboratory's Hazardous Waste Facility Permit.

[b] NFA criterion are listed in Section II.B.4.a.(4).(b), "No Further Action (NFA) Proposals Criteria," in the New Mexico Environment Department RCRA Permits Management Program Document Requirement Guide.

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1.0 INTRODUCTION

Los Alamos National Laboratory (the Laboratory) is a multidisciplinary research facility owned by the Department of Energy (DOE) and managed by the University of California. The Laboratory is located in north-central New Mexico approximately 60 miles northeast of Albuquerque and 20 miles northwest of Santa Fe. The Laboratory site (Figure 1.0-1) covers 43 square miles of the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing ephemeral and intermittent streams that run from west to east. Mesa tops range in elevation from approximately 6200 ft to 7800 ft. The eastern portion of the plateau stands 300 ft to 900 ft above the Rio Grande.

The Laboratory's Environmental Restoration (ER) Project is involved in a national effort by the DOE to clean up facilities that were formerly involved in weapons production and research. The goal of the ER Project is to ensure that DOE's past operations do not threaten human or environmental health and safety. To achieve that goal, the ER Project is currently investigating sites potentially contaminated by past Laboratory operations. Sites under investigation are either solid waste management units (SWMUs) or areas of concern (AOCs). In the Laboratory's ER Project, SWMUs and AOCs are collectively referred to as potential release sites (PRSs). This Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) addresses PRS 21-005, a former nitric acid pit. The investigation was conducted in accordance with the Hazardous and Solid Wastes Amendments (HSWA) of 1984 and follows the requirements in Module VIII of the Laboratory's Hazardous Waste Facility Permit (EPA 1990, 1585). Module VIII was issued to the Laboratory by the US Environmental Protection Agency (EPA) on May 23, 1990, and modified on May 19, 1994. The Laboratory RFI work plan for Technical Area (TA) 21 (LANL 1991, 7528, 7529, 7680; three volumes) was approved by the EPA.

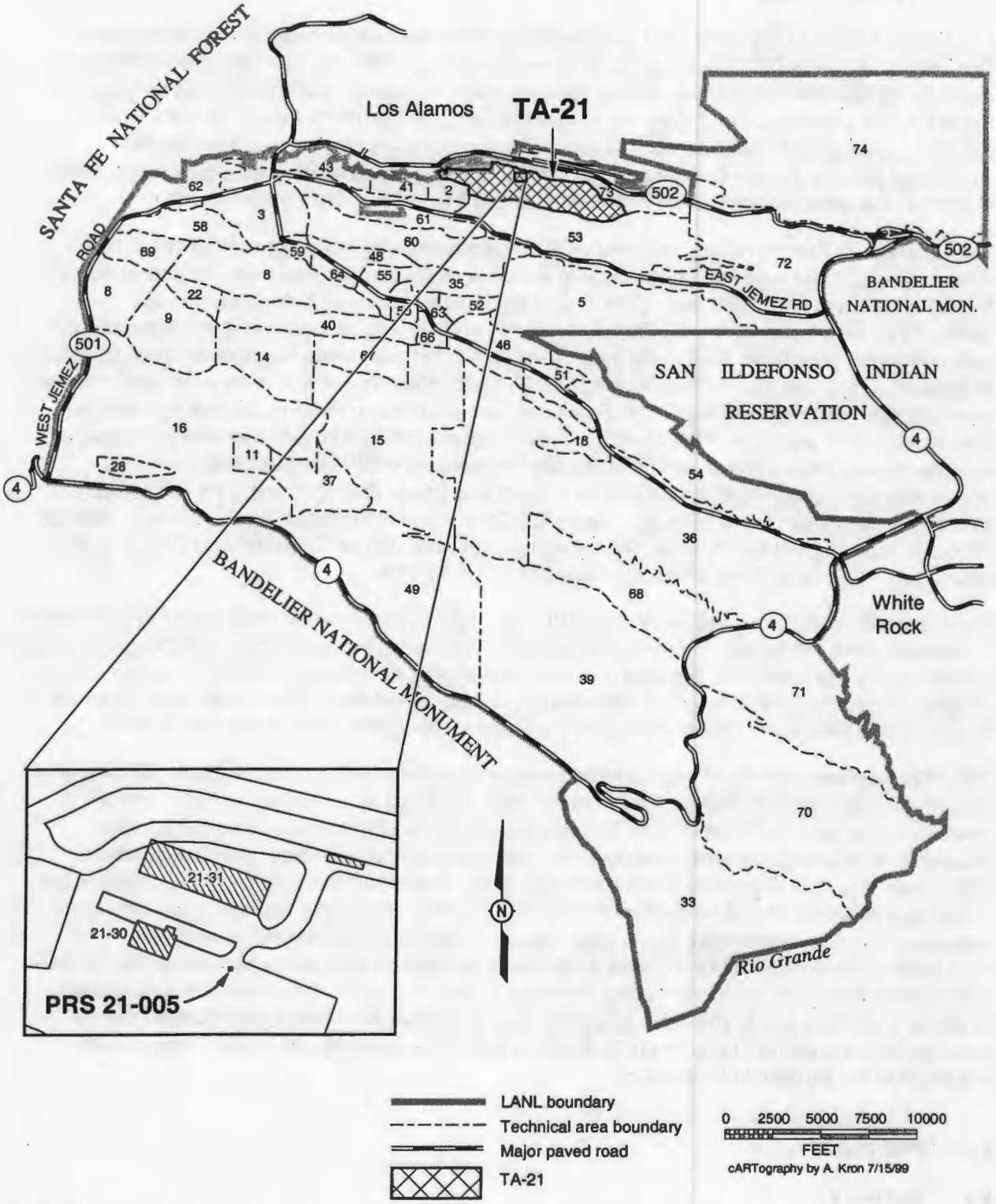
The approved installation work plan (IWP) (LANL 1996, 55574) describes the methodologies used in this investigation. Recent changes to data review and ecological screening assessment methodologies are not reflected in the approved IWP. The data review methodology is included in Appendix C. The ecological screening methodology is described in "Screening Level Ecological Risk Assessment Approach for the Environmental Restoration Project at Los Alamos National Laboratory" (Kelly et al. 1998, 57916).

This RFI report describes the characterization sampling activities at PRS 21-005 at TA-21. This report is divided into three sections. Section 1 is the introduction. Section 2 presents the site history, including previous and current field investigations, data review, human health, ecological, and surface water assessments. Section 3 contains references. More detailed information is provided in the attached appendixes. Appendix A contains a list of acronyms and a glossary of terms. Appendix B discusses the current and anticipated future land use of PRS 21-005 and the climate, geology, hydrology, ecological resources, and cultural resources for the area. Appendix C includes the complete data quality assurance/quality control (QA/QC) results. Appendix D provides an abridged version of the data for the investigation (analytical suites and results). Appendix E provides details about statistical calculations. Appendix F provides details about risk assessments and calculations. Photographs from the current investigation are presented in Appendix G. Borehole logs of the five boreholes drilled in the current investigation are provided in Appendix H.

2.0 PRS 21-005

2.1 Summary

PRS 21-005, a former nitric acid pit, was in use from 1946 to 1967. The pit was approximately 3 ft square by 4 ft deep and constructed of reinforced concrete. It was covered with a steel plate and had no inlet or outlet pipes. Documents were placed into the pit and nitric acid was poured in, as needed, to destroy classified documents. The pit was removed in 1967.



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F1.0-1 / 21-005 RFI RPT / 011400 / PTM

Figure 1.0-1. Location of TA-21 with respect to Laboratory TAs and surrounding land holdings

There is no documentation of any releases from the pit. The integrity of the pit when it was removed is thought to have been good. Evidence for this is found in instructions to workers stating that acid needed to be absorbed before removal of the pit (Francis 1999, 63871). Also, a memorandum stated that radionuclide screening of the pit before removal was not possible because of the presence of acid solutions within the pit (LANL 1999, 63870).

The objectives of this RFI are

1. to determine the location of the acid pit structure (TA-21-70),
2. identify if contaminants are present, and
3. if contaminants are identified, determine their lateral and vertical extent.

Five boreholes were drilled within and surrounding PRS 21-005: one centered on the former pit location and one each 5 ft to the north/northeast, south/southwest, east/northeast, and west/southwest of the former pit location. A total of 22 samples were collected from recovered cores and submitted to off-site fixed laboratories for analysis. The full suite of analyses for all samples consisted of gross alpha, beta, and gamma radiation; gamma-emitting radionuclides; inorganic chemicals, including mercury by cold vapor atomic absorption (CVAA); isotopic uranium; isotopic plutonium; nitrates; volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs); and polychlorinated biphenyls (PCBs). Soil pH was performed on site with pH paper and deionized water every 2.5 ft on all recovered core samples. Details of the RFI investigation can be found in Section 2.3.4.2.

PRS 21-005 has been sampled, and the nature and extent of contamination has been defined. All detected analytes were eliminated as chemicals of potential concern (COPCs). The screening assessment results indicated that potential releases from the pit did not pose a potential for adverse impacts to human health or the environment. No further action (NFA) is recommended based on Criterion 5.

2.2 Description and Operational History

PRS 21-005 is a SWMU listed on Table A of the Laboratory HSWA Permit (EPA 1990, 1585).

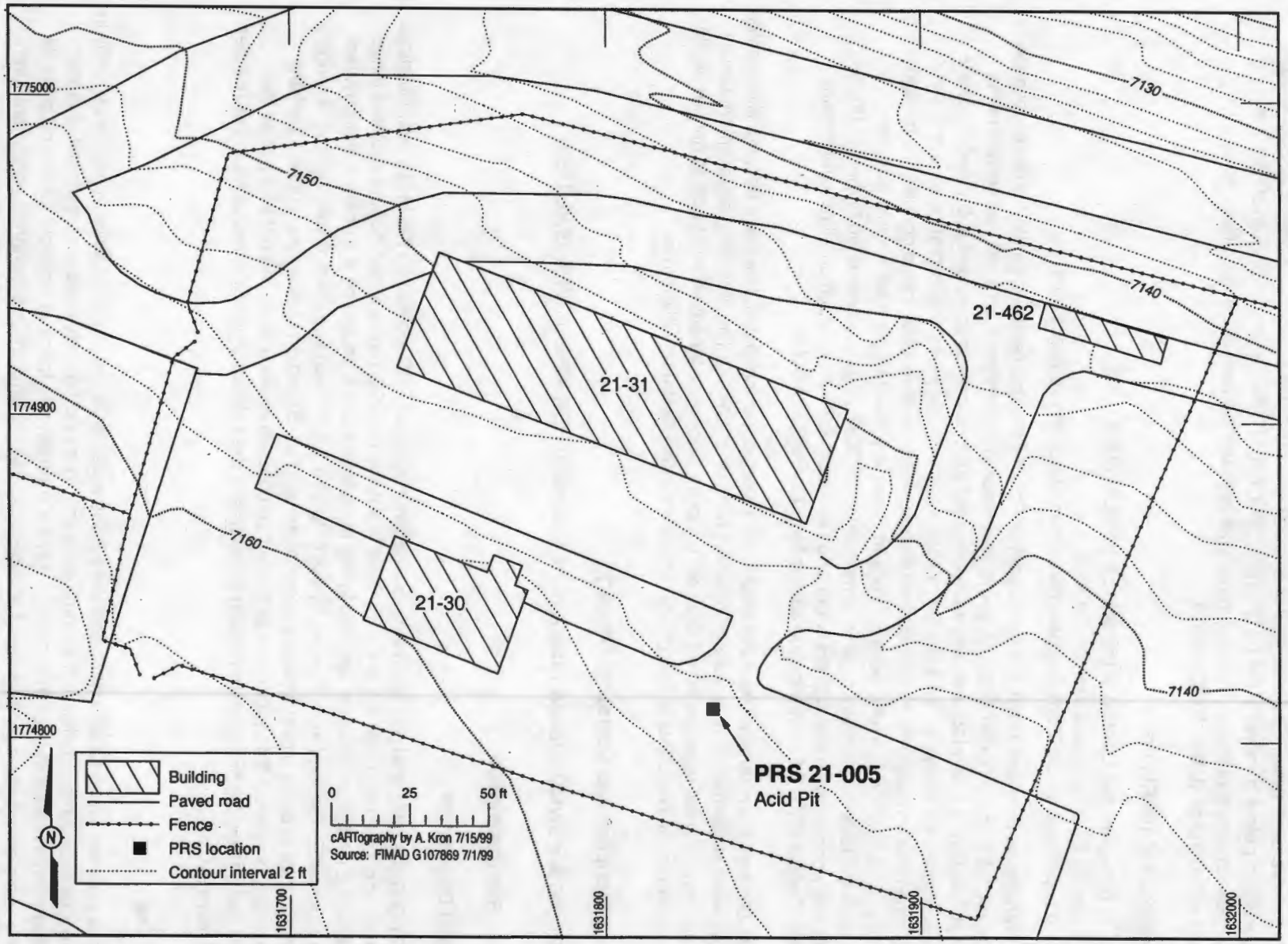
2.2.1 Site Description

Physical Description

PRS 21-005, the nitric acid pit (TA-21-70), is a decommissioned PRS located on DP Mesa near Buildings TA-21-30 and TA-21-31 (Figure 2.2-1). The area is entirely on DOE property and behind a locked fence. The pit was a reinforced concrete box with inside dimensions of 3 ft square by 4 ft deep; it was covered with a steel plate. The total area covered by the PRS and the surrounding area of investigation is roughly 225 ft^2. No inlet or outlet piping was connected to the acid pit. Based on observations during the field investigation (Section 2.3.4.2), the pit was formed and poured in place using the tuff bedrock as the outside form. Many septic tanks and similar structures at the Laboratory were constructed in this manner in the mid-1940s.

Land Use

TA-21 is currently under DOE control, and the PRS is within a locked chainlink fence. TA-21 is currently in the process of decontamination and decommissioning. The land has been used for chemical research and plutonium metal production from 1945 to 1978. Currently, the Johnson Controls roads and grounds group is using the site as a parking area for vehicles and larger grounds maintenance equipment. Both the TA-21 work plan and land transfer proposals assume future land use of TA-21 will be industrial.



F2.2-1 / 21-005 RFI RPT / 011400 / PTM

Figure 2.2-1. Site map of PRS 21-005

Relation to Other PRSs

There are no other PRSs immediately adjacent to or contiguous with the acid pit. However, the site is within the TA-21 complex, and there are numerous other PRSs in the general vicinity. The nearest PRS is 21-002(b), which is a former drum storage structure (TA-21-38), located approximately 75 ft northeast of PRS 21-005. The next closest is PRS C-21-024, which is the location of a former warehouse; it is located approximately 125 ft east of PRS 21-005. Because PRS 21-005 was a subsurface structure, releases from other PRSs are assumed to have not influenced this site.

Environment

PRS 21-005 is located beneath a paved parking area adjacent to Buildings TA-21-30 and TA-21-31. The immediate area of the PRS slopes gently to the north and drains towards DP canyon. Because the PRS structure was partially removed in 1967 and the area is now covered by asphalt, erosion of soil/fill beneath the asphalt or infiltration of water into the PRS is highly unlikely.

An ephemeral watercourse is present in the bottom of DP canyon to the north of the PRS. Flow in this watercourse is primarily limited to snowmelt water and rainwater runoff. The water enters the drainage from a storm sewer at the head of the canyon and from the northern half of DP mesa. Detailed discussion of the geology and hydrology of the area can be found in Appendix B.

There are no PRS-specific cultural resources present at this site. General information regarding cultural resources at TA-21 are included in Appendix B-6.0.

A biological resource field survey has been conducted for the general area of this PRS. The mesa proper provides limited habitat for biota and does not contain sensitive habitats; threatened or endangered species are not present on the mesa top. General information regarding ecological resources at TA-21 are included in Appendix B-5.0, and the ecological scoping checklist for PRS 21-005 is included in Appendix F-3.0.

2.2.2 Operational History

The nitric acid pit was constructed in 1946 to dissolve classified documents. It contained an unknown volume of nitric acid. The concentration of the acid used in the pit is not known. It is not known if the pit was ever pumped out during the period it was used. The pit was partially removed in 1967. Instructions to the workers who removed the pit called for acid within the pit to be absorbed; they were then to dig out around the sides of the pit before lifting it out in one piece from the hole (Francis 1999, 63871). The amount of material used to absorb the acid within the pit is not known. It is assumed that clean fill was used to backfill the resulting excavation.

2.3 Investigatory Activities

2.3.1 Summary

This section describes the investigatory activities for PRS 21-005, including the preliminary site conceptual model guiding the RFI fieldwork (Section 2.3.3) and RFI field activities (Section 2.3.4.2). A review of the RFI data is also presented (Section 2.3.4.3) followed by a description of how the conceptual model for PRS 21-005 was revised based on information gained during the RFI investigation (Section 2.3.5)

2.3.2 Previous Investigations

No previous investigations have occurred at this site, and there is no documentation of releases from the pit.

2.3.3 Preliminary Site Conceptual Model

Work orders for the removal of the acid pit, dated November 2, 1966 (Francis 1999, 63871), stated the need to place soil to absorb the acid in the pit, implying that there was still acid in the pit and that the integrity of the pit was still intact. There are no documented releases from the acid pit during the time of its usage, and it is not known if the pit was periodically pumped out. However, in the 21 years the pit remained in the ground, acid may have degraded the concrete resulting in a release to the subsurface. If releases did occur from the pit, the COPCs are inorganic chemicals, nitrates, and low pH corrosive soils. Any leakage from the pit would have been an aqueous solution, which would preferentially migrate downward into the vadose zone. Migration of any contaminants through the vadose zone would be by way of leaching and/or dispersion. Highly corrosive soils are not anticipated because carbonates within the basic soils (e.g., high pH) would aid in neutralization of any released acid. Residual nitrates would probably have biodegraded since the removal of the pit in 1967.

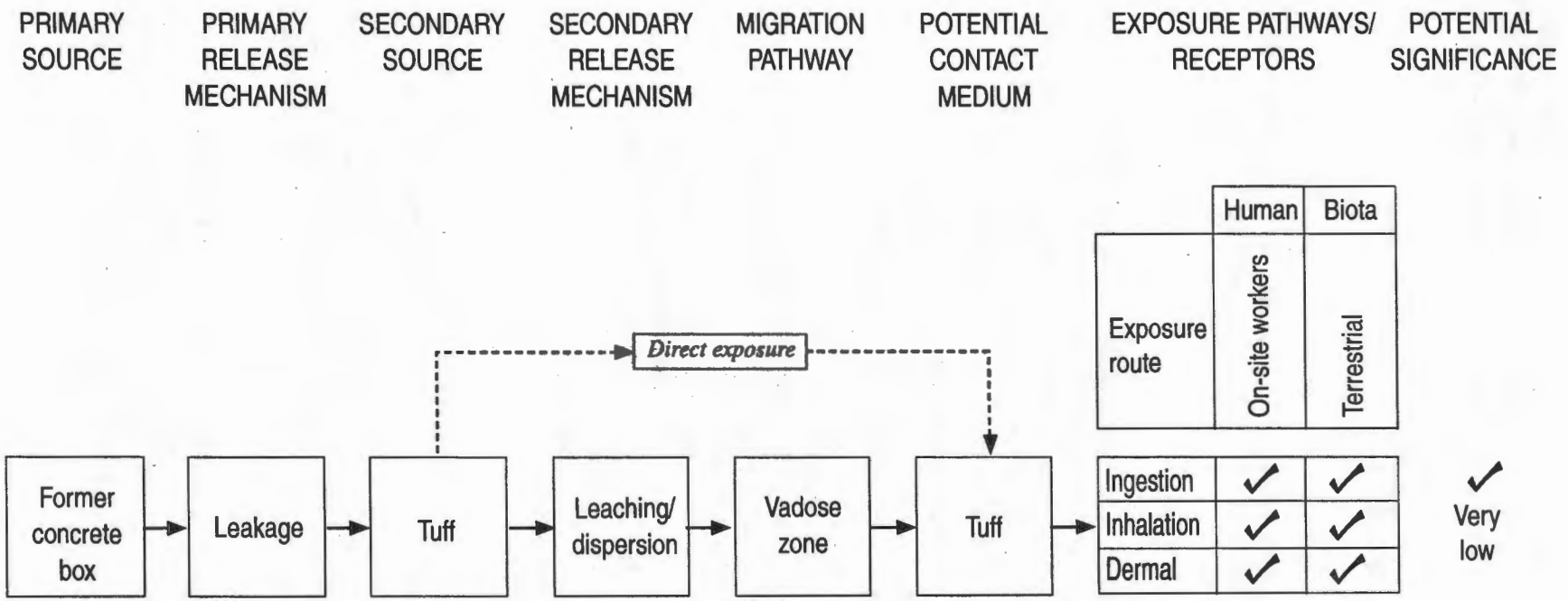
Because the former location of the pit is now under asphalt pavement, there are no complete exposure pathways to potential human or ecological receptors. However, if construction were to occur in the future, workers at the site could be exposed by way of incidental ingestion of tuff, inhalation of particulates, and dermal contact with the tuff. A preliminary conceptual model is presented in Figure 2.3-1. The model depicts potential contaminant releases from the concrete box, as well as potential subsequent exposure to humans and terrestrial animals.

Investigatory Approach

The objectives of this RFI are

1. to determine the location of the acid pit structure (TA-21-70),
2. identify if contaminants are present, and
3. if contaminants are identified, determine their lateral and vertical extent.

The TA-21 work plan originally called for a single angled borehole to be advanced beneath the former pit location because an office trailer was located directly over PRS 21-005 (LANL 1991, 7680). From this borehole, four samples were to be collected between 0 and 10 linear ft. The total depth of the borehole was to have been 7 ft below ground surface (bgs). Since the writing of the work plan, the trailer has been removed from the site. Therefore, a single borehole was drilled at the center of the former pit to a total depth of 20 ft, as proposed in the 21-005 fact sheet (Francis 1999, 63871). The fact sheet was transmitted to the New Mexico Environment Department (NMED) on December 14,1998, and was verbally approved by NMED on April 15, 1999 (Environmental Restoration Project 1999, 64004). Core samples were to be collected every 5 ft. This modified approach provides more precise locations of the samples in relation to the former pit location and investigates a greater vertical profile. The full suite of analyses includes gross alpha, beta, and gamma; gamma-emitting radionuclides; inorganic chemicals including mercury by CVAA; isotopic uranium; isotopic plutonium; nitrates; VOCs; and SVOCs. PCB analysis was added to the suite at the request of NMED Hazardous and Radioactive Materials Bureau (HRMB).



F2.3-1 / 21-005 RFI RPT / 011400 / PTM

Figure 2.3-1. Preliminary conceptual model for PRS 21-005

If assessment of the data from the single borehole indicated that a release had occurred, then four additional boreholes would be advanced around the location of the pit center to determine lateral extent (Francis 1999, 63871). The planned depth of these additional boreholes would be adjusted, as appropriate, based on assessment of the initial data.

2.3.4 Field Investigation and Data Evaluation

2.3.4.1 Summary

This section describes the field investigation and data evaluation for PRS 21-005. The field investigation is discussed in Section 2.3.4.2, and the data review is included in Section 2.3.4.3.

2.3.4.2 Field Investigation

RFI activities at PRS 21-005 began on June 3, 1999, and concluded on June 15, 1999. The weather was warm and dry each day of sample collection. Applicable ER standard operating procedures (SOPs) and vendor manuals (VMs) were followed during completion of each phase of the field work, which included radiological screening, borehole drilling, subsurface tuff sampling, geodetic surveying, and related activities. The ER Project SOPs used during completion of this work are as follows:

- LANL-ER-SOP-1.01, R0, "General Instruction for Field Investigations"
- LANL-ER-SOP-1.02, R0, "Sample Containers and Preservation"
- LANL-ER-SOP-1.03, R1, "Handling, Packaging, and Shipping of Samples"
- LANL-ER-SOP-1.04, R3, "Sample Control and Field Documentation"
- LANL-ER-SOP-1.05, R0, "Field Quality Control Samples"
- LANL-ER-SOP-1.06, R1, "Management of Environmental Restoration Project Wastes"
- LANL-ER-SOP-1.08, R0, "Field Decontamination of Drilling and Sampling Equipment"
- LANL-ER-SOP-3.01, R1, "Land Surveying Procedures"
- LANL-ER-SOP-4.01, R1, "Drilling Methods and Drill Site Management"
- LANL-ER-SOP-6.09, R0, "Spade and Scoop Method of Collection of Soil Samples"
- LANL-ER-SOP-6.26, R0, "Core Barrel Sampling for Subsurface Earth Materials"
- LANL-ER-SOP-11.04, R0, "Soil and Core pH"
- VM-1.R0, "Operating Instruction for the EnCore Sampler"

Site Survey

A review was conducted of historical records, including maps, engineering plans, and reports in order to determine an approximate location of the pit (Francis 1999, 63871). Site visits were conducted to substantiate the available information and existing site conditions. A geodetic survey of the site was performed to confirm the size and position of buildings. The approximate pit location was estimated from historical research conducted by W. Francis (1999, 63871). Available drawings used an outdated coordinate system. The coordinates were converted to the state plane referenced coordinate system by scaling the pit location relative to structures TA-21-30 and TA-21-31.

On June 3, 1999, a CME-750 drill rig was mobilized to PRS 21-005. Two exploratory borings were advanced to the fill/tuff interface in the approximate location of the former acid pit. The expected depth to tuff was approximately 4 ft, allowing for the 3-ft depth of the concrete pit plus the thickness of the concrete bottom of the pit. Both borings encountered tuff bedrock at a depth of 2 ft. Two additional borings were advanced to the south of the first two borings with tuff bedrock encountered again at 2 ft.

It was decided that because tuff bedrock was very shallow, it would be more cost and time effective to use a backhoe to expose the fill/tuff interface in an effort to identify the former location of the acid pit. On June 8, 1999, a backhoe was mobilized at the site, and excavation to the soil/tuff contact began. An area approximately 15 ft square that included the four initial borings was excavated with no evidence of the former pit location (Figure 2.3-2). No additional excavation could be performed until a new excavation permit was issued because the area immediately to the north first needed to be cleared for underground utilities (Appendix G, Photographs 1 to 3).

A utility clearance was obtained, and on June 14, excavation north of the borings began. A reinforced concrete slab was identified directly north of the first exploratory borings beneath 6 in. of asphalt and 1.5 ft of fill. After excavating an area approximately 10 ft square with the backhoe and digging by hand with a shovel, the entire slab was uncovered. The slab was approximately 4 ft square with the uppermost surface approximately level. The surface appeared etched, and the outline of the missing vertical walls was visible. Based on the location of this slab, the etched appearance of the concrete and outline of the former walls, it was determined that the slab was the bottom of the former acid pit (Appendix G, Photographs 4 to 8).

Apparently, the bottom of the acid pit structure became detached from the rest during removal and was left in place. Examination of the excavation showed no sign of any stained soils or tuff surrounding the slab. It is assumed that the soil/absorbent used to soak up any acid within the pit was removed from the excavation either before or after the sides of the concrete box detached from the bottom.

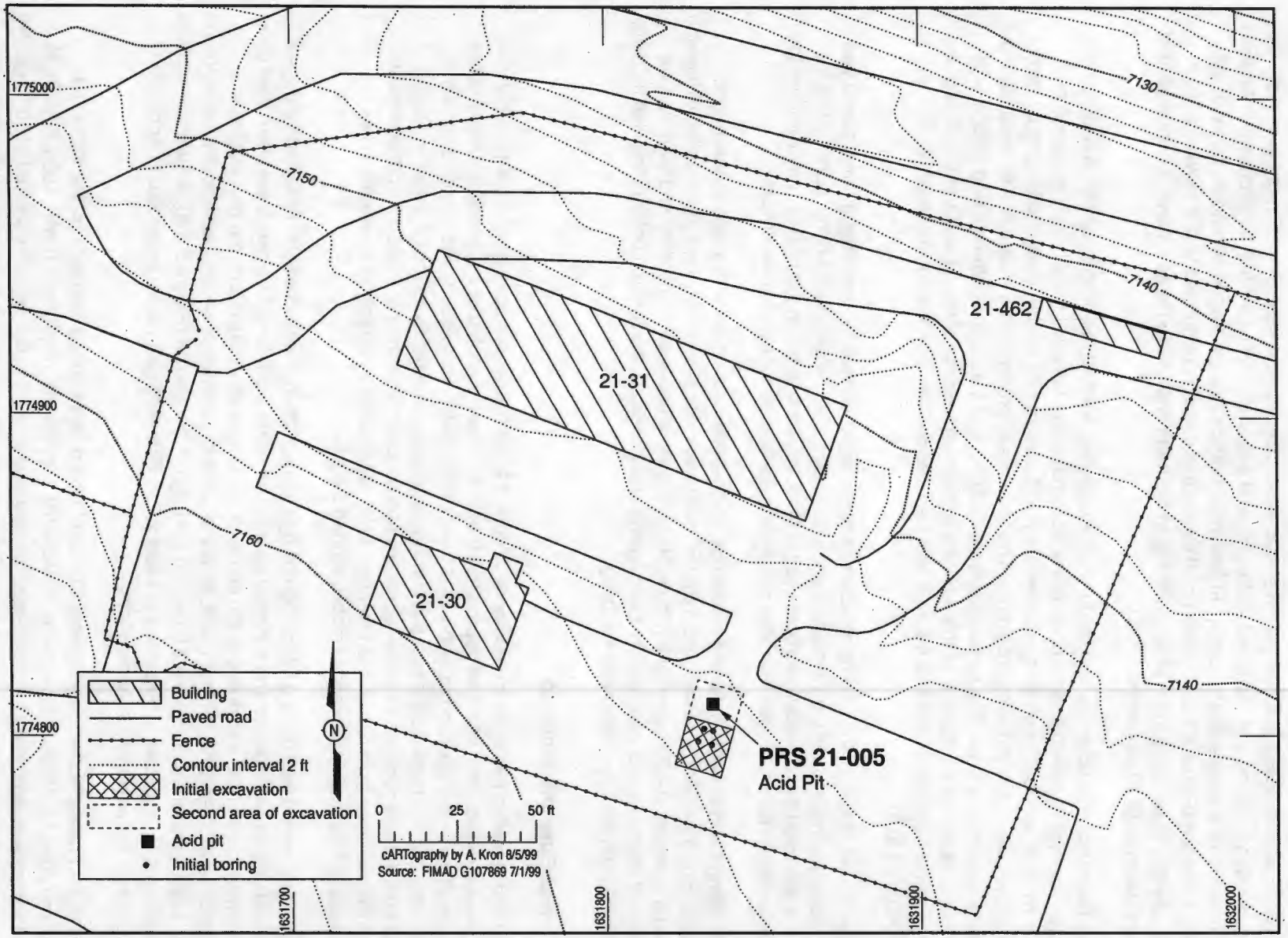
After locating the slab center relative to Buildings TA-21-30 and TA-21-31 with a tape measure and photographing the slab, it was removed from the excavation with a backhoe. Final examination of the slab showed it to be about 4 ft square by 2 ft thick. No cracks were observed in the slab, and there was no evidence of stained soil or concrete. The excavation was backfilled, the former center of the slab flagged, and the site prepared for drilling and sampling.

Subsurface Borehole Sampling

Drilling and sampling began on the afternoon of June 14, 1999, and was completed June 15, 1999. Five borings were drilled, each to a total depth of 20 ft bgs, and were sampled at 5-ft intervals, unless noted otherwise. This was a deviation from the TA-21 work plan (LANL 1991, 7680) and modified fact sheet (LANL 1999, 63870) because the four surrounding boreholes were not to be drilled unless analytical results from the first borehole indicated a release had occurred from the pit. The additional boreholes were drilled because both nature and extent could be determined by drilling all boreholes in this investigation, thus avoiding a second mobilization to the site.

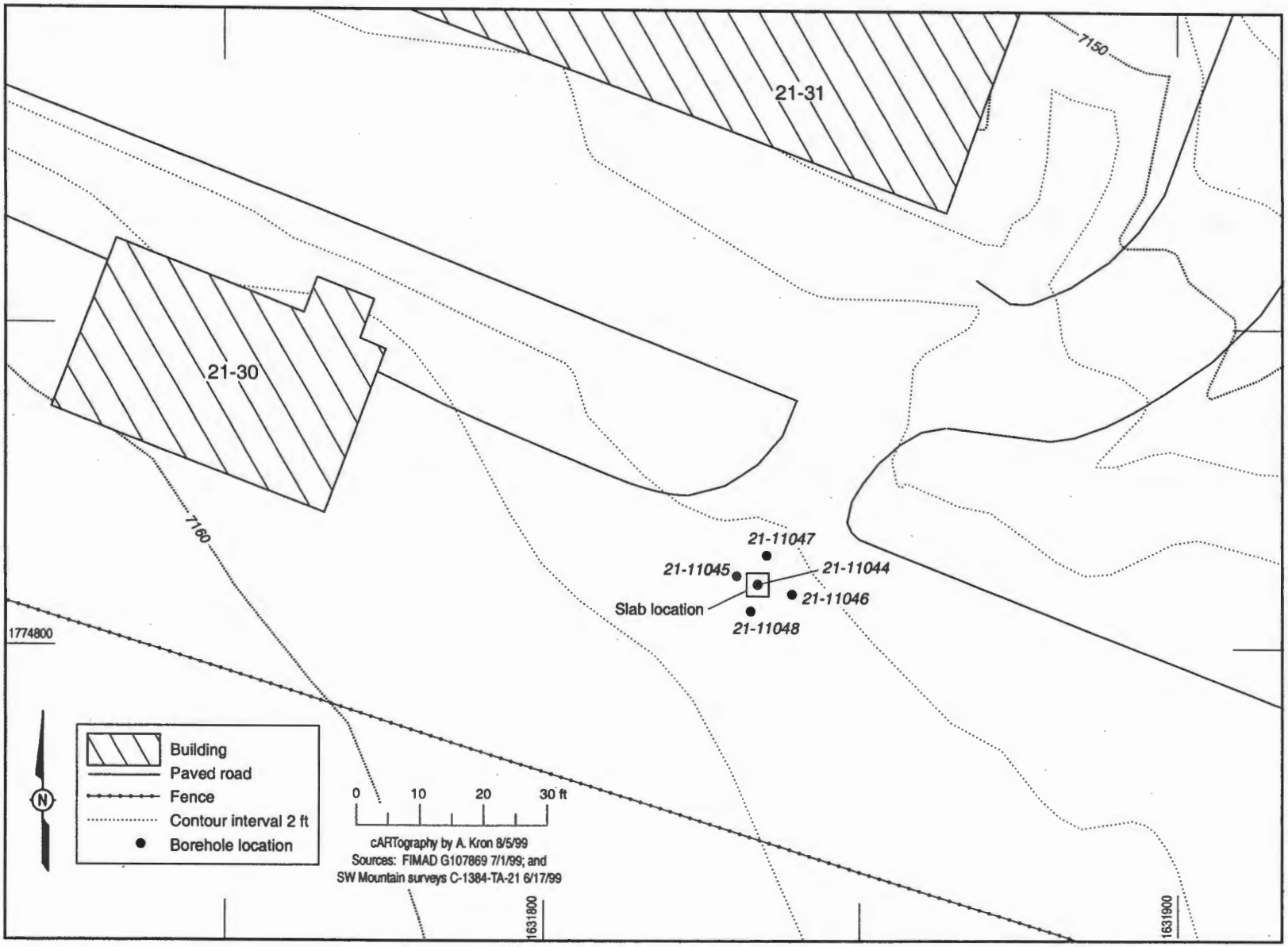
All boreholes were drilled using a CME-750 drill rig turning 4.25-in.-inside-diameter hollow-stem augers. Continuous core was collected and retrieved by wire line using a 5-ft-long, two-piece, stainless steel core barrel. The first borehole was drilled at the center of the former pit location, and the four additional boreholes were drilled 5 ft north/northeast, south/southwest, east/northeast, and west/southwest of the pit center, placing them approximately 3 ft beyond the edge of the acid pit (Figure 2.3-3). A summary table of borehole samples collected is presented in Table 2.3-1. Site photographs are presented in Appendix G. Borehole logs are presented in Appendix H.

Borehole 21-11044 (Pit Center). Borehole 21-11044 was drilled through the center of the former pit location on June 14, 1999. Samples were collected at 5-ft intervals as planned (LANL 1999, 63870). No biased samples were collected. A weathered fracture was present in the sample collected at 10 ft bgs. No staining was observed in the recovered core. The uppermost portions of the recovered tuff cores were weathered to a reddish gray color that turned to light gray below approximately 7.5 to 10 ft.



F2.3-2 / 21-005 RFI RPT / 011400 / PTM

Figure 2.3-2. Site map of PRS 21-005 showing initial exploratory borings and areas excavated to locate former acid pit



F2.3-3 / 21-005 RFI RPT / 011400 / PTM

Figure 2.3-3. Borehole locations for PRS 21-005

Table 2.3-1
Summary of Samples Collected at PRS 21-005 for Fixed-Laboratory Analyses

Location ID	Sample ID	Sample Type	Depth (ft)	Gamma Spectroscopy	Gross Alpha and Gross Beta Radiation	Gross Gamma Radiation	Isotopic Plutonium	Isotopic Uranium	TAL Metals	Nitrate as Nitrogen	PCBs	SVOCs	VOCs
21-11044	MD21-99-0051	Grab	4.5–5	5694R	5694R	5694R	NA*	5694R	5693R	5693R	5692R	5692R	5692R
21-11044	MD21-99-0052	Grab	9.5–10	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11044	MD21-99-0053	Grab	14.5–15	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11044	MD21-99-0054	Grab	19.5–20	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11045	MD21-99-0055	Grab	2.5–3.5	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11045	MD21-99-0056	Grab	7–7.5	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11045	MD21-99-0057	Grab	7.5–10	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11045	MD21-99-0058	Grab	14.5–15	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0059	Grab	4–5	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0060	Grab	9.5–10	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0061	Grab	13.75–14.5	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0062	Grab	19.5–20	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11047	MD21-99-0063	Grab	4.5–5	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11047	MD21-99-0064	Grab	9.5–10	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11047	MD21-99-0065	Grab	14.5–15	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11047	MD21-99-0066	Grab	19.5–20	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11048	MD21-99-0067	Grab	4.5–5	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11048	MD21-99-0068	Grab	9.5–10	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11048	MD21-99-0069	Grab	14.5–15	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11048	MD21-99-0070	Grab	19.5–20	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11045	MD21-99-0071	Grab	19.5–20	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0072	FD	4–5	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11044	MD21-99-0143	Grab	4.5–5	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11044	MD21-99-0144	Grab	9.5–10	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11044	MD21-99-0145	Grab	14–15	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11044	MD21-99-0146	Grab	19.5–20	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0147	Grab	2.5–3.5	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0148	Grab	7–7.5	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0149	Grab	9.5–10	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0150	Grab	14.5–15	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0151	Grab	4–5	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0152	Grab	9.5–10	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0153	Grab	13.75–14.5	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0154	Grab	19.5–20	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11047	MD21-99-0155	Grab	4.5–5	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA

Note: Numbers in the cells for each analytical suite are request numbers. All samples were collected from geologic Unit Qbt 3.

Table 2.3-1 (continued)

Location ID	Sample ID	Sample Type	Depth (ft)	Gamma Spectroscopy	Gross Alpha and Gross Beta Radiation	Gross Gamma Radiation	Isotopic Plutonium	Isotopic Uranium	TAL Metals	Nitrate as Nitrogen	PCBs	SVOCs	VOCs
21-11047	MD21-99-0156	Grab	9.5–10	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11047	MD21-99-0157	Grab	14.5–15	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11047	MD21-99-0158	Grab	19.5–20	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11048	MD21-99-0159	Grab	4.5–5	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11048	MD21-99-0160	Grab	9.5–10	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11048	MD21-99-0161	Grab	14.5–15	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11048	MD21-99-0162	Grab	19.5–20	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0163	Grab	19.5–20	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0164	Grab	4–5	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA

*NA = not analyzed.

Borehole 21-11045 (5 ft WNW of Pit Center). Borehole 21-11045 was started on June 14, 1999. The first sample (MD21-99-0055) was to be collected from the 4.5-ft to 5.0-ft interval; however, this sample was actually collected from the 2.5-ft to 3.5-ft interval because a discolored area not clearly related to weathering was present at that interval. The second sample, MD21-99-0056, was collected from the 7.0-ft to 7.5-ft depth range. This sample is an additional biased sample collected because of the presence of fractures. All of the remaining samples were collected at the planned intervals, and no staining was observed in those cores.

Borehole 21-11046 (5 ft ESE of Pit Center). Borehole 21-11046 was drilled on June 15, 1999. Sample MD21-99-0060 was collected at the planned depth of 14.5 to 15.0 ft and was found to contain a silt-filled vertical fracture. Sample MD21-99-0061 was collected at 13.75 to 14.5 ft to include the trace of a thin discolored fracture. All other samples were collected from unfractured cores with no evidence of alteration.

Borehole 21-11047 (5 ft NNE of Pit Center). Borehole 21-11047 was drilled on June 15, 1999. All samples were collected at 5-ft intervals as planned. No biased samples were collected because there was no indication of staining, fracturing, or alteration of the core attributable to a release from the pit.

Borehole 21-11048 (5 ft SSW of Pit Center). Borehole 21-11048 was drilled on June 15, 1999. All samples were collected at 5-ft intervals as planned. No biased samples were collected because there was no indication of staining, fracturing, or alteration of the core attributable to a release from the pit.

Soil pH was measured in the field at each 2.5-ft interval of the five 20-ft cores. Commercially prepared deionized water and pH paper was used. The initial pH of the water was measured using pH paper and was determined to be 5.0. Equal volumes of tuff and deionized water were placed in decontaminated glass jars and allowed to equilibrate for a minimum of 20 min. The pH of the water and tuff were then measured with pH paper. All samples measured had pHs of 5 to 7 showing that the pH of the tuff at PRS 21-005 was not strongly acidic. Table 2.3-2 summarizes the pH values measured in each 2.5-ft core run.

Table 2.3-2
pH Screening Results

Location ID	Depth (ft)	pH	Location ID	Depth (ft)	pH
21-11044	2.5	7	21-11046	12.5	7
21-11044	5	5	21-11046	15	7
21-11044	7.5	5	21-11046	17.5	7
21-11044	10	7	21-11046	20	7
21-11044	12.5	6	21-11047	2.5	6
21-11044	15	7	21-11047	5	7
21-11044	17.5	6	21-11047	7.5	7
21-11044	20	6	21-11047	10	7
21-11045	2.5	7	21-11047	12.5	6
21-11045	5	7	21-11047	15	6
21-11045	7.5	7	21-11047	17.5	7
21-11045	10	6.5	21-11047	20	6
21-11045	12.5	7	21-11048	2.5	6.5
21-11045	15	6.5	21-11048	5	7
21-11045	17.5	6.5	21-11048	7.5	6.5
21-11045	20	7	21-11048	10	7
21-11046	2.5	6.5	21-11048	12.5	6
21-11046	5	6.5	21-11048	15	7
21-11046	7.5	7	21-11048	17.5	7
21-11046	10	6.5	21-11048	20	7

Twenty-two core samples were collected at PRS 21-005, four from each of five boreholes, a field duplicate, and one additional sample collected at a stained fracture. Table 2.3-1 summarizes the sample information. All 22 samples were analyzed for gross alpha, beta, and gamma radiation; gamma-emitting radionuclides; isotopic plutonium; isotopic uranium; target analyte list (TAL) metals including mercury; nitrate; PCBs; VOCs; and SVOCs. The analytical methods and reporting limits for these analyses are presented in Appendix D. Table 2.3-1 lists 44 sample numbers. Sample numbers MD21-99-0051 through MD21-99-0072 are the original numbers for the 22 samples. These numbers were used for all analytical suites except isotopic plutonium. Sample numbers MD21-99-0143 through MD21-99-0164 represent split samples taken from the original 22 samples. These split samples were shipped to a different off-site fixed laboratory than originally planned and analyzed for isotopic uranium. The change in analytical laboratories necessitated the splitting of samples and creation of additional sample identification (ID) numbers.

Site Restoration

After completion of drilling, all boreholes were backfilled with cuttings to approximately 2 ft bgs. The remaining 2 ft of the borehole were grouted to the surface. Subsequently, the area uncovered during asphalt removal was resurfaced with an asphalt patch. The concrete slab from the bottom of the pit will be disposed of according to waste characterization strategy form.

2.3.4.3 Data Review

Inorganic Chemical Comparison with Background

Twenty-two subsurface samples were collected from the acid pit area (PRS 21-005) and sent to an off-site analytical laboratory for analysis of TAL metals. A complete list of the analytes for this suite is presented in Appendix D-1.0. An abridged version of the analytical data for this PRS is presented in Appendix D-2.0.

A detailed discussion of the data QA is presented in Appendix C. The recoveries in the laboratory control samples for iron were high (>125%), and all of the iron data (22 samples) are qualified as J+. Some analytical results (arsenic, beryllium, cobalt, sodium, and vanadium in all 22 samples; calcium, copper, magnesium, nickel, and potassium in 21 samples; barium in 20 samples, antimony in 18 samples; chromium in 8 samples; selenium in 2 samples; and thallium in 1 sample) were qualified as J because the reported analytical results were less than the reporting limits but greater than the instrument detection limits. There is greater uncertainty in results below the reporting limit, and these results are therefore qualified as estimated. There were no other data quality issues associated with the inorganic chemical analytical results. All of the inorganic chemical data are usable and considered adequate for determining whether a release had occurred at this site and to evaluate the nature and extent of any potential contamination.

Data qualified as J+ or J are considered to be detected, estimated values because the associated QC data did not meet specifications or the reported value was less than the reporting limits. The qualification of the data as J or J+ indicates uncertainty in the reported concentration but not in the identity of the analytes. The "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)" (EPA 1989, 8021) and the "Guidance for Data Usability in Risk Assessment (Part A)" (EPA 1992, 54947) state that these data can and should be used in a risk assessment in the same way as data with no qualifications.

Background values (BVs) used in the background comparisons were the values for Bandelier Tuff Units Qbt 2,3,4 (Ryti and Longmire 1998, 59730). The analytical and sample preparation methods used in analyzing the samples collected during the RFI were comparable to the methods used to determine the background data set. The samples were analyzed by inductively coupled plasma emission spectroscopy (ICPES) and CVAA for mercury, while the background data were produced by inductively coupled plasma mass spectroscopy (ICPMS) and CVAA for mercury. The detection limits for the ICPES analyses are comparable to those for ICPMS. All nondetected inorganic analytes for this investigation had reporting limits less than the Laboratory BVs for Bandelier Tuff Units Qbt 2,3,4.

The frequencies of detection and the reported range of concentrations for inorganic chemicals at PRS 21-005 are summarized in Table 2.3-3. The table only includes data for detected analytes, while undetected analytes are included in Appendix D-2.0. Twenty inorganic chemicals were detected in the tuff samples in at least one sample. Of these detected inorganic chemicals, aluminum, antimony, barium, copper, magnesium, nickel, and selenium were detected above their BVs in one sample, and chromium was detected above its BV in four samples (Table 2.3-3). Other inorganic chemicals were either undetected or detected below their respective tuff BVs. None of the inorganic chemicals had detection limits greater than their respective BVs. Nitrates were not detected, and there is no nitrate BV established for comparison.

Table 2.3-3
Frequency of Detected Inorganic Chemicals at PRS 21-005

Analyte	Number of Samples Analyzed	Number of Detects	Sample Concentration Range[a] (mg/kg)	BV (mg/kg)	Frequency of Detects Above BV[b]
Aluminum	22	22	197–9660	7340	1/22
Antimony	22	18	[0.19]–0.53	0.5	1/22
Arsenic	22	22	1.1–2.3	2.79	0/22
Barium	22	22	2.5–66.1	46	1/22
Beryllium	22	22	0.14–1.1	1.21	0/22
Calcium	22	22	237–1770	2200	0/22
Chromium, total	22	22	0.87–11.4	7.14	4/22
Cobalt	22	22	0.51–2.4	3.14	0/22
Copper	22	22	0.68–5.1	4.66	1/22
Iron	22	22	4570–13100	14500	0/22
Lead	22	22	1.4–6.4	11.2	0/22
Magnesium	22	22	114–1960	1690	1/22
Manganese	22	22	113–233	482	0/22
Nickel	22	22	0.99–7.9	6.58	1/22
Potassium	22	22	109–1380	3500	0/22
Selenium	22	2	[0.12]–0.31	0.3	1/22
Sodium	22	22	53.1–417	2770	0/22
Thallium	22	1	[0.12]–0.34	1.1	0/22
Vanadium	22	22	1–11.4	17	0/22
Zinc	22	22	15.3–41.4	63.5	0/22

[a] Values in square brackets indicate nondetected results.

[b] Value is the ratio of the number of detects exceeding the BV to the number of analyses.

Inorganic chemicals that were either detected below their BVs or had detection limits less than their BVs were not evaluated further. Inorganic chemicals detected above their BVs were compared to the range of BVs for each metal to determine if they were different from background (Table 2.3-4). Concentrations of aluminum, antimony, barium, nickel, and selenium were greater than the range of tuff BVs (350–8370 mg/kg, 0.05–0.4 mg/kg, 1.4–51.6 mg/kg, 0.5–7 mg/kg, and 0.1–0.105 mg/kg, respectively). A comparison of the detected concentrations of chromium (7.8–11.4 mg/kg), copper (5.1 mg/kg), and magnesium (1960 mg/kg) to the ranges of BVs indicated that the detected concentrations of these inorganic chemicals were within the ranges of the tuff BVs (0.25–13 mg/kg, 0.25–6.2 mg/kg, and 39–2820 mg/kg, respectively). As a result, chromium, copper, and magnesium are not considered to be different from tuff background and are not evaluated further. Aluminum, antimony, barium, nickel, and selenium were identified as COPCs (Table 2.3-5) and carried forward to the screening evaluation, Section 2.4.

Table 2.3-4
Inorganic Chemicals with Concentrations at or Exceeding BVs at PRS 21-005

Analyte	Location ID	Sample ID	Sample Concentration (mg/kg)*	BV (mg/kg)	Depth (ft)
Aluminum	21-11044	MD21-99-0052	9660	7340	9.5–10
Antimony	21-11045	MD21-99-0055	0.53(J)	0.5	2.5–3.5
Barium	21-11044	MD21-99-0052	66.1(J)	46	9.5–10
Chromium	21-11047	MD21-99-0065	9	7.14	14.5–15
	21-11047	MD21-99-0066	8.4	7.14	19.5–20
	21-11048	MD21-99-0070	7.8	7.14	19.5–20
	21-11045	MD21-99-0071	11.4	7.14	19.5–20
Copper	21-11044	MD21-99-0052	5.1	4.66	9.5–10
Magnesium	21-11044	MD21-99-0052	1960	1690	9.5–10
Nickel	21-11044	MD21-99-0052	7.9	6.58	9.5–10
Selenium	21-11044	MD21-99-0052	0.31(J)	0.3	9.5–10

Note: Descriptions of the analytical methods used for this PRS can be found in Appendix C-1.0, Table C-1.0-1. Detection limits can be found in Appendix D-1.0, Table D-1.0-1.

* Data qualifiers are defined in the glossary, Appendix A-2.0.

Table 2.3-5
Results of RFI Inorganic Chemical Data Review at PRS 21-005

Analyte	Result	Rationale
Aluminum	Retained	One sample value exceeded the BV for Qbt 2,3,4
Antimony	Retained	One sample value exceeded the BV for Qbt 2,3,4
Barium	Retained	One sample value exceeded the BV for Qbt 2,3,4
Chromium	Eliminated	Sample values fall within the range of concentrations in the background data set
Copper	Eliminated	Sample value falls within the range of concentrations in the background data set
Magnesium	Eliminated	Sample value falls within the range of concentrations in the background data set
Nickel	Retained	One sample value exceeded the BV for Qbt 2,3,4
Nitrates	Eliminated	No nitrates were detected
Selenium	Retained	One sample value exceeded the BV for Qbt 2,3,4

Radionuclide Comparison with Background/Fallout Radionuclide Concentrations

Twenty-two subsurface samples were collected from the acid pit (PRS 21-005) and sent to off-site analytical laboratories for analysis of isotopic plutonium, isotopic uranium, and gamma-emitting radionuclides by gamma spectroscopy. The complete lists of the analytes for these suites are presented in Appendix D-1.0. An abridged version of the analytical data for this PRS is presented in Appendix D-2.0.

For gamma-emitting radionuclides, all laboratory-reported radionuclides went through the validation procedure presented in Appendix C. The gamma radionuclides that are potential historical contaminants and have half-lives greater than 30 days were compared to BVs. These eight radionuclides are

americium-241, cesium-134, cesium-137, cobalt-60, europium-152, ruthenium-106, sodium-22, and uranium-235.

A detailed discussion of the data QA is presented in Appendix C. Radionuclides in a number of samples were qualified as U (nondetected) because the results were less than the minimum detectable activity and/or the results were less than three times the 1-sigma uncertainty. The analytes and samples affected by this determination are presented in Table C-5.3-1, Appendix C. Plutonium-238 and plutonium-239 were qualified as nondetected, estimated (UJ) in 21 of 22 samples because the tracer recoveries were between 10–30%. The isotopic plutonium results in the other sample were qualified as R (rejected) because the tracer recovery was less than 10%. One to seven radionuclides from the gamma spectroscopy analysis were also qualified as R in each sample because of spectral interference. The radionuclide data considered unusable were primarily for analytes that are either not reliably measured by gamma spectroscopy, are data quality analytes, or are QC analytes. The exceptions were ruthenium-106, cesium-134, and uranium-235, which are considered to be potential historical contaminants at the Laboratory. Both ruthenium-106 and cesium-134 were rejected in only one sample, so there are still 21 usable sample results for these radionuclides. Although uranium-235 was rejected in seven samples, all samples were also analyzed by alpha spectroscopy so usable uranium-235 results are available at all locations. The alpha spectroscopy analysis is a more reliable and accurate method for uranium-235. There were no other data quality issues associated with the radionuclide analytical results from this PRS. Therefore, despite some unusable radionuclide data, there is sufficient data of good quality to determine whether a release had occurred at this site and to evaluate the nature and extent of any potential contamination.

The qualification of the data as UJ (nondetected, estimated) indicates uncertainty in the reported concentration but not in the identity of the analytes. The "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)" (EPA 1989, 8021) and the "Guidance for Data Usability in Risk Assessment (Part A)" (EPA 1992, 54947) state that these data can and should be used in a risk assessment in the same way as data with no qualifications.

The BVs used in the background comparisons were the values for Bandelier Tuff Units Qbt 2,3,4 (Ryti and Longmire 1998, 59730). The analytical and sample preparation methods used in analyzing the samples were comparable to the methods used to determine the background data set.

The frequency of detection and the reported range of concentrations for the detected radionuclides are summarized in Table 2.3-6. The table includes only data for detected analytes; undetected analytes are included in Appendix D-2.0. One radionuclide, uranium-235, was detected above its tuff BV in one sample, while uranium-234 and uranium-238 were detected below their respective tuff BVs (Table 2.3-6). The other radionuclides were undetected and not evaluated further.

Based on the isotopic ratios for uranium, it was determined that natural uranium (uranium-238:uranium-234, approximately 1:1) was present in the samples (Table 2.3-6). Uranium-234 and uranium-238 were not detected above their respective tuff BVs and are not evaluated further. Uranium-235 was detected in borehole 21-11046, sample MD21-99-0060, at a concentration of 0.1 pCi/g. Comparison of the concentration of uranium-235 to the range of BVs (0.03–0.11 pCi/g) indicated that the concentration was within the background range. As a result, uranium-235 is not considered to be different from tuff background and is not evaluated further. Therefore, no radionuclides were identified as COPCs (Table 2.3-7), and none are carried forward to the screening evaluation in Section 2.4.

Table 2.3-6
Frequency of Detected Radionuclides at PRS 21-005

Analyte	Number of Samples Analyzed	Number of Detects	Concentration Range[a] (pCi/g)	Background/ Fallout Values (pCi/g)	Frequency of Detects Above Background/ Fallout Values[b]
Uranium-234	22	22	0.63–1.04	1.98	0/22
Uranium-235	22[c]	4	[0.0]–0.1	0.09	1/22
Uranium-238	22	22	0.59–1.02	1.93	0/22

[a] Values in square brackets indicate nondetected results.

[b] Value is the ratio of the number of detects exceeding the BV to the number of analyses.

[c] The samples collected from the acid pit were analyzed for isotopic uranium by gamma spectroscopy, which also reports results of uranium-235. Because the isotopic uranium analyses are more accurate than the gamma spectroscopy, only uranium-235 data from these analyses are evaluated. All data are presented in Appendix D.

Table 2.3-7
Results of RFI Radionuclide Data Review at PRS 21-005

Analyte	Result	Rationale
Uranium-234	Eliminated	Concentrations were below the BV for Qbt 2,3,4
Uranium-235	Eliminated	Sample values fall within the range of concentrations in the background data set
Uranium-238	Eliminated	Concentrations were below the BV for Qbt 2,3,4

Evaluation of Organic Chemicals

All 22 samples collected from PRS 21-005 were sent to an off-site analytical laboratory for analysis of SVOCs, VOCs, and PCBs. The complete lists of the analytes for these suites are presented in Appendix D-1.0. An abridged version of the analytical data for this PRS is presented in Appendix D-2.0.

Results of the QA/QC assessment are summarized below by analytical suite. Despite some QC issues that required qualification of the data, there are sufficient organic chemical sample data of good quality to determine whether a release has occurred at this site and to evaluate the nature and extent of any potential contamination. A detailed discussion of the data QA is presented in Appendix C.

All of the SVOC data in two samples (MD21-99-0051 and MD21-99-0057) were qualified as UJ- and potentially biased low because the surrogate recoveries associated with these samples were low. One internal standard in sample MD21-99-0066, perylene-d12, for one sample had low recoveries. A focused data validation qualified the analytes associated with this internal standard as UJ because the surrogate recoveries were acceptable. Three internal standards, acenaphthene-d10, naphthalene-d8, and phenanthrene-d10, in sample MD21-99-0069 had low recoveries. A focused data validation qualified the analytes associated with these internal standards as UJ because the surrogate recoveries were acceptable. All of the SVOCs in sample MD21-99-0059 were qualified as R (rejected) because the recoveries for the internal standards and surrogates were outside of the acceptance limits. However, a field duplicate was collected and analyzed for this sample location. The data for the field duplicate are usable without qualification and will be used in place of the original sample. Bis(2-ethylhexyl)phthalate in five samples and diethylphthalate in seven samples were qualified as nondetected (U) because of blank contamination. All other SVOC data were qualified as U (nondetected).

Two VOCs, trichloroethene and toluene, were each qualified as J+ and potentially biased high in separate samples because of high surrogate recoveries. Toluene and trichloroethene were also detected below the estimated quantitation limit (EQL). Benzene in another sample was qualified as J because the sample result was less than the reporting limit but greater than the method detection limit. Acetone in 15 samples, 1,2-dichlorobenzene in 3 samples, and 1,2,4-trimethylbenzene in 1 sample were qualified as nondetected (U) because of blank contamination. All other VOC data were qualified as U (nondetected).

All of the PCB congeners in five samples were qualified as UJ- and potentially biased low because the surrogate recoveries associated with these samples were low. All other PCB data was qualified as U (nondetected).

The qualification of the data as J or UJ (detected or nondetected, estimated) indicates uncertainty in the reported concentration but not in the identity of the analytes. The Risk Assessment Guidance for Superfund, Part A (EPA 1989, 8021) and the Guidance for Data Usability in Risk Assessment (Part A) (EPA 1992, 54947) states that these data can and should be used in a risk assessment in the same way as data with no qualification.

The frequency of detected organic chemicals at this PRS is presented in Table 2.3-8; the undetected analytes are included in Appendix D-2.0. Three organic chemicals, benzene, toluene, and trichloroethene were each detected in one sample collected from the tuff. The other organic compounds were not detected in any samples collected from this PRS and are not evaluated further.

Table 2.3-8
Frequency of Detected Organic Chemicals at PRS 21-005

Analyte	Number of Samples Analyzed	Number of Detects	Concentration Range[a] (mg/kg)	EQL (mg/kg)	Frequency of Detects[b]
Benzene	22	1	0.00033–[0.0085]	0.005	1/22
Toluene	22	1	0.00088–[0.0085]	0.005	1/22
Trichloroethene	22	1	0.00054–[0.0071]	0.005	1/22

[a] Values in square brackets indicate nondetected results.

[b] Value is the ratio of the number of detects to the number of analyses.

The samples in which benzene, toluene, and trichloroethene were detected are presented in Table 2.3-9. Although toluene was not detected in the method blanks associated with these samples, this analyte is a laboratory contaminant and may be present as a result of laboratory contamination rather than site activities. Based on the evaluation of organic chemicals, benzene, toluene, and trichloroethene were identified as COPCs (Table 2.3-10) and were carried forward to the screening evaluation, Section 2.4.

2.3.5 Revised Site Conceptual Model

This RFI discovered that the acid pit had been only partially removed in 1967. Excavation performed in June 1999 revealed that the bottom of the acid pit remained in the ground. No stained soils were observed surrounding the bottom of the pit, nor did drilling and sampling beneath the location of the acid pit show any staining or alteration of the subsurface Bandelier Tuff. Because aluminum, barium, nickel, and selenium were detected at concentrations greater than their respective BVs in a sample beneath the former location of the acid pit, the possibility of a release from the nitric acid pit cannot be ruled out.

Table 2.3-9
Detected Organic Chemicals at PRS 21-005

Analyte	Location ID	Sample ID	Sample Concentration (mg/kg)	Depth (ft)
Benzene	21-11047	MD21-99-0065	0.00033(J+)	14.5–15
Trichloroethene	21-11046	MD21-99-0059	0.00054(J+)	4–5
Toluene	21-11046	MD21-99-0060	0.00088(J+)	9.5–10

Note: Descriptions of the analytical methods used for this PRS can be found in Appendix C-1.0, Table C-1.0-1. Detection limits can be found in Appendix D-1.0, Table D-1.0-1.

Table 2.3-10
Results of RFI Organic Chemical Data Review at PRS 21-005

Analyte	Result	Rationale
Benzene	Retained	Detected in one sample
Toluene	Retained	Detected in one sample
Trichloroethene	Retained	Detected in one sample

A revised conceptual model is presented in Figure 2.3-4. This model indicates that potential exposure for on-site workers would be by way of incidental ingestion of soil and dermal contact with the soil. These pathways would only be complete if the asphalt covering was removed exposing the tuff beneath. The potential significance of the exposure would be very low because of the short exposure time of the construction workers to the soil and the low concentrations of the COPCs. For biological receptors, there would be no pathways for exposure because the asphalt-covered site precludes exposure. If construction were to occur at the site in the future, no biota would be present during excavation activities, and presumably any excavated tuff would be removed from the site.

2.3.5.1 Nature and Extent of Contamination

Aluminum, antimony, barium, benzene, nickel, selenium, toluene, and trichloroethene are the COPCs identified by the data review. Each inorganic chemical that was detected above its BV was detected only once. Aluminum, barium, nickel, and selenium were detected (9660, 66.1, 7.9, and 0.31 mg/kg, respectively) above BVs at the 9.5- to 10 ft-interval at borehole 21-11044 (Figure 2.3-3) and could be the result of a release from PRS 21-005. In the next two deeper samples at that location (14.5- to 15-ft and 19.5- to 20-ft intervals), each metal was detected at less than its BV and not detected above its BV in the four surrounding boreholes. Thus, the extent from any potential release of inorganic chemicals (aluminum, barium, nickel, and selenium) from the acid pit has been defined.

Antimony was detected (0.53 mg/kg) above its BV of 0.5 mg/kg at the 2.5- to 3.5-ft interval at borehole 21-11045 (Figure 2.3-3). In the next three deeper samples at this location (7- to 7.5-ft, 9.5- to 10-ft, and 14.5-to 15-ft intervals), antimony was detected at less than its BV. Because antimony was not detected above its BV in the samples collected at borehole 21-11044, the detected concentration was in a sample collected 3 ft from the edge of the pit, and the sample was above the bottom of the former pit, antimony is assumed not to be related to a release from PRS 21-005. In addition, the primary direction of any environmental transport of antimony would be vertical rather than lateral from its source. Therefore, the extent of antimony does not need to be defined further for PRS 21-005.

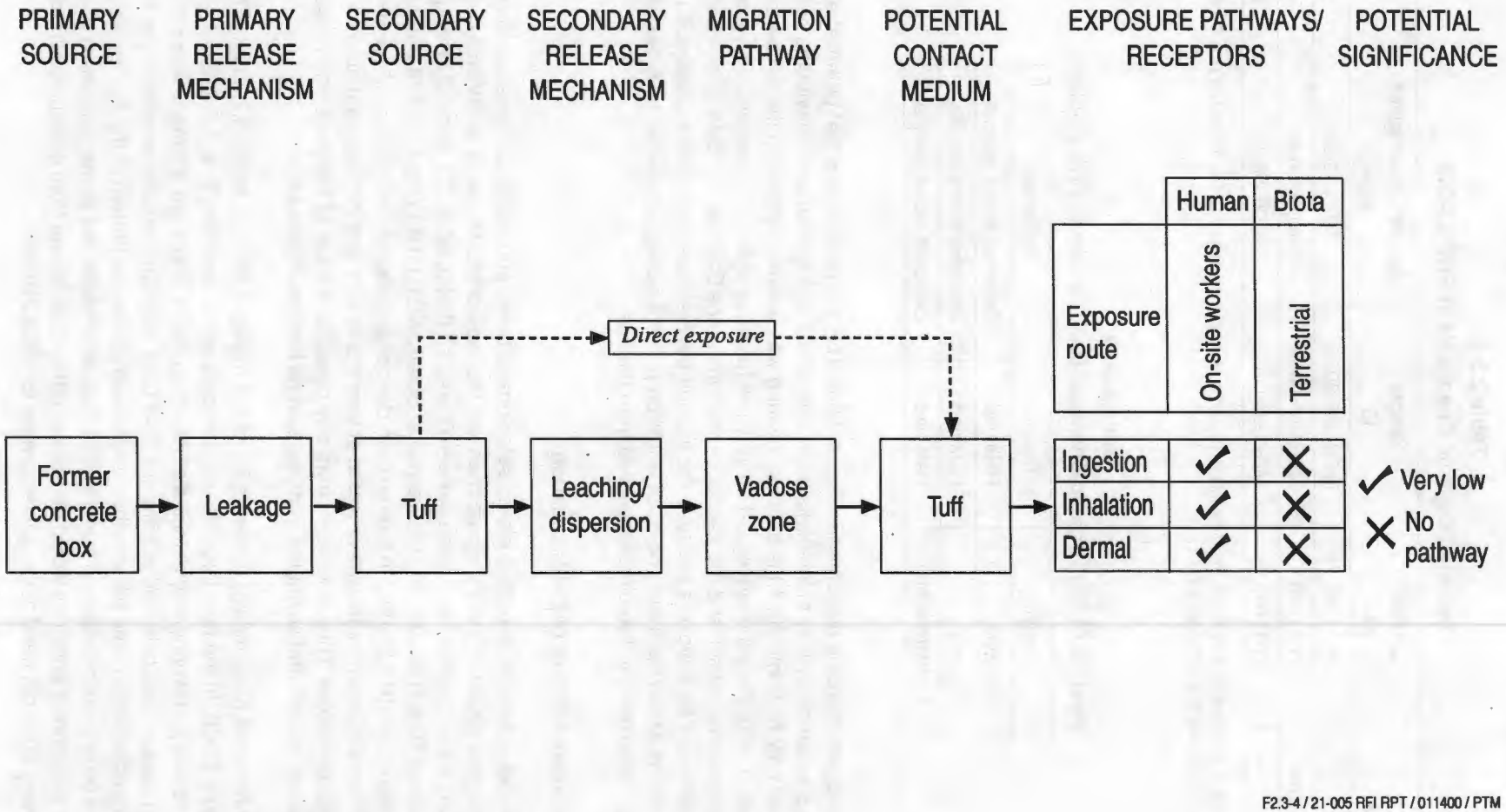


Figure 2.3-4. Revised conceptual model for PRS 21-005

Three organic compounds were detected outside of the footprint of the pit at levels below the EQL of 0.005 mg/kg. Benzene was detected at a depth of 14.5 ft in borehole 21-11047, trichloroethene was detected at a depth of 4.0 ft in borehole 21-11046, and toluene was detected at a depth of 9.5 ft at location 21-11046. The organic compounds were not detected beneath the former pit and are assumed not to be due to a release from the PRS. Additionally, the bottom two samples at boreholes 21-11046 and 21-11047 detected no organic compounds. Therefore, the extent of benzene, toluene, and trichloroethene do not need to be defined further for PRS 21-005.

2.3.5.2 Environmental Fate

Antimony, benzene, toluene, and trichloroethene were chemicals detected in the subsurface tuff adjacent to this PRS and, as stated previously, were not related to a release. Inorganic chemicals aluminum, barium, nickel, and selenium were detected above BVs beneath the bottom of the PRS. Therefore, detailed information on the environmental fate of aluminum, barium, nickel, and selenium is presented in Appendix F-2.0.

Table 2.3-11 presents the generic soil screening levels for the protection of groundwater to provide an indication of the potential impact of these chemicals in soil to groundwater. The generic soil screening levels were derived using default values in standardized equations presented in EPA's soil screening guidance (EPA 1996, 59902) and were obtained from the most recent EPA Region 9 guidance (EPA 1998, 58751). Because there is no evidence of shallow perched or alluvial groundwater in the area and the regional aquifer is approximately 1100 ft below the mesa-top surface, a default dilution attenuation factor (DAF) of 20 was applied to account for the natural processes that would reduce contaminant concentration before reaching the groundwater. Based on this relationship, contaminants with detected concentrations less than the generic soil screening levels would indicate that there was no potential impact to the groundwater. Because the sample results from PRS 21-005 detected all subsurface COPCs below their values, there are no potential groundwater problems for these analytes.

Table 2.3-11
Sample Results Compared to DAFs

Analyte	Location ID	Sample ID	Sample Concentration (mg/kg)	DAF 20[a] (mg/kg)
Aluminum	21-11044	MD21-99-0052	9660	N.A.[b]
Antimony	21-11045	MD21-99-0055	0.53(J)	5.0
Barium	21-11044	MD21-99-0052	66.1(J)	1600
Benzene	21-11047	MD21-99-0065	0.00033(J)	0.03
Nickel	21-11044	MD21-99-0052	7.9	130
Selenium	21-11044	MD21-99-0052	0.31(J)	5.0
Toluene	21-11046	MD21-99-0059	0.00088(J)	12.0
Trichloroethene	21-11046	MD21-99-0060	0.00054(J)	0.06

[a] DAF of 20.

[b] N.A. = not available. EPA Region 9 does not provide a DAF 20 for aluminum.

Nitrates were analyzed to assist with determination of whether or not a release from the pit had occurred. It was hypothesized that residual nitric acid from a release would result in elevated levels of nitrates. The sample results indicated no detected concentrations of nitrates at detection limits of 2.1 to 2.4 mg/kg.

These data would indicate that either there was no release of nitric acid from the pit or that, if there had been a release, the nitric acid had degraded to nitrogen and oxygen.

2.4 Site Assessments

2.4.1 Summary

A human health screening assessment and an ecological screening assessment were conducted. The human health screening assessment indicated that COPCs retained by the data review did not pose an unacceptable risk to human health, so a human health risk assessment was not conducted. The ecological screening assessment did not identify any chemicals of potential ecological concern (COPECs), so an ecological risk assessment was not performed. A surface water assessment was conducted for PRS 21-005. The results of the surface water assessment indicated a low potential for erosion (Appendix B-4.2.1). No groundwater or underground storage tank assessments were conducted at this site.

2.4.2 Screening Assessments

The human health and ecological screening follow the HRMB Risk-Based Decision Tree (NMED 1998, 57761) and appropriate EPA guidance (EPA 1998, 58751). The ecological screening assessment is based on the approach presented in Kelly et al. (1998, 57916).

2.4.2.1 Human Health

Scoping

PRS 21-005 is located on DOE-owned land. It is currently behind a locked fence and removed from public access. The potential receptors would be Laboratory and/or construction workers; potential exposure pathways would be dermal contact, inhalation of particulates, and incidental ingestion of soil. Both the TA-21 work plan and land transfer proposals assume future land use of TA-21 to be industrial.

Screening Evaluation

The COPCs identified by the data review of the inorganic, organic, and radionuclide chemical sample results (Section 2.3.4.3) were compared with screening action levels (SALs) to determine if the chemicals were detected at concentrations of potential concern to human health. The SALs used in these comparisons were values for a residential exposure scenario, calculated using the most current toxicity values from EPA's Integrated Risk Information System (IRIS) database, standard default values, and equations (EPA 1998, 58751) and based on the methodology presented in Appendix C. The screening evaluation follows guidance provided by EPA Region 6 and NMED. The maximum concentration of each COPC was compared with the SAL for radionuclides; the SALs for Class A, B1, and B2 carcinogens; 10 times the SAL for Class C carcinogens; or 0.1 of the SAL for noncarcinogens, if there are two or more noncarcinogenic COPCs.

Based on the data review, six noncarcinogenic COPCs (aluminum, antimony, barium, nickel, selenium, and toluene) were carried forward to the screening assessment. Table 2.4-1 presents the comparison of these COPCs to 0.1 of the SAL. Antimony, barium, nickel, selenium, and toluene were detected at concentrations less than 0.1 of their respective SALs, indicating no potential adverse health effects resulting from exposure to these chemicals at the maximum detected concentrations. Therefore, antimony, barium, nickel, selenium, and toluene are not evaluated further. Aluminum was detected at concentrations greater than 0.1 of the SAL and is discussed further in the uncertainty analysis.

Table 2.4-1
Comparison of Noncarcinogenic Chemicals to SAL at PRS 21-005

Analyte	Location ID	Sample ID	Depth (ft)	Maximum Sample Value (mg/kg)	SAL (mg/kg)	0.1 of the SAL (mg/kg)
Aluminum	21-11044	MD21-99-0052	9.5–10	9660	75000	7500
Antimony	21-11045	MD21-99-0055	2.5–3.5	0.53(J)	30	3
Barium	21-11044	MD21-99-0052	9.5–10	66.1(J)	5200	520
Nickel	21-11044	MD21-99-0052	9.5–10	7.9	1500	150
Selenium	21-11044	MD21-99-0052	9.5–10	0.31(J)	370	37
Toluene	21-11046	MD21-99-0060	9.5–10	0.00088(J)	520	52

Two carcinogens (benzene and trichloroethene) were carried forward from the data review. Benzene is a class A carcinogen (sufficient evidence of carcinogenicity in humans); EPA's IRIS database (August 1999) indicates that trichloroethene's carcinogen class has not been finalized. Both chemicals are compared directly to their respective SALs (Table 2.4-2). The concentrations detected of both carcinogens were several orders of magnitude less than their respective SALs. Therefore, there is no potential for unacceptable risk to human health from exposure to the maximum detected concentrations of these chemicals, and they are not evaluated further.

Table 2.4-2
Comparison of Carcinogenic Chemicals with SALs at PRS 21-005

Analyte	Location ID	Sample ID	Depth (ft)	Maximum Sample Value (mg/kg)	SAL
Benzene	21-11047	MD21-99-0065	14.5–15	0.00033(J)	0.62
Trichloroethene	21-11046	MD21-99-0059	4–5	0.00054(J)	2.7

No radionuclides were identified as COPCs in the data review.

Uncertainty Analysis

The screening assessment is a conservative comparison of the maximum concentrations detected at the site with SALs based on a residential exposure scenario. As presented in the scoping section (Section 2.4.2.1), this PRS is currently under Laboratory control, i.e., industrial land use. It is possible that in the future this land could be transferred to a new owner, but the land use would most likely remain as industrial. Therefore, the human health screening assessment is an overestimate of the potential risk from exposure to the COPCs.

The only chemical that is a potential concern for adverse health effects based on the screening evaluation is aluminum. It was detected at 9660 mg/kg at a depth of 9.5 ft to 10 ft, which is greater than the BV of 7340 mg/kg and 0.1 of the SAL (7500 mg/kg). Aluminum is not expected to produce adverse human health effects at 9660 mg/kg because the detected concentration is subsurface and exposure would only occur if the area is excavated. The exposure frequency and duration of exposure for a construction worker (250 days and one year, respectively) is considerably less than for a resident (350 days and

30 years, respectively). Therefore, the screening assessment is an overestimate of the potential risk from exposure to aluminum.

Interpretation

The results of the RFI sampling and data review indicate that there may have been a release to the environment from the nitric acid pit. Four inorganic chemicals (aluminum, barium, nickel, and selenium) were detected (borehole 21-11044) above their BVs under the pit. The concentrations of each inorganic chemical, with the exception of aluminum, were less than 0.1 of the SAL and therefore eliminated as COPCs.

One inorganic (antimony) and three organic chemicals (benzene, toluene, and trichloroethene) were detected outside of the footprint of the pit but not under the pit and are not considered to be a release from this PRS. The concentrations of these analytes were less than 0.1 of the SAL for noncarcinogens and less than SAL for carcinogens and are eliminated as COPCs.

Aluminum was retained as a COPC as a result of a comparison of the maximum detected concentration with 0.1 of the SAL, based on residential exposure. The SAL is the concentration of a chemical in the soil that is not expected to produce adverse health effects if an individual would be exposed to the soil for 30 years. If the soil concentration exceeds this threshold, there might be the potential for adverse health effects. Aluminum, however, was detected at a little more than one-tenth SAL; therefore, adverse health effects are not expected from aluminum at this concentration. Additionally, the EPA Region 9 preliminary remediation goal (PRG) for aluminum in soil under the more representative industrial exposure scenario is 100,000 mg/kg (EPA 1998, 58751). The aluminum concentration at the site (9660 mg/kg) is an order of magnitude less than the industrial PRG. Therefore, there are no COPCs identified by the human health screening assessment.

2.4.2.2 Ecological

The approach for conducting ecological screening assessments is described in "Screening Level Ecological Risk Assessment Approach for the ER Project at LANL" (Kelly et al. 1998, 57916). The assessment consists of four parts: a scoping evaluation, a screening evaluation, an uncertainty analysis, and an interpretation of the results.

The scoping evaluation includes the data assessment, which identifies data quality issues and results in the list of COPCs for the PRS and the problem formulation for the PRS under investigation. Details of the data assessment can be found in Section 2.3.4.3 and Appendix C. The basis for the problem formulation for PRS 21-005 is the Ecological Scoping Checklist, which is provided in Appendix F. The scoping checklist is completed early in the assessment process and is a useful tool for organizing existing ecological information. This information is used to determine whether ecological receptors might be affected; identify the type of receptors that might be present (i.e., terrestrial and/or aquatic); determine whether the PRS should be aggregated with other PRSs; determine data adequacy related to nature, rate, and extent of contamination; and develop the ecological site conceptual model for the PRS.

The purpose of the ecological screening evaluation is to identify COPECs and not to calculate risk. The evaluation involves the calculation of hazard quotients (HQs) and hazard indices (HIs) for all COPCs and all appropriate screening receptors, as described in Kelly et al. (1998, 57916). The HQ is the ratio of the contaminant level in the exposure medium to an acceptable dose, based on toxicity studies for the receptor. An HI is the sum of HQs across contaminants with like effects for a given screening receptor. An HQ or HI greater than 1.0 is considered to be an indicator of potential adverse impacts. The chemicals

resulting in an HQ greater than 1.0 or contribute more than 0.1 to an HI greater than 1.0 are identified as COPECs.

An uncertainty analysis follows the COPEC identification and describes the key sources of uncertainty related to the screening assessment. The uncertainty analysis can result in either adding or removing chemicals from the list of COPECs for the PRS. This narrative contains a qualitative uncertainty analysis of the issues relevant to evaluating the potential ecological risk for this PRS.

The interpretation section presents the results of the screening assessment in the context of a risk management decision. Possible decisions include a recommendation for corrective action in terms of ecological concerns or a proposal for an ecological NFA. If the data are not adequate to support either of these recommendations, further investigation would be required to support a baseline risk assessment.

Scoping

The results of the data QA for the samples collected at PRS 21-005 are presented in Appendix C. The QA/QC issues associated with the analytical data do not affect the sufficiency and quality of the data for decision-making purposes. Although some of the results are potentially biased low or high and some data were rejected, the overall data are considered to be of good quality, adequate for a screening assessment, and representative of the site. The RFI sampling conducted at this PRS delineated the extent of the contamination.

The problem formulation is necessary to establish the breadth and focus of the screening assessment. The result of this process is an ecological site conceptual model for the PRS under investigation. The RFI conducted for PRS 21-005 involved subsurface sampling of the former location of the acid pit as well as the subsurface area around where the acid pit was located.

This PRS was an acid pit (TA-21-70) installed in 1946 to dispose of classified documents. The pit was partially aboveground and was a 3-ft-square by 4-ft-deep reinforced concrete structure. The structure, except for the bottom, was removed in 1967 and disposed of at Material Disposal Area (MDA) G. The only material known to be used at this site was concentrated nitric acid. There were no known releases at this site. Any releases would have been as liquid from spills or leaks. The soil/tuff under the pit would have received any releases from the pit. The PRS is within the developed portion of TA-21. It is located approximately 100 ft east of Building TA-21-30 and about the same distance south of Building TA-21-31. The PRS is covered by asphalt and is a part of the parking/storage area next to Building TA-21-30. The area to the south of the PRS is also a paved parking area and to the north is Building TA-21-31 and more pavement.

There are no other PRSs immediately adjacent to or contiguous with the acid pit. However, the site is within the TA-21 complex, and there are numerous other PRSs in the general vicinity. The nearest PRS is 21-002(b), which is a former drum storage structure (TA-21-38), located approximately 75 ft northeast of PRS 21-005. The next closest is PRS C-21-024, which is the location of a former warehouse, located approximately 125 ft east of PRS 21-005. Because PRS 21-005 was a subsurface structure, releases from other PRSs are assumed to have not influenced this site.

Threatened and endangered species are potential receptors in this portion of TA-21. The Laboratory's Ecology Group (ESH-20) intersected PRS location information from Facility for Information Management, Analysis, and Display with threatened and endangered species habitat using the Geographical Information System databases to determine the likelihood of the presence of threatened and endangered species in this area. The PRS is entirely within an area of potential Mexican spotted owl nesting habitat and within an area in which the spotted owl can be conservatively assumed to forage at a medium

frequency. It is also in the vicinity of potential peregrine falcon nesting habitat and approximately 1600 ft away and within an area in which the falcon can conservatively be assumed to forage at a relatively high frequency. The PRS is within an area in which the bald eagle is conservatively assumed to forage at a relatively low frequency. No other threatened and endangered species are potentially present in the vicinity of the PRS.

The ecological site conceptual model, which is part of the ecological scoping checklist (Appendix F-3.0), was not completed because no exposure pathways are present for terrestrial and aquatic ecological receptors. The site is in a developed area and is situated beneath an asphalt-paved parking area. Based on the low-level inorganic chemicals detected above background and the low-level organic chemicals detected in and around the site, a release from the acid pit may have occurred. However, because of the nature of the PRS (subsurface, under asphalt, developed area), ecological receptors are not present on site. Transport pathways to off-site receptors are not complete because the pit was a reinforced concrete structure that has been removed, and the former location is located under asphalt.

Screening Evaluation

An ecological screening evaluation for the acid pit (PRS 21-005) was not conducted because there are no ecological receptors present, and there are no pathways for exposure.

Uncertainty Analysis

Because an ecological screening evaluation was not conducted for the acid pit (PRS 21-005), an uncertainty analysis is not provided.

Interpretation

The PRS does not have any ecological receptors present because the acid pit (PRS 21-005) is subsurface, and there are no pathways to receptors off site. As a result, this PRS does not present any potential adverse ecological impacts.

2.4.3 Risk Assessment

Baseline risk assessments were not conducted for PRS 21-005 because there were no COPCs carried forward from the human health screening assessment and there were no potential adverse ecological impacts because of the subsurface nature of the PRS.

2.4.4 Other Applicable Assessments

2.4.4.1 Surface Water

An assessment of the erosion/sediment transport potential at PRS 21-005 was conducted according to SOP 2.01, R0, "Surface Water Site Assessments." The erosion potential is numerically rated from 1 to 100 using a matrix system. PRSs that score below 40 have a low erosion potential; those that score from 40 to 60 have a medium erosion potential; and those that score above 60 have a high erosion potential. The erosion potential at PRS 21-005 is 17.5 indicative of a low erosion potential. The complete assessment is contained in Appendix B-4.2.1 of this document.

2.4.4.2 Groundwater

A groundwater assessment was not performed for PRS 21-005 because this site does not present a potential pathway for contaminant release to groundwater because of the depth to groundwater (approximately 1100 ft).

2.4.4.3 Underground Storage Tanks

An underground storage tank assessment was not performed because it is not applicable for PRS 21-005.

2.4.4.4 Other

No other assessments were applicable.

2.5 Conclusions and Recommendations

PRS 21-005 has been sampled and the nature and extent of contamination has been defined. Based on the results of the investigation, the following conclusions are made.

- Four inorganic chemicals (aluminum, barium, nickel and selenium) were detected above BVs in one sample beneath the bottom of the pit. The concentrations of each inorganic chemical, with the exception of aluminum, were less than 0.1 of the SAL and, therefore, are eliminated as COPCs. Aluminum was detected at a little more than 0.1 of the SAL; therefore, adverse health effects are not expected from aluminum at this concentration. Additionally, the EPA Region 9 PRG for aluminum in soil under the more representative industrial scenario is 100,000 mg/kg. The aluminum concentration at this site (9660 mg/kg) is an order of magnitude less than the industrial PRG. Therefore, aluminum is not a COPC for this site.
- Single detects of benzene, toluene, trichloroethene, and antimony were found outside the footprint of the pit and are not related to a release from the acid pit. The concentration of these analytes are less than 0.1 of the SAL for noncarcinogens and less than SAL for carcinogens.
- The screening assessment results indicated that potential releases from the pit did not pose a potential for adverse impacts to human health or the environment.
- This PRS does not have any ecological receptors present because the acid pit was subsurface, and there are no pathways to receptors off site. As a result, this PRS does not present any potential adverse ecological impacts.

NFA is recommended based on Criterion 5, "The PRS has been characterized or remediated in accordance with current and applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected land use" (NMED 1998, 57761).

3.0 REFERENCES

The following list includes all references cited in this document. Parenthetical information following each reference provides the author, publication date, and the ER ID number. This information also is included in the citations in the text. ER ID numbers are assigned by the Laboratory's ER Project to track records associated with the Project. These numbers can be used to locate copies of the actual documents at the ER Project's Records Processing Facility and in the ER Project reference library titled "Reference Set for Material Disposal Areas, Technical Area 21."

Copies of the reference library are maintained at NMED-HRMB; the DOE Los Alamos Area Office; United States Environmental Protection Agency, Region VI; and the ER Project MDAs Focus Area. This library is a living collection of documents that was developed to ensure that the administrative authority (AA) has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the AA are not included in the reference library.

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Appendix A

Acronyms and Glossary

APPENDIX A ACRONYMS AND GLOSSARY

A-1.0 ACRONYMS

AA	administrative authority
AOC	area of concern
bgs	below ground surface
BV	background value
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CRDL	contract-required detection limit
CVAA	cold vapor atomic absorption
DAF	dilution attenuation factor
DOE	Department of Energy
EPA	Environmental Protection Agency
EQL	estimated quantitation limit
ER	environmental restoration
ESH	Environment, Safety, and Health (Laboratory Division)
FIMAD	Facility for Information Management, Analysis, and Display
GPC	gel permeation chromatography
HI	hazard index
HQ	hazard quotient
HRMB	Hazardous and Radioactive Materials Bureau (NMED)
HSWA	Hazardous and Solid Waste Amendments of 1984
IA	interim action
ICPES	inductively coupled plasma emission spectroscopy
ICPMS	inductively coupled plasma mass spectroscopy
ID	identification
IDL	instrument detection limit
IRIS	Integrated Risk Information System
LCS	laboratory control sample
IWP	installation work plan
Laboratory	Los Alamos National Laboratory
MDA	material disposal area
NA	not analyzed
NFA	no further action

NMED	New Mexico Environment Department
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
PRS	potential release site
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RN	request number
RPD	relative percent difference
SAL	screening action level
SMDP	strategic management decision point
SOP	standard operating procedure
SOW	statement of work
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list
T&E	threatened and endangered
TPU	total propagated uncertainty
VM	vendor manual
VOC	volatile organic compound

A-2.0 GLOSSARY

Absolute retention time. The time (from the moment of introduction) it takes an analyte to reach the chromatograph detector.

Aquifer. Permeable body of geologic material capable of yielding groundwater to wells or springs.

Alpha radiation. Radiation composed of alpha particles emitted during the radioactive decay of certain nuclides. The least penetrating of the three common types of radiation (alpha, beta, and gamma), alpha radiation can be blocked easily (for example, by a sheet of paper or the outer layer of skin).

Area of concern (AOC). An area at the Laboratory known or suspected to be contaminated with radionuclides but not contaminated by hazardous chemicals or hazardous waste.

Background value (BV). The upper tolerance limits (UTLs) of background sample results, calculated as the upper 95% confidence limit for the 95th percentile. When a UTL cannot be calculated, either the detection limit or the maximum reported value is used as a BV; BVs are used as simple threshold numbers

to identify potentially contaminated site sample results that are greater than background levels in that geological sample medium (or group of media). All inorganic chemicals and radionuclides have BVs.

Baseline risk assessment. (also known as risk assessment). A site-specific analysis of the potential adverse effects of hazardous substances that are released from a site in the absence of any control or mitigation actions. A baseline risk assessment consists of four steps: data collection and analysis, exposure assessment, toxicity assessment, and risk characterization.

Beta radiation. Radioactive transformation of a nuclide in which the nucleus emits a beta particle (electron or positron). Beta radiation can be blocked by an inch of wood or by a thin sheet of aluminum.

Chemical of potential concern (COPC). Chemical, detected at a site, that has the potential to adversely affect human receptors due to its concentration, distribution, and mechanism of toxicity. A COPC remains a concern until exposure pathways and receptors are evaluated in a site-specific risk assessment.

Chemical of potential ecological concern (COPEC). Chemical, detected at a site, that has the potential to adversely affect ecological receptors due to its concentration, distribution, and mechanism of toxicity. A COPC remains a concern until exposure pathways and receptors are evaluated in a site-specific risk assessment.

Cold vapor atomic absorption (CVAA). CVAA is an analytical technique used for measuring mercury; it is described in EPA Methods 7470A (Mercury in Liquid Waste) and 7471A (Mercury in Solid or Semisolid Waste). The technique is based on the absorption of radiation at 253.7-nm by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration.

Contract-required detection limit (CRDL). The CRDLs are the minimum reporting limits required under a contract between Los Alamos National Laboratory and a contract laboratory. The CRDLs are not necessarily intrinsically tied to instrument sensitivity but rather are reporting limits.

Data qualifier. The data qualifiers used in the ER Project baseline-validation process are as follows:

- "A" Contractually required data are not available for data review and evaluation.
- "U" The analyte was analyzed for but not detected.
- "J" 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+" The analyte was positively identified, and the result is likely to be biased high.
- "J-" The analyte was positively identified, and the result is likely to be biased low.
- "UJ" The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
- "RPM" Without further review of the raw data, the sample results are unusable due to 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" Professional judgement should be applied to using the data in decision-making.
- "PM" Professional judgement should be applied to using the data in decision-making. A manual review of raw data is recommended to determine if the defect impacts data use for decision-making.
- "R" The data is rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

Data quality assessment. Statistical and scientific evaluation of a data set that assesses the validity and performance of the data-collection design and statistical tests; establishes whether a data set is adequate for its intended use.

Data validation. Systematic process that applies a defined set of performance-based criteria to a body of data; may result in qualification of the data. The data validation process is performed independently of the analytical laboratory that generates the data set and occurs before conclusions are drawn from the data. The process may comprise a standardized data review (routine data validation) and/or a problem-specific data review (focused data validation).

Detection limit. Minimum concentration that can be determined by a single measurement by an instrument; implies a specified statistical confidence that the analytical concentration is greater than zero.

Dilution attenuation factor. Ratio of contaminant concentration in soil leachate to the concentration in groundwater at the receptor point and is used to account for dilution of soil leachate in an aquifer.

Exposure pathway. Mode by which a receptor may be exposed to contaminants in environmental media, e.g., drinking water, ingesting food, or inhaling dust.

External standard. External standard calibration involves comparison of instrument responses from the sample to the responses from the target compounds in the calibration standards. Sample peak areas (or peak heights) are compared to peak areas (or heights) of the standards.

Field duplicate. A second sample collected as near as possible to the original sample.

Focused validation. A technically based analyte-, sample-, and potentially data-use-specific process that extends the qualification of data beyond method or contractual compliance and provides a level of confidence that an analyte is present or absent. If the analyte is present, the quality of the quantitation may be obtained through focused validation.

Gamma radiation. A form of electromagnetic, high-energy radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays and require heavy shielding, such as concrete or steel, to be blocked.

Hazard index (HI). The sum of hazard quotients for multiple contaminants to which a receptor (j) is determined to be exposed, i.e., $HI_j = \Sigma_i HQ_{ij}$.

Hazard quotient (HQ). The ratio of a calculated exposure (E) to or dose (D) from a given contaminant (I) to a given receptor (j) over a reference value (TRV) for contaminant (I) determined to be protective of receptor (j), i.e., $HQ_{ij} = E_{ij}$ [or D_{ij}]TRV_{ij}.

Hazardous and Solid Waste Amendment of 1984. Amendments to the Resource Conservation and Recovery Act, 1984. HSWA added land disposal restrictions, minimum technology requirements, and expanded corrective-action authorities to the RCRA statue.

Human health screening assessment. A comparison of concentrations of contaminants in environmental media to conservatively calculated reference values that are deemed to be protective of human health to determine if the reference levels are exceeded. The goal is to focus further investigation on contaminants and sites that are potential threats to human health.

Hydraulic conductivity. The rate at which water moves through a medium in a unit of time under a unit hydraulic gradient through a unit area measured perpendicular to the direction of flow.

Inductively coupled plasma emission spectroscopy (ICPES). ICPES determines trace elements, including metals, in solutions. The instrument measures characteristic emission spectra by optical spectrometry. Samples are nebulized, and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and photosensitive devices are used to monitor the intensities of the emission lines.

Inductively coupled plasma mass spectroscopy (ICPMS). ICPMS is applicable to the determination of sub-µg/l concentrations of a large number of elements in water samples and in waste extracts or digests. When dissolved constituents are required, samples must be filtered and acid preserved before analysis. No digestion is required before analysis for dissolved elements in water samples. The method measures ions produced by a radio-frequency inductively coupled plasma. Analyte species originating in a liquid are nebulized, and the resulting aerosol transported by argon gas into the plasma torch. The ions produced are entrained in the plasma gas and introduced, by means of an interface, into a mass spectrometer. The ions produced in the plasma are sorted according to their mass-to-change ratios and quantified with a channel electron multiplier.

Instrument detection limit. The IDL is defined to be three times the average of the standard deviations obtained on three nonconsecutive days from the analysis of a standard solution, with seven consecutive measurements of that solution per day. The standard solution must be prepared at a concentration of three to five times the instrument manufacturer's estimated IDL. This is a measure of instrument sensitivity without any consideration for contributions to signal from reagents.

Interference. A chemical or physical entity whose influence results in a decrease or increase in the response of an analytical method or other measurement system relative to the response obtained in the absence of the entity.

Internal standard. Compound added to the sample after sample preparation for qualitative and quantitative instrument analysis—the compound serve as a standard of retention time and response, which is invariant from run to run with the instruments. (Handbook of Environmental Analysis, by Roy-Keith Smith, 3rd ed.)

Laboratory control sample. The LCS is a known matrix spiked with compound(s) representative of the target analytes. The LCS is used to document laboratory performance. The acceptance criteria for LCSs are method specific.

Material disposal area. An area used any time between the beginning of Laboratory operations in the early 1940s and the present for disposing of chemically and/or radioactively contaminated materials.

Matrix spike. An aliquot of sample spiked with a known concentration of target analyte(s). The spiking typically occurs before sample preparation and analysis.

Method blank. An analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing and which is prepared and analyzed in the same manner as the corresponding environmental samples. The method blank is used to assess the potential for contamination to the sample during preparation and analysis.

Minimum detectable activity. For the analysis of radionuclides, the minimum detectable activity is the lowest detectable radioactivity for a given analytical technique. The following equation can be used to calculate the minimum detectable activity.

$$\text{Minimum detectable activity} = 4.65(BKG)^{0.5} + 2.71/2.22 * EFF * V * T_s * Y$$

Where BKG = the total background counts
EFF = the fraction detector efficiency
V = the volume or unit weight
T_s = the sample count duration
Y = the fractional chemical recovery obtained from the tracer recovery

Depending on the type of analysis, other terms may also be required in the denominator (e.g. gamma abundance). Other formulas may be used to calculate the minimum detectable activity.

Perched groundwater. Groundwater that lies above the regional water table and is separated from it by an unsaturated zone.

Polychlorinated biphenyls. More commonly known as PCBs. A family of colorless, odorless compounds used in industrial applications because of their chemical, electrical, and thermal stability. Polychlorinated biphenyls are found in many gaskets and large electrical transformers and capacitors. They have proven to be toxic to both humans and animals.

Potential release site (PRS). A site suspected of releasing or having the potential to release contaminants into the environment. PRS is a generic term that includes solid waste management units, hazardous waste sites listed in Module 7 of the Laboratory's Hazardous Waste Facility Permit, and sites that have been identified as potentially contaminated by radioactivity.

Quality assurance. All those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily in service.

Quality control. All those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements. Quality control is the process through which actual quality performance is measured and compared with standards.

RCRA facility investigation (RFI). The second step of a RCRA corrective action, to gather enough data to fully characterize the nature, extent, and rate of migration of contaminants to determine the appropriate response action. The RFI is generally equivalent to the remedial investigation portion of the SARA process.

Regional aquifer. Geologic material(s) or unit(s) of regional extent whose saturated portion yields significant quantities of water to wells, contains the regional zone of saturation, and is characterized by the regional water table or potentiometric surface.

Relative percent difference. The RPD is the measure used to assess the precision between parent sample results and their associated duplicate results. The RPD is calculated as follows:

RPD = absolute value of (S-R)/((S+R)/2) X 100

Where RPD = relative percent difference
S = parent sample result
R = duplicate sample result

The Los Alamos National Laboratory ER Project criteria for the RPD is less than 20% for aqueous samples and less than 35% for soil samples when the sample concentrations are greater than or equal to five times the method detection limit (MDL). For samples with concentrations less than five times the MDL, but greater than the MDL, the control is ±MDL. No precision criterion applies to samples with concentrations less than the MDL.

Reporting limit. The RL is the numerical value that an analytical laboratory (in conjunction with its client) selects to determine if a target analyte is detected. Results below the RL are considered not detected, while results greater than the RL are considered detected. The RLs are not necessarily based on instrument sensitivity. RLs can be established at the instrument detection limit, method detection limit, estimated quantitation limit, and contract-required detection limit.

Resource Conservation and Recovery Act (RCRA). The RCRA regulations establish a comprehensive hazardous waste management system under the authority of RCRA Subtitle C. RCRA regulates hazardous waste from its point of generation through its point of final disposal. RCRA also regulates solid waste under Subtitle D.

Retention time window criteria. The x-axis on a chromatogram represents retention time. A retention time window is a specified time range on this axis. If a target analyte is detected within its retention time window, it is considered detected. The retention time window criteria are the exact time windows on the chromatogram defining a given target analyte and are method specific. Absolute retention times are used for compound identification in all gas chromatograph and high-pressure liquid chromatography methods that do not employ internal standard calibration. Retention time windows are crucial to the identification of target compounds. The windows are established to compensate for minor shifts in absolute retention times as a result of sample loadings and normal chromatographic variability. The width of retention time windows should be carefully established to minimize the occurrence of both false positive and false negative results. Tight retention time windows may result in false negatives and/or may cause unnecessary reanalysis of samples when surrogates or spiked compounds are erroneously not identified. Overly wide retention time windows may result in false positive results that cannot be confirmed after further analysis.

Screening action level (SAL). Medium-specific concentration level for a chemical derived using conservative criteria below for which it is generally assumed that there is no potential for unacceptable risk to human health. The derivation of a SAL is based on conservative exposure and land-use assumptions. However, if an applicable regulatory standard exists that is less than the value derived by risk-based computations, it will be used for the SAL.

Serial dilution sample. A serial dilution sample is a requirement of EPA Method 6010B (Inductively Coupled Plasma-Atomic Emission Spectrometry). Serial dilutions are made by performing a series of dilutions of an aliquot taken from a stock solution for a target analyte. The first dilution of the original stock solution serves as the stock solution for the second dilution and the second dilution serves as the stock solution for the third dilution and so on. To meet the requirement of EPA Method 6010B, one serial dilution analysis must be performed for each matrix in every sample batch, with a minimum of one serial dilution sample per 20 samples. The serial dilution analysis is accomplished by diluting the sample(s) by a factor of five and comparing the dilution-corrected results to those of the undiluted parent sample(s). The serial dilution results are required to agree within ±10% of the undiluted parent sample results, where the undiluted results are greater than or equal to the method detection limit.

Site conceptual model. A qualitative or quantitative description of sources of contamination, environmental transport pathways for contamination, and biota that may be impacted by contamination (called receptors) and whose relationships describe qualitatively or quantitatively the release of contamination from the sources, the movement of contamination along the pathways to the exposure points, and the uptake of contaminant by the receptors.

Solid waste management unit (SWMU). Any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste.

Surrogate. An organic compound used in the analyses of organic target analytes that is similar in composition and behavior to target analytes but is not normally found in field samples. Surrogates are added to every blank and spike sample to evaluate the efficiency with which analytes are recovered during extraction and analysis.

Total propagated uncertainty. The TPU refers to the range of concentrations (expressed as plus or minus the measured concentration) that include the theoretical or true concentration of an analyte with a specific degree of confidence. Radiochemical results are required to be accompanied by sample-specific uncertainty bounds (TPU) that reflect the 67% confidence level (1-sigma TPU). The TPU includes not only the measurement or counting error but also the technique-specific error term that includes uncertainty values for each contributing measurement process and a sample-specific contribution reflecting specific chemical recoveries, detectors used, etc. All radiochemical result uncertainties incorporate terms for technique-related and sample-specific measurement errors.

Tracer. A tracer is a substance, usually a radioactive isotope, added to a sample to determine the efficiency (chemical or physical losses) of the chemical extraction, reaction, or analysis. The tracer is assumed to behave in the same manner as that of the target radionuclides. Recovery guidelines for tracer results are 30% to 110% under the current contract laboratory statement of work and will be 40% to 105% under the new statement of work. Correction of the analytical results for the tracer recovery is performed for each sample. The concentration of the tracer added needs to be sufficient to result in a maximum of 10% uncertainty at the 95% confidence level in the measured recovery.

Vadose zone. The unsaturated zone. Portion of the subsurface above the regional water table in which pores are not fully saturated.

Appendix B

Operational and Environmental Setting

APPENDIX B OPERATIONAL AND ENVIRONMENTAL SETTING

B-1.0 OPERATIONAL HISTORY AND LAND USE

Technical Area (TA) 21 is located on DP Mesa, which is on the northern Los Alamos National Laboratory (Laboratory) boundary immediately east-southeast of the Los Alamos townsite (Figure B-1.0-1). TA-21 was used primarily for plutonium research, metals production, and related activities from 1945 to 1978. Since 1978, administrative and various other activities have been conducted there. 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 Resource Conservation and Recovery Act facility investigation (RFI) work plan (LANL 1991, 7528).

This report specifically addresses Potential Release Site (PRS) 21-005, TA-21-70, a nitric acid pit used for the disposal of classified correspondence; the pit was installed in 1946 and removed in 1967. The PRS is within a locked fence. The only known material used at this PRS was concentrated nitric acid. Although no data are available on whether other contaminants were present in the nitric acid pit, suspected chemicals of potential concern are nitrates and inorganic chemicals. The volume and concentration of nitric acid used at PRS 21-005 were not documented. The TA-21 operable unit RFI work plan (LANL 1991, 7680) does not record any other PRSs and facility processes in the general area as having contributed to contamination at PRS 21-005.

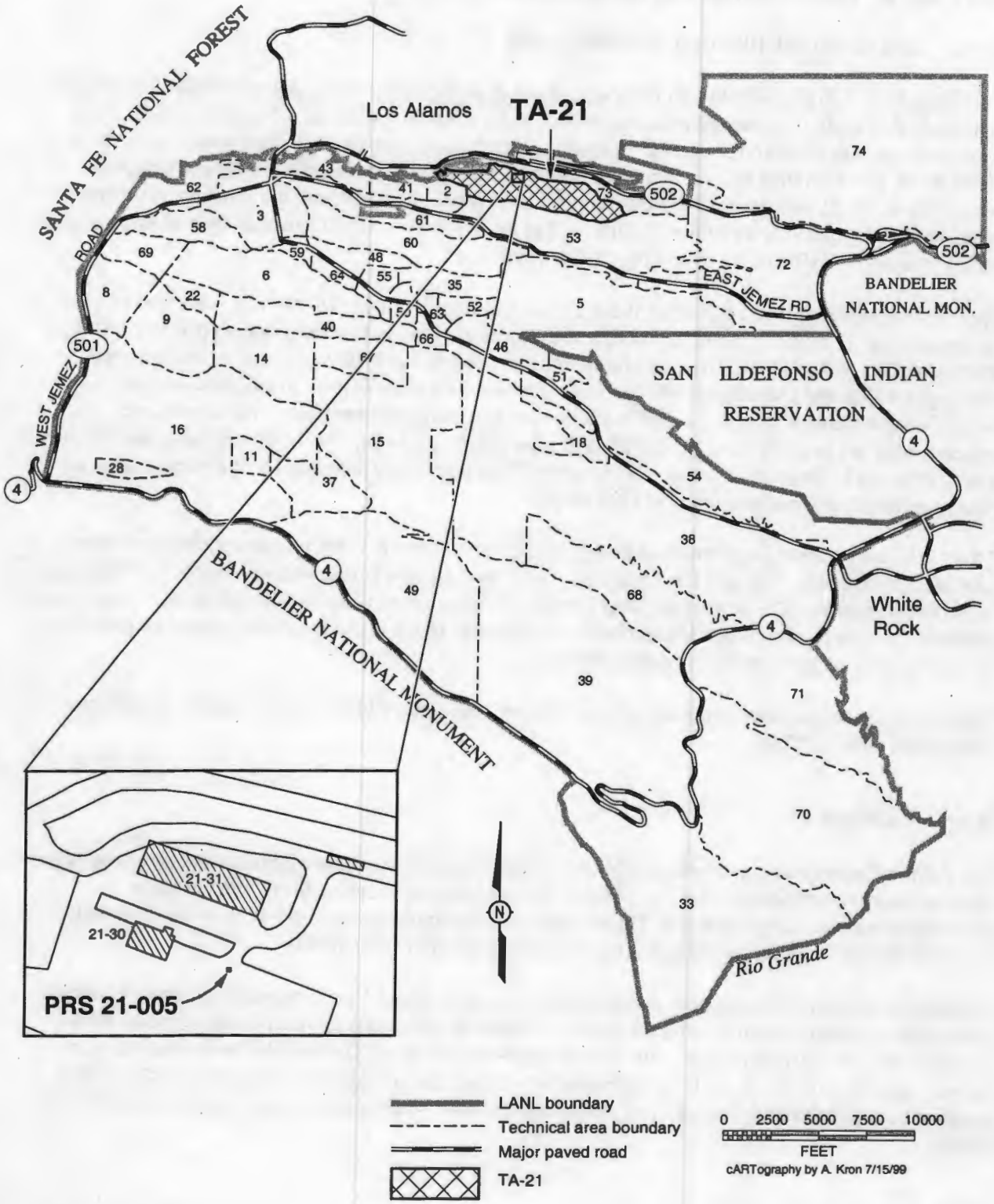
TA-21 is currently under Department of Energy (DOE) control and is in the process of decontamination and decommissioning. The land has historically been used for light industrial applications. Any future use of the land (either by DOE or following land transfer of the property) would still be industrial. Currently, the Johnson Controls Northern New Mexico roads and grounds group is using the site as a parking area for vehicles and larger grounds-keeping equipment.

Future and current land-use maps can be found in the 1995 update to the Laboratory site development plan (LANL 1995, 57224).

B-2.0 CLIMATE

Los Alamos County has a semiarid, temperate mountain climate. Summer afternoon temperatures in Los Alamos County are typically in the 70s and 80s (°F), infrequently reaching 90°F, and nighttime temperatures are typically in the 50s. Typical winter temperatures are from 30–50°F in the daytime to 15–25°F at night, occasionally dropping to 0°F or below (Bowen 1990, 6899).

Annual precipitation (including both rain and snow) averages about 18 in. Recorded extremes in annual precipitation range between 6.8 and 30.3 in. An average of 40% of the annual precipitation falls during thunderstorms in July and August, often in brief, high-intensity rains. Daily rainfall extremes of 1 in. or greater occur in most years, and the estimated 100-yr daily rainfall extreme is about 2.5 in. Snowfall is greatest from December through March, and heavy snowfall is infrequent in other months (Bowen 1990, 6899).



Source: FIMAD, G104997 8/9/96)

F1.0-1 / 21-005 RFI RPT / 011400 / PTM

Figure B-1.0-1. Location of TA-21 with respect to Laboratory TAs and surrounding land holdings

B-3.0 GEOLOGY

B-3.1 Geologic Setting

The mesa surfaces are immediately underlain by the Bandelier Tuff of Pleistocene age, which outcrops in a few places on the mesa surfaces and is exposed along canyon walls. The Bandelier Tuff comprises two units: the Tshirege and Otowi members (Smith and Bailey 1966, 21584). The Tshirege Member is the uppermost rock unit and consists of multiple-flow units of crystal-rich ash-flow tuff and displays significant variations in welding and vapor-phase alteration, both within a single stratigraphic section and at varying distances from the caldera. The Otowi Member of the Bandelier Tuff underlies the Tshirege Member beneath the Pajarito Plateau and outcrops along canyon walls. The Otowi Member is a nonwelded, vitric ash-flow tuff composed of multiple-flow units.

Beneath the Bandelier Tuff, a sequence of interstratified sedimentary and volcanic rocks of Miocene to Pleistocene age occur and outcrop on the margins of the Pajarito Plateau. Along the walls of the canyons below the Bandelier Tuff, Pliocene-Pleistocene andesite and latite volcanic rocks of the Tschicoma Formation crop out. The Tschicoma Formation consists of voluminous domes and flows of dacite and andesite that interfinger with sediments of the Puye Formation and are exposed in the upper canyons.

B-3.2 Soils

The location of the PRS and the surrounding area are completely covered by asphalt. Surrounding areas have had their soils either removed or disturbed. Any undisturbed areas of the mesa top have moderately to well-developed sandy loam to clay soils on Bandelier Tuff and alluvium. The depth to tuff bedrock and the effective rooting depth are 20–50 cm.

B-4.0 HYDROLOGY

B-4.1 Hydrological Conceptual Model

The Los Alamos Canyon to the south of TA-21 with effluent-fed perennial surface flow has an alluvial aquifer that is recharged by, and hydrologically connected to, the surface stream flow. Surface water rapidly infiltrates through the permeable alluvium until downward movement is restricted by the less permeable sediments of the Tschicoma Formation, the Bandelier Tuff, or the Puye Formation; this results in a shallow, saturated zone perched in the alluvium. The areal extent of this alluvial aquifer along the main axis of the canyon is not well defined. As water flows downgradient (eastward) in the alluvium, water is lost to evaporation, transpiration, and infiltration into underlying sediments.

The hydrology of the mesa top vadose zone (which is formed in the Bandelier Tuff) does not bear water, except in very shallow and localized areas. The low moisture content and extensive thickness of the unsaturated zone (up to 1100 ft of unsaturated volcanic tuff and sediments of the Bandelier and Puye Formations and Cerros del Rio basalts) minimize the potential for downward movement of water through the Bandelier Tuff and onto the main aquifer.

B-4.2 Surface Water

The Los Alamos Canyon drainage area covers about 27.5 km^2 and extends from the drainage divide on the flanks of the Sierra de Los Valles to the Rio Grande near Otowi. The Los Alamos Reservoir, situated in the upper reach of the canyon, impounds water from a small, spring-fed perennial stream, which is used for irrigating lawns in parts of the Laboratory. Surface flow below the reservoir is intermittent. The

hundred-year flood discharge is 12 m^3/s. Surface flow in Los Alamos Canyon may discharge to the Rio Grande during high runoff from summer storms. Maximum flood discharge and frequency vary from 20 m^3/s for a 50-yr frequency to 3 m^3/s for a 2-yr. frequency (Purtymun 1975, 11787).

B-4.2.1 ER-SOP 2.01 Assessment(s)

At the Laboratory, surface water runoff and sediment transport are among the potential migration pathways by which contaminants might be transported to off-site receptors. Surface water may also access subsurface contaminants exposed by soil erosion. Soil erosion is dependent on several factors, which include soil properties, the amount of vegetative cover, the slope of the contaminated area, exposure, the intensity and frequency of precipitation, and seismic activity.

The Laboratory's Environmental Restoration (ER) Project has developed ER-SOP-2.01, "Surface Water Site Assessment," to assess sediment transport and erosion concerns at specific PRSs. ER-SOP-2.01 provides a basis for prioritizing and scheduling actions to control erosion of potentially contaminated soils at specific PRSs. The procedure is a two-part evaluation. Part A is a compilation of existing PRS analytical data, site maps, and knowledge-of-process information. Part B is an assessment of the erosion/sediment transport potential at the PRS. Erosion potential is numerically rated from 1 to 100 by means of a matrix system. PRSs that score above 40–60 have a high erosion potential. Part A of this assessment is initiated and completed by the Laboratory ER Project; Part B is completed by the Laboratory's Water Quality and Hydrology Group (ESH-18). The ER-SOP-2.01 assessment for PRS 21-005 is attached at the end of this appendix. A Surface Water Assessment Team composed of representatives from the ER Project, ESH-18, the Laboratory's Facility Management group (FSS-7), and the DOE Oversight Bureau evaluates each completed assessment. If necessary, a best management practice or other action is implemented based on the results of the assessment.

B-4.3 Groundwater

B-4.3.1 Alluvial Waters

Two alluvial wells, LAUZ-1 and LAUZ-2, located in DP canyon (a side canyon that merges with Los Alamos Canyon east of TA-21) were drilled to a total depth of 15 ft. Alluvial water was encountered in both wells at approximately 4.5 ft below the surface. The saturated zone at the time was approximately 3.5 ft thick. This alluvial water is thought to be the source of DP Spring. This spring flows from the south-facing slope of DP Canyon 0.62 miles east-northeast of LADP-4.

B-4.3.2 Perched Waters

The deep well, LADP-4, was drilled in 1993 in DP Canyon to a depth of 800 ft to determine whether there is perched groundwater beneath DP Canyon. Unpublished information from drill cores at former TA-10 show that the top of the Puye Formation is a weakly to moderately developed paleosol (old soil profile) that contains 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 Puye Formation within the overlying Guaje Pumice Bed (Figure B-4.3-1). The paleosol at the top of the Puye Formation acts as an aquitard. From borehole LADP-4, the groundwater at the base of the Bandelier Tuff is known not to be present in DP canyon, approximately 1200 ft north of LADP-3, and therefore probably does not underlie TA-21. The perched groundwater continues upcanyon at least 0.62 miles, based on data from well LAO-1, but the lateral continuity of the aquifer in other directions beyond TA-21 is not known at present.

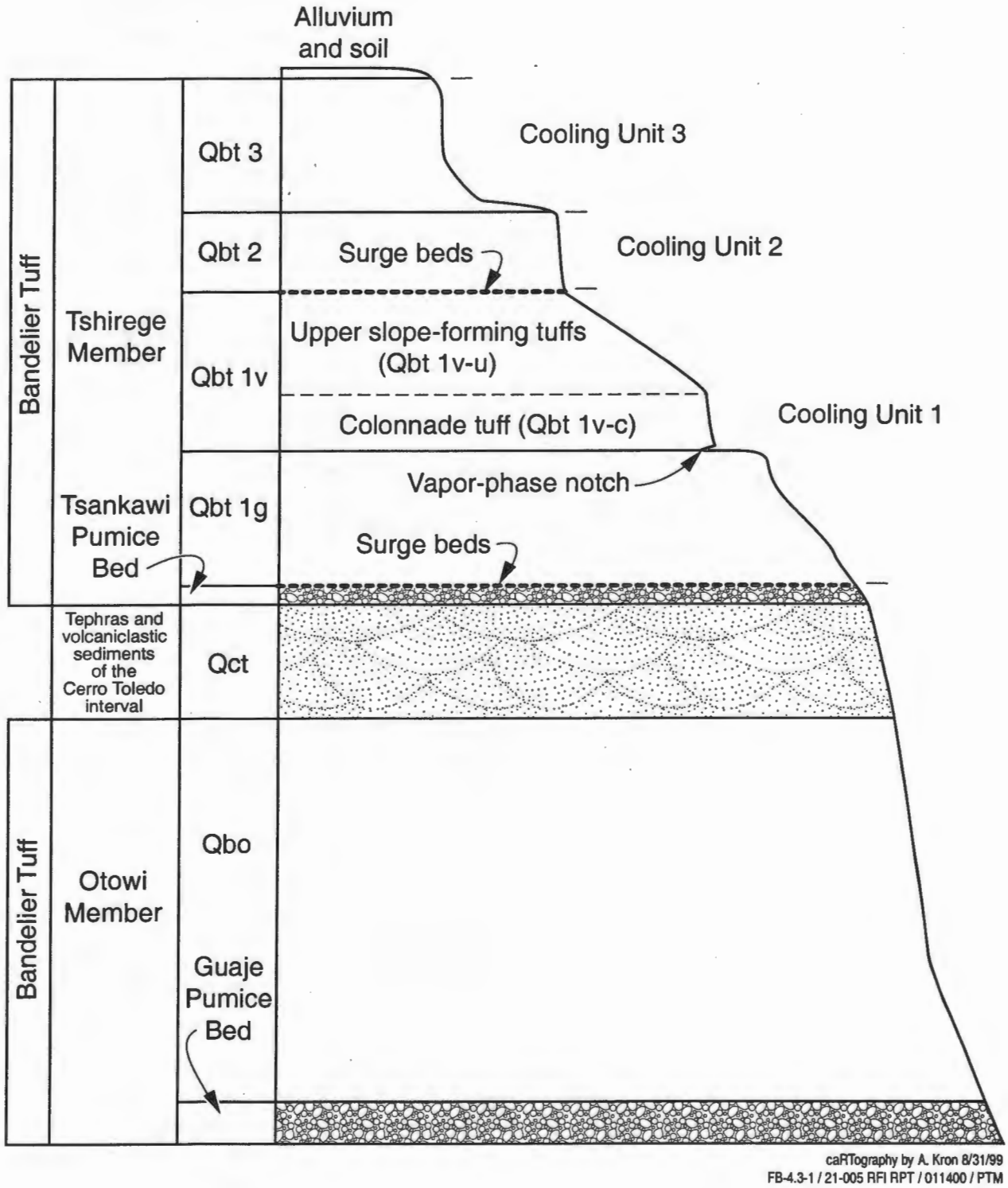


Figure B-4.3-1. Generalized stratigraphy of TA-21

B-4.3.3 Regional Aquifer

The main regional aquifer beneath TA-21 is at an elevation of approximately 5900 ft or approximately 1100 ft below the surface, chiefly within sediments of the Puye and Tesuque Formations (Broxton and Eller 1995, 58207). Thus, for mesa-top sites at TA-21, more than 1200 ft of tuff and volcaniclastic sediments separate the surface from the main aquifer.

B-4.3.4 Vadose Zone

The summary of studies provides strong support for the concept that the unsaturated zone of the Bandelier Tuff provides substantial impedance to the movement of liquid in the subsurface. For a depth of more than 1000 ft, the subsurface hydrology at TA-21 is dominated by unsaturated flow conditions. The top of the saturated zone occurs approximately 1150 ft (350.5 m) below the surface of the mesa, and most of this distance, 800 ft (243.8 m), is in the Bandelier Tuff.

The various units of the Bandelier Tuff tend to have relatively high porosities. Porosity ranges from 30%–60% by volume, generally decreasing for more highly welded tuff. Permeability varies for each cooling unit. Values for the Tshirege Member of the Bandelier Tuff at TA-54, determined using in situ vacuum and water injection test and laboratory analyses of cores, range between 0.1 and 0.6 darcies. No specific TA-21 data are available. Moisture content of native tuff is low, generally less than 5% by volume throughout the profile. Previous studies at TA-21 disposal areas where liquid has been added have shown that moisture content changes little below 40 ft. The specific retention of the tuff ranges between 18% and 38% by volume, which indicates a considerable field capacity for holding moisture (Purtymun and Stoker 1990, 7508 and Kearl et al. 1986, 15368).

Hydraulic conductivity is dependent on the porous medium and the fluid. Saturated tuff has a hydraulic conductivity in the range of 0.02 cm/hr for welded tuff to 1.12 cm/hr for nonwelded tuff. The hydraulic conductivity of unsaturated tuff varies with moisture content and had values two to five orders of magnitude lower than saturated tuff (Purtymun and Stoker 1990, 7508).

The moisture characteristic curve is important in unsaturated porous media in relating water content to suction, tension, or negative-pressure head. However tests have only been done on crushed Bandelier Tuff, and the applicability of these results to intact tuff remains in question.

B-5.0 ECOLOGICAL RESOURCES

Biological resource field surveys have been conducted in the general area of this PRS for compliance with the Federal Endangered Species Act of 1973; 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;" and DOE Order 5400.1, "General Environmental Protection Program."

TA-21 is a mesa-top site in a developed, industrialized area. The preurban natural overstory of the mesa was a ponderosa pine community. The understory currently present comprises grasses and forbs commonly found in disturbed soils; the understory includes western wheat grass, Canada bluegrass, bottlebrush squirreltail, cheat grass, sand dropseed, summer cypress, prickly lettuce, and horseweed. The mesa proper provides limited habitat for biota, it does not contain sensitive habitats, and threatened or endangered species are not present on the mesa top. See the Ecological Scoping Checklist for PRS 21-005 in Appendix F for more information on threatened and endangered species.

B-6.0 CULTURAL RESOURCES

Pursuant to the National Historic Preservation Act of 1966 (amended), a cultural resource survey was conducted at Operable Unit 1106 during the summer of 1991 (McGehee et al. 1992, 28310). The methods and techniques used for this survey conformed 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 any of the PRSs, including PRS 21-005, in this area that are eligible for inclusion in the National Register of Historic Places (ESH ID #99-0113 reviewer comments) (LANL 1999, 64002). The review comments included specific details about this PRS.

APPENDIX B REFERENCES

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Los Alamos National Laboratory

Environment, Safety & Health Division
ESH-18 Water Quality & Hydrology Group

Surface Water Assessment
Erosion Matrix for PRS 21-005

CRITERIA EVALUATED	Value	Erosion/Sediment Transport Potential Low 0.1	Medium 0.5	High 1.0	Calculated Score
Site Setting (43)					
On mesa top	1	Defined based on topographic setting			1.0
Within bench of canyon	4				
Within the canyon floodplain but not watercourse	13				
Within bottom of canyon channel in watercourse	17				
Estimated % ground and canopy cover	13	>75%	25-75%	<25%	1.3
Slope	13	0-10%	10-30%	>30%	1.3
Surface Water Factors-Run-off (46)					
Visible evidence of runoff discharging? (Yes/No)	5	If no, score of 0 for runoff section.			5.0
		If yes, score 5 and proceed with section.			
Where does runoff terminate?	19	Other	Bench Setting	Drainage/Wetland	1.9
Has runoff caused visible erosion? (Yes/No)	22	Sheet	Rill	Gully	0.0
		If no, score as 0. If yes, calculate as appropriate.			
Surface Water Factors-Run-on (11)					
Structures adversely affecting run-on (Yes/No)	7*	If yes, score as 7. If no, score as 0.			7.0
Current operations adversely impacting (Yes/No)	4	If yes, score as 4. If no, score as 0.			0.0
Natural drainages onto site (Yes/No)	7*	If yes, score as 7. If no, score as 0.			0.0
**Select either structures or natural drainages.*					
MAX. POSSIBLE EROSION MATRIX SCORE:	**100**			**Total Score**	17.5

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Los Alamos National Laboratory
SURFACE WATER
SITE ASSESSMENT

SITE INFORMATION

1a) PRS Number 21-005 **1b) Structure Number** 21-30 **1c) FMU Number** 66

2. Date/Time (M/D/Y H:M am/pm) 07/20/1999

SITE SETTING (check all that apply)

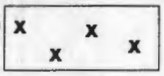
3. ◉ **On mesa top (a).** ○ **In the canyon floor, but not in an established channel (c)**

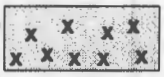
○ **Within a bench of a canyon (b).** ○ **Within established channel in the canyon floor (d).**

Explanation: Sump removal area east of 21-30 in parking lot.

4. Estimated ground and/or canopy cover at site: (deciduous leaves, pine needles, rocks, vegetation, trees,

(illustration)

(a) 

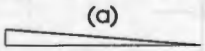
(b) 

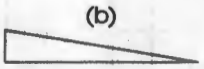
(c)

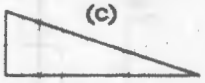
Estimated % of ground/canopy cov ○ 0% to 25% ○ 25% to 75% ◉ 75% to 100%

Explanation: Asphalt coverage on entire site, except near area of excavation.

5. Steepest slope at the area impacted:

(a) 

(b) 

(c) 

◉ Less than 10% ○ 10% to 30% ○ 30% and greater

Explanation: Flat area sloped towards the north.

RUNOFF FACTORS

Y / N

☑ ☐ **6. Is there visible evidence of runoff discharging from site? If yes, answer a) - c) below:**

☐ ☑ 6a) Is runoff channelized? If yes, describ ○ Man-made channel. ○ Natural channel.

Explanation: Runoff from site of excavation into bar ditch along access road on the northeast side of building.

RUNOFF FACTORS, CONT'D

6b) Where does evidence of runoff terminate?

- ○ **Drainage or wetland (name)** DP/Los Alamos
- ○ **Within bench of canyon setting (name)**
- ◉ **Other (i.e., retention pond, meadow, mesa top)** bar ditch

Explanation: Runoff appears to terminate along access road into the bar ditch on the northeast side of building 21-30.

Y / N

☐ ☑ 6c) Has runoff caused visible erosion at the site? If yes, explain belo ○ Sheet ○ Rill ○ Gully

Explanation: None observed, mostly asphalt cover.

RUN-ON FACTORS

Please rate the potential for storm water to run on to this site: (Check EITHER #7 or #9)

☑ ☐ **7.** Are structures (i.e., buildings, roof drains, parking lots, storm drains) creating run-on to the site?

Explanation: Area parking lot creates run-on to site.

☐ ☑ **8.** Are current operations (i.e., fire hydrants, NPDES outfalls) adversely impacting run-on to the site?

Explanation: No operational impact.

☐ ☑ **9.** Are natural drainage patterns directing stormwater onto site?

Explanation: None in addtion to the parking area.

ASSESSMENT FINDING:

☐ ☑ **10. Based on the above criteria and the assessment of this site, does soil erosion potential exist? (REFER TO EROSION POTENTIAL MATRIX.)**

Veenis, Steve

11. Signature of Water Quality/Hydrology Representative

SV Initials of independent reviewer.

Check here when information is entered in database: ☑

This page is for ESH-18 notes, recommendations, and photos.

	Y	N	
12. a)	◉	○	Is there visible trash/debris on the site?
b)	○	◉	Is there visible trash/debris in a watercourse?

Description of existing BMPs:

○	○	Are BMPs being properly maintained? If no, describe in "Other Internal Notes."
○	○	Are BMPs effectively keeping sediment in place and reducing erosion potential?

OTHER INTERNAL NOTES:

Misc. plastic and debris from excavation. Will be removed prior to leaving site.

Appendix C

Results of Quality Assurance/Quality Control Activities

APPENDIX C RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

C-1.0 SUMMARY OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

This appendix consists of an assessment of the quality of analytical results obtained for Potential Release Site (PRS) 21-005 during 1999. PRS 21-005 was a pit used from 1946 through 1967 in which nitric acid was used to dissolve classified documents. Table C-1.0-1 presents a list of chemicals and analytical methods for this investigation. Twenty-two soil samples were collected for this investigation; they included 20 planned samples from the four boreholes (five from each), a field duplicate sample, and a sample at a stained fracture.

Table C-1.0-1
Analytical Techniques Used for Samples Collected at PRS 21-005

Chemical Category	Analyte List	Extraction Method	Analytical Method
Radiation	Gross alpha radiation	Paragon SOP[a] 702R12	Alpha scintillation Paragon SOP 724R5
	Gross beta radiation	Paragon SOP 702R12	Proportional counting Paragon SOP724R5
	Gross gamma radiation	Paragon SOP 739R2	Proportional counting Paragon SOP 739R2
Radionuclides	Gamma-emitting radionuclides	Paragon SOP 739R2	Gamma spectroscopy Paragon SOP 713R4
	Isotopic uranium	Chemical separation Paragon SOP 778R3	Alpha spectroscopy Paragon SOP 714R4
	Isotopic plutonium	Chemical separation Quanterra internal SOP	Alpha spectroscopy Quanterra internal SOP
Inorganic chemicals	Target analyte metals	EPA[b] Method 3050	EPA Method 6010b
	Nitrate	None	EPA Method 300.0
Organic chemicals	PCBs[c]	EPA Method 3540	EPA Method 8082
	VOCs[d]	EPA Method 5035	EPA Method 8260
	SVOCs[e]	EPA Method 3540	EPA Method 8270

[a] SOP = standard operating procedure.
[b] EPA = Environmental Protection Agency.
[c] PCB = polychlorinated biphenyl.
[d] VOC = volatile organic compound.
[e] SVOC = semivolatile organic compound.

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the requirements of the "Quality Assurance Project Plan Requirements for Sampling and Analysis" (LANL 1996, 54609) and the Los Alamos National Laboratory (Laboratory) Environmental Restoration (ER) Project analytical services statement of work (SOW) for contract laboratories (LANL 1995, 49738). The results of the QA/QC activities were used to estimate accuracy, bias, and precision of the analytical measurements. QC samples, which included method blanks, blank spikes, matrix spikes, and laboratory control samples (LCSs), were used to assess accuracy and bias. Internal standards, external standards, surrogates, and tracers were also used to assess accuracy. The type and frequency of QC analyses are described in the ER Project analytical services SOW (LANL 1995, 49738). Other QC factors, such as sample preservation and holding times, were also assessed. The requirements for

sample preservation and holding times are given in the ER Project Standard Operating Procedure (SOP) ER-SOP-1.02, Rev. 0, "Sample Containers and Preservation." Evaluating these QC indicators allows estimates to be made of the accuracy, bias, and precision of the analytical suites. A focused data validation was also performed for all the data packages (also referred to as request numbers). The focused validation followed the same procedure discussed above and included a more detailed review of the raw data results generated by the contract analytical laboratory.

Data validation results, including request numbers, sample identification numbers, and their associated qualifiers, are given in Section C-5.0. The data are usable for evaluation and interpretive purposes. The entire data set meets the standards set for use in this report with three exceptions.

1. The semivolatile analysis for sample MD21-99-0059 was rejected because of serious deficiencies with the internal standard and surrogate recoveries. The field duplicate of sample MD21-99-0059, sample MD21-99-0072 semivolatile results, will be used to replace the rejected results.
2. Selected gamma spectroscopy results were rejected because of spectral interference from other gamma-emitting radionuclides. These rejected radionuclides are discussed in Section C-5.3.
3. The isotopic plutonium results for sample MD21-99-0157 were rejected because the plutonium tracer recovery for this sample was less than 10%. This results in the loss of one expected isotopic plutonium analysis but does not compromise the conclusions drawn in the investigation. This sample was between 9.5 and 10 ft and was therefore not a bounding sample at the bottom of the borehole. It was also not the extra sample taken at the stained fracture.

A summary of the soil samples collected for analyses is presented in Table C-1.1-1.

Table C-1.1-1
Summary of Borehole Samples Analyzed at PRS 21-005

Request Number	Collection Date	ER Sample ID	Analytical Suite	Analytical Laboratory
Inorganic Chemicals				
5693	June 1999	MD21-99-0051 MD21-99-0052 MD21-99-0053 MD21-99-0054 MD21-99-0055 MD21-99-0056 MD21-99-0057	TAL metals EPA Method 6010 B Nitrate EPA Method 300.0	Paragon Analytics
5700	June 1999	MD21-99-0058 MD21-99-0059 MD21-99-0060 MD21-99-0061 MD21-99-0062 MD21-99-0063 MD21-99-0064 MD21-99-0065 MD21-99-0066 MD21-99-0067 MD21-99-0068 MD21-99-0069 MD21-99-0070 MD21-99-0071 MD21-99-0072	TAL metals EPA Method 6010 B Nitrate EPA Method 300.0	Paragon Analytics

Table C-1.1-1 (continued)

Request Number	Collection Date	ER Sample ID	Analytical Suite	Analytical Laboratory
Organic Chemicals				
5692	June 1999	MD21-99-0051 MD21-99-0052 MD21-99-0053 MD21-99-0054 MD21-99-0055 MD21-99-0056 MD21-99-0057	PCBs, EPA Method 8082 SVOCs EPA Method 8270 VOCs EPA Method 8260	Quanterra Quanterra Quanterra
5699	June 1999	MD21-99-0058 MD21-99-0059 MD21-99-0060 MD21-99-0061 MD21-99-0062 MD21-99-0063 MD21-99-0064 MD21-99-0065 MD21-99-0066 MD21-99-0067 MD21-99-0068 MD21-99-0069 MD21-99-0070 MD21-99-0071 MD21-99-0072	PCBs, EPA Method 8082 SVOCs EPA Method 8270	Quanterra Quanterra
5708	June 1999	MD21-99-0058 MD21-99-0059 MD21-99-0060 MD21-99-0061 MD21-99-0062 MD21-99-0063 MD21-99-0064 MD21-99-0065 MD21-99-0066 MD21-99-0067 MD21-99-0068 MD21-99-0069 MD21-99-0070 MD21-99-0071 MD21-99-0072	VOCs EPA Method 8260	Kemron
Radiation and Radionuclides				
5694	June 1999	MD21-99-0051 MD21-99-0052 MD21-99-0053 MD21-99-0054 MD21-99-0055 MD21-99-0056 MD21-99-0057	Gross alpha, beta, and gamma Proportional counting Gamma-emitting radionuclides Gamma spectroscopy Isotopic uranium Chemical separation Alpha spectroscopy	Paragon Analytics

Table C-1.1-1 (continued)

Request Number	Collection Date	ER Sample ID	Analytical Suite	Analytical Laboratory
Radiation and Radionuclides (continued)				
5701	June 1999	MD21-99-0058 MD21-99-0059 MD21-99-0060 MD21-99-0061 MD21-99-0062 MD21-99-0063 MD21-99-0064 MD21-99-0065 MD21-99-0066 MD21-99-0067 MD21-99-0068 MD21-99-0069 MD21-99-0070 MD21-99-0071 MD21-99-0072	Gross alpha, beta and gamma Proportional counting Gamma-emitting radionuclides Gamma spectroscopy Isotopic uranium Chemical separation Alpha spectroscopy	Paragon Analytics
5711	June 1999	MD21-99-0143 MD21-99-0144 MD21-99-0145 MD21-99-0146 MD21-99-0147 MD21-99-0148 MD21-99-0149 MD21-99-0150 MD21-99-0151 MD21-99-0152 MD21-99-0153 MD21-99-0154 MD21-99-0155 MD21-99-0156 MD21-99-0157 MD21-99-0158 MD21-99-0159 MD21-99-0160 MD21-99-0161 MD21-99-0162 MD21-99-0163 MD21-99-0164	Isotopic plutonium Chemical separation Alpha spectroscopy	Quanterra

Summaries of the analytical methods for inorganic chemicals, radionuclides, and organic analytes are provided in the following sections. The contract-required detection limit (CRDL) for each analyte listed is provided in Appendix D-1.0. These limits are also detailed in the ER Project analytical services SOW (LANL 1995, 49738).

C-2.0 INORGANIC CHEMICAL METHODS

The 22 borehole samples collected at PRS 21-005 were analyzed for target analyte list (TAL) metals. The inorganic chemical methods for this data set are detailed in Table C-2.0-1. Holding times were met for all inorganic chemical digestions and analyses. The CRDLs defined by the ER Project analytical services

SOW (LANL 1995, 49738) for inorganic chemicals is provided in Appendix D. The qualifiers for inorganic analytes are provided in Section C-5.2.

Table C-2.0-1
Analytical Methods for Inorganic Chemical Analysis

Analytical Method	Analytical Description	Analytical Suite
EPA SW-846 Method 6010B	ICPES[a]	Aluminum, antimony, arsenic, barium, beryllium, calcium, cadmium, cobalt, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, silver, thallium, vanadium, and zinc
EPA SW-846 Method 7471A	CVAA[b]	Mercury

[a] ICPES = inductively coupled plasma emission spectroscopy.

[b] CVAA = cold vapor atomic absorption.

C-2.1 Inorganic Chemical QA/QC Samples

LCSs, method blanks, matrix spike samples, field duplicate samples, interference check samples, and serial dilution samples were analyzed to assess accuracy and precision for inorganic chemical analyses. Each of these QA/QC sample types is defined in the ER Project analytical services SOW (LANL 1995, 49738) and is described briefly in the sections below.

The LCS serves as a monitor of the overall performance of each step during the analysis, including sample digestion. The analytical results for the samples were qualified according to National Functional Guidelines (EPA 1994, 48639) if the individual LCS recovery indicated an unacceptable bias in the measurement of individual analytes. The LCS recoveries should fall into the control limits of 75–125%. Nitrate was also analyzed for this data set using EPA Method 300.0. The LCS recovery for nitrate is also 75–150%.

Preparation blanks are used as a measurement of bias and potential cross contamination. The blank results for inorganic chemical analyses were within acceptable limits for all the analyses. All target analytes should be below the CRDL in the preparation blank.

Accuracy for inorganic chemical analyses are also assessed using matrix spike samples. A matrix spike sample is designed to provide information about the effect of each sample matrix on the sample-preparation procedures and analytical technique. The spike sample recoveries should be within the acceptance range of 75–125%.

Analyzing field duplicate samples assessed precision of inorganic chemical analyses. All relative percent differences (RPDs) between the sample and field duplicate should ±35%.

C-2.2 Inorganic Chemical Background Values

It is important to note that the currently used ER Project analytical services SOW (LANL 1995, 49738) was issued before the widespread use of axial view ICPES (also known as *trace* ICPES) and before the development of the Laboratory soil inorganic chemical background data set. With the advent of axial view ICPES, detection limits for inorganic chemicals have greatly improved. As an example, antimony soil detection limits for the older radial view ICPES are typically on the order of 12 mg/kg, while on the *trace* ICPES the detection limits are as low as 0.5 mg/kg.

The report "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier tuff at Los Alamos National Laboratory" (Ryti et al. 1998, 59730) was developed after *trace* ICPES was widely used. Because of good communication with the contract analytical laboratory, all samples were analyzed using *trace* ICPES. Therefore, all nondetected inorganic compounds in this data set have reporting limits less than the Laboratory background values. The 22 samples collected for this investigation are all compared to the Qbt 2,3,4 background for unweathered tuff.

C-3.0 ORGANIC CHEMICAL ANALYSES

The 22 borehole samples collected at PRS 21-005 were analyzed for VOCs, SVOCs, and PCBs. Details for the EPA analytical methods are shown in Table C-3.0-1. All QC procedures were followed as required in the ER Project analytical services SOW (LANL 1995, 49738). All extraction and analysis holding times were met. Qualifiers applied to these samples are presented in Section C-5.0. The SVOC TAL, including the required estimated quantitation limits (EQLs), and the PCB analyte list with CRDLs are in Appendix D.

Table C-3.0-1
Analytical Methods for Organic Chemical Analyses

Analytical Method	Analytical Description	Target Compound List
EPA Method 3540–Extraction EPA SW-846 Method 8270–Analysis	SVOCs	ER Project analytical services SOW (LANL 1995, 49738), also in Appendix D of this report.
EPA Method 5035–Sampling EPA Method 5035–Extraction EPA SW-846 Method 8260–Analysis	VOCs	ER Project analytical services SOW (LANL 1995, 49738), also in Appendix D of this report.
EPA Method 3540–Extraction EPA SW-846 Method 8082–Analysis	PCBs	ER Project analytical services SOW (LANL 1995, 49738), also in Appendix D of this report.

C-4.0 RADIOCHEMICAL ANALYSES

The 22 borehole samples collected at PRS 21-005 were analyzed for radioactivity and radionuclides by the methods listed in Table C-4.0-1. The maximum allowable reporting limit, as defined in the ER Project analytical services SOW, for radiochemicals is provided in Appendix D, Table D-1.0-2.

Table C-4.0-1
Analytical Methods for Radiochemical Analyses

Radiation and Radionuclide(s)	Analytical Technique
Gamma-emitting radionuclides	Gamma spectroscopy
Isotopic plutonium	Chemical separation/alpha spectroscopy
Isotopic uranium	Chemical separation/alpha spectroscopy
Gross alpha, beta, gamma	Proportional counting

Radionuclides with reported values less than the minimum detectable activity were qualified as nondetected (U). The radionuclides qualified as nondetected based on the minimum detectable activity are discussed in Section C-5.3. Each radionuclide result was also compared with the corresponding

1-sigma total propagated uncertainty (TPU). If the result was not greater than three times the TPU, it was qualified as nondetected (U). Radionuclides qualified as nondetected (U) based on the 1-sigma TPU are also discussed in Section C-5.3.

Certain gamma spectroscopy analytes are subject to spectral interference from energies of other radionuclides. When this occurs, it is not possible to reliably measure these radionuclides. Contract analytical laboratory results indicated spectral interference for several gamma spectroscopy analytes. These values were rejected (R) because of spectral interference, as summarized in Section C-5.3. All other radionuclide results including the qualified data are usable for evaluation and interpretive purposes.

Precision and bias of radiochemical analyses performed at off-site fixed laboratories were assessed using matrix spike samples, LCSs, method blanks, duplicates, and tracers. The ER Project analytical services SOW (LANL 1995, 49738) specifies that spike sample recoveries should be within ±25% of the certified value. All spike sample recoveries met this acceptance criteria. LCSs were analyzed to assess accuracy for radionuclide analyses. The LCSs serve as a monitor of the overall performance of each step during the analysis, including the radiochemical separation preparation. The ER Project analytical services SOW (LANL 1995, 49738) specifies that LCS recoveries should be within ±25% of the certified value. The analytical results for individual LCSs were all within the ±25% recovery control limit. Method blanks are also used to assess bias. The ER Project analytical services SOW (LANL 1995, 49738) specifies that the method blank concentration should not exceed the required EQL. All method blanks met these criteria.

C-5.0 DATA VALIDATION

The following sections discuss the data qualifiers applied to each analyte for a given sample. Data qualifiers are defined in Table C-5.0-1. Table C-5.1-1 (inorganic chemical data quality), Table C-5.2-1 (organic chemical data quality), and Table C-5.3-1 (radionuclide data quality) summarize the qualifiers for this data set.

Table C-5.0-1
Explanation of Data Qualifiers Used in the Data Validation Procedure

Qualifier	Explanation
U	The analyte was analyzed for but not detected. Reported value is the sample-specific EQL or detection limit.*
J	The reported value should be regarded as estimated.
J+	The reported value should be regarded as estimated and biased high.
J-	The reported value should be regarded as estimated and biased low.
UJ	The analyte was analyzed for but not detected. Reported value is an estimate of the sample-specific quantitation limit or detection limit.
UJ+	The analyte was analyzed for but not detected. Reported value is an estimate of the sample-specific quantitation limit or reporting limit with a high bias.
UJ-	The analyte was analyzed for but not detected. Reported value is an estimate of the sample-specific quantitation limit or reporting limit with a low bias.
R	The sample results were rejected because of serious deficiencies in the ability to analyze the sample and meet quality control criteria; presence or absence cannot be verified.

* For radionuclide analyses, the reported value is the best estimate of the analyte concentration, even when that estimate is less than the detection limit. For statistical reasons, the estimates may sometimes be negative results.

C-5.1 Inorganic Chemical Data Review

For request number 5693, Paragon Analytics analyzed seven borehole samples for EPA TAL metals and nitrate.

- *Nitrate.* The method blank result for nitrate was below the reporting limit. The LCS result was within acceptance criteria of 75–125%. All initial and continuing calibration blanks were below the reporting limit for nitrate. All initial and continuing calibration verifications for this request met acceptance criteria. No data qualification was necessary.
- *TAL Metals.* The method blank results were below detection limits for all analytes. The recoveries for the LCS met acceptance criteria of 75–125%, except for antimony and iron, which were both high. No data qualifiers were applied for antimony because of the high recovery because the antimony recovery was within acceptance criteria in the matrix spike sample. Iron was not spiked in the matrix spike sample, therefore the results for iron were qualified as estimated and biased high (J+), as presented in Table C-5.1-1. The matrix spike recovery for manganese was low (73.9% compared to the lower limit of 75%). No data qualifiers were applied to manganese because the concentration of manganese in the native sample was greater than four times the concentration of matrix spike added during the digestion. When the native sample concentration is that much greater than the spike added, spike recoveries may not be accurate. Further, the LCS recovery for manganese (102.5%) indicates that the digestion and analysis were in control.

Table C-5.1-1
Inorganic Chemical Data Quality Evaluation

Request Number	Location ID	Sample ID	Analyte	Explanation
5693R	21-11044 21-11044 21-11044 21-11044 21-11045 21-11045 21-11045	MD21-99-0051 MD21-99-0052 MD21-99-0053 MD21-99-0054 MD21-99-0055 MD21-99-0056 MD21-99-0057	Iron	The results for this analyte should be regarded as estimated and biased high (J+) because the recovery for iron in the LCS was high.
5693R	21-11044 21-11045 21-11045	MD21-99-0051 MD21-99-0055 MD21-99-0057	Antimony, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, magnesium, nickel, potassium, sodium, vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the reporting limit but above the IDL*.
5693R	21-11044	MD21-99-0052	Antimony, arsenic, beryllium, cobalt, selenium, sodium, thallium, vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the reporting limit but above the IDL.
5693R	21-11044 21-11044	MD21-99-0053 MD21-99-0054	Arsenic, barium, beryllium, calcium, chromium, cobalt, copper, magnesium, nickel, potassium, sodium, vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the reporting limit but above the IDL.
5693R	21-11045	MD21-99-0056	Antimony, arsenic, barium, beryllium, calcium, cobalt, copper, magnesium, nickel, potassium, selenium, sodium, vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the reporting limit but above the IDL.

Table C-5.1-1 (continued)

Request Number	Location ID	Sample ID	Analyte	Explanation
5700R	21-11045 21-11046 21-11046 21-11046 21-11046 21-11047 21-11047 21-11047 21-11047 21-11048 21-11048 21-11048 21-11048 21-11045 21-11046	MD21-99-0058 MD21-99-0059 MD21-99-0060 MD21-99-0061 MD21-99-0062 MD21-99-0063 MD21-99-0064 MD21-99-0065 MD21-99-0066 MD21-99-0067 MD21-99-0068 MD21-99-0069 MD21-99-0070 MD21-99-0071 MD21-99-0072	Iron	The results for this analyte should be regarded as estimated and biased high (J+) because the recovery LCS control sample was high.
5700R	21-11045 21-11046 21-11048	MD21-99-0058 MD21-99-0060 MD21-99-0069	Antimony, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, magnesium, nickel, potassium, sodium, vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the reporting limit but above the IDL.
5700R	21-11046 21-11046 21-11047 21-11047 21-11047 21-11048 21-11048 21-11048 21-11045 21-11046	MD21-99-0059 MD21-99-0062 MD21-99-0063 MD21-99-0064 MD21-99-0065 MD21-99-0067 MD21-99-0068 MD21-99-0070 MD21-99-0071 MD21-99-0072	Antimony, arsenic, barium, beryllium, calcium, cobalt, copper, magnesium, nickel, potassium, sodium, vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the reporting limit but above the IDL.
5700R	21-11046	MD21-99-0061	Arsenic, beryllium, calcium, cobalt, copper, magnesium, nickel, potassium, sodium, vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the reporting limit but above the IDL.
5700R	21-11047	MD21-99-0066	Arsenic, barium, beryllium, calcium, cobalt, copper, magnesium, nickel, potassium, sodium, vanadium	The results for these analytes should be regarded as estimated (J) because the results were less than the reporting limit but above the IDL.

* IDL = instrument detection limit.

For request number 5700, Paragon Analytics analyzed 15 borehole samples (including one field duplicate sample MD21-99-0059) for EPA TAL metals and nitrate.

- *Nitrate.* The method blank result for nitrate was below the reporting limit. The LCS result was within acceptance criteria of 75–125%. All initial and continuing calibration blanks were below the reporting limit for nitrate. All initial and continuing calibration verifications for this request met acceptance criteria. No data qualifications were necessary.
- *TAL Metals.* The method blank results were below detection limits for all analytes. The recoveries for the LCS met acceptance criteria of 75–125% except for antimony and iron, which were both high. No data qualifiers were applied for antimony because of the high recovery because the antimony recovery was within acceptance criteria in the matrix spike sample. Iron was not spiked in the matrix spike sample; therefore, the results for iron were qualified as estimated and biased

high (J+), as presented in Table C-5.1-1. The matrix spike recovery for manganese was low (72% compared to the lower limit of 75%). No data qualifiers were applied to manganese because the concentration of manganese in the native sample was greater than four times the concentration of matrix spike added during the digestion. When the native sample concentration is that much greater than the spike added, spike recoveries may not be accurate. Further, the LCS recovery for manganese (102.5%) indicates that the digestion and analysis were in control.

Table C-5.1-1 also presents the analytes that were qualified as estimated (J) because the results were less than the reporting limits but above the IDL. There were no data quality problems with the nitrate analyses by EPA Method 300.0.

The results for the field duplicate are presented in Table C-5.1-2. Sample MD21-99-0059 was split for a field duplicate, MD21-99-0072. All RPDs met acceptance criteria of less than 35%, except antimony. The RPD for antimony between the sample and the field duplicate is high because both results are detected just above the IDL. The RPD was not calculated on the reporting limits when both results were nondetected. The agreement between the sample and the field duplicate shows acceptable sampling and analytical precision.

Table C-5.1-2
Inorganic Chemical Field Duplicate RPDs

Analyte	Comments	RPD (%)
Aluminum	—[a]	21
Antimony	Both results below the reporting limit	61
Arsenic	Both results below the reporting limit	7
Barium	Both results below the reporting limit	10
Beryllium	—	7
Cadmium	Both results nondetected	n/a[b]
Calcium	Both results below the reporting limit	18
Chromium	—	4
Cobalt	Both results below the reporting limit	5
Copper	Both results below the reporting limit	5
Iron	—	2
Lead	—	5
Magnesium	Both results below the reporting limit	11
Manganese	—	6
Mercury	Both results nondetected	n/a
Nickel	Both results below the reporting limit	2
Nitrate	Both results nondetected	n/a
Potassium	Both results below the reporting limit	14
Selenium	Both results nondetected	n/a
Silver	Both results nondetected	n/a
Sodium	—	5
Thallium	Both results nondetected	n/a
Vanadium	Both results below the reporting limit	7
Zinc	—	5

[a] A dash indicates that both results are above the reporting limit.

[b] n/a = not applicable.

C-5.2 Organic Chemical Data Review

For request number 5692, Quanterra analyzed seven borehole samples for PCBs, SVOCs, and VOCs.

- *PCBs.* The method blank was below the reporting limit for all target analytes. The initial and continuing calibration verifications passed acceptance criteria. The surrogate recoveries all passed acceptance criteria. The retention time window criteria and breakdown criteria were within the specified ranges.
- *SVOCs.* The method blank results were below the reporting limits for all analytes. The initial and continuing calibration verifications met acceptance criteria. All internal standard recoveries were within specified ranges except two internal standards in sample MD21-99-0055. Because the surrogate recoveries were within the specified ranges, no data qualifiers were necessary. All surrogate recoveries met acceptance criteria except for two samples. The qualifiers resulting from these surrogate failures (reporting limits estimated and biased low UJ-) are shown in Table C-5.2-1.
- *VOCs.* Except for acetone, the method blank results were all below reporting limits. Acetone was therefore qualified as nondetected in one sample, as shown in Table C-5.2-1. The initial and continuing calibrations passed acceptance criteria. The internal standards were within the specified ranges for all samples. The surrogate recoveries all passed except for dibromofluoromethane in sample MD21-99-0053. The dibromofluoromethane surrogate recovery in this sample was high. No data qualifications were necessary because of this high surrogate recovery because nothing was detected in this sample.

Table C-5.2-1
Organic Chemical Data Quality Evaluation

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5692R	21-11044 21-11045	MD21-99-0051 MD21-99-0057	SVOCs	All target analytes	The reporting limits for these analytes should be regarded as estimated and biased low (UJ-) because the surrogate recoveries associated with these analytes were low.
5692R	21-11044	MD21-99-0053	VOCs	Acetone	The result for this analyte should be regarded as nondetected (U) because this analyte was reported less than the EQL, and the result was less than 10 times the concentration of the analyte in the method blank.
5699R	21-11045 21-11046 21-11046 21-11048 21-11045	MD21-99-0058 MD21-99-0060 MD21-99-0062 MD21-99-0068 MD21-99-0071	SVOCs	Bis(2-ethylhexyl)phthalate	The result for this analyte should be regarded as non-detected (U; the result was less than 10 times the concentration of the analyte in the method blank.

Table C-5.2-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5699R	21-11045 21-11046 21-11046 21-11046 21-11047 21-11047 21-11046	MD21-99-0058 MD21-99-0059 MD21-99-0060 MD21-99-0061 MD21-99-0064 MD21-99-0065 MD21-99-0072	SVOCs	Diethylphthalate	The result for this analyte should be regarded as nondetected (U); the result was less than 5 times the concentration of the analyte in the method blank.
5699R	21-11046	MD21-99-0059	SVOCs	All target analytes	The results for these analytes should be regarded as rejected (R) because of serious deficiencies with the internal standard and surrogate recoveries.
5699R	21-11047	MD21-99-0066	SVOCs	Benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, dibenz(a,h)anthracene, di-n-octylphthalate, indeno(1,2,3-cd)pyrene	The reporting limits for these analytes should be regarded as estimated (UJ) because the internal standard (perylene-d12) associated with these analytes was low.
5699R	21-11048	MD21-99-0069	SVOCs	Benzoic acid, bis(2-chloroethoxy)methane, 4-chloroaniline, 4-chloro-3-methylphenol, 2,4-dichlorophenol, 2,4-dimethylphenol, hexachlorobutadiene, isophorone, 2-methylnaphthalene, naphthalene, nitrobenzene, 2-nitrophenol, 1,2,4-trichlorobenzene	The reporting limits for these analytes should be regarded as estimated (UJ) because the internal standard (naphthalene-d8) associated with these analytes was low.
5699R	21-11048	MD21-99-0069	SVOCs	Acenaphthene, acenaphthylene, chloronaphthalene[2-], chlorophenyl-phenyl[4-]ether, dibenzofuran, diethylphthalate, dimethyl phthalate, dinitrophenol[2,4-], dinitrotoluene[2,4-], dinitrotoluene[2,6-], fluorene, hexachlorocyclopentadiene, nitroaniline[2-], nitroaniline[3-], nitroaniline[4-], nitrophenol[4-], trichlorophenol[2,4,6-], trichlorophenol[2,4,5-],	The reporting limits for these analytes should be regarded as estimated (UJ) because the internal standard (acenaphthalene-d10) associated with these analytes was low.

Table C-5.2-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5699R	21-11048	MD21-99-0069	SVOCs	Anthracene, bromophenyl-phenylether[4-], di-n-butylphthalate, dinitro-2-methylphenol[4,6-], fluoranthene, hexachlorobenzene, nitrosodimethylamine[n-], pentachlorophenol, phenanthrene	The reporting limits for these analytes should be regarded as estimated (UJ) because the internal standard (phenanthrene-d10) associated with these analytes was low.
5699R	21-11045 21-11047 21-11048 21-11048 21-11045	MD21-99-0058 MD21-99-0066 MD21-99-0068 MD21-99-0070 MD21-99-0071	PCBs	All target congeners	The reporting limits for these analytes should be regarded as estimated and biased low (UJ-) because the surrogate recoveries associated with these analytes were low.
5708R	21-11045 21-11046 21-11046 21-11046 21-11046 21-11047 21-11047 21-11047 21-11047 21-11048 21-11048 21-11048 21-11045 21-11046	MD21-99-0058 MD21-99-0059 MD21-99-0060 MD21-99-0061 MD21-99-0062 MD21-99-0063 MD21-99-0064 MD21-99-0065 MD21-99-0066 MD21-99-0067 MD21-99-0069 MD21-99-0070 MD21-99-0071 MD21-99-0072	VOCs	Acetone	The results for this analyte should be regarded as nondetected (U) because this analyte was reported less than the EQL, and the result was less than 10 times the concentration of the analyte in the method blank.
5708R	21-11045 21-11046 21-11046	MD21-99-0058 MD21-99-0059 MD21-99-0060	VOCs	1,2-Dichlorobenzene	The results for this analyte should be regarded as nondetected (U) because this analyte was reported less than the EQL, and the result was less than 5 times the concentration of the analyte in the method blank.
5708R	21-11047	MD21-99-0064	VOCs	1,2,4-Trimethylbenzene	The result for this analyte should be regarded as nondetected (U) because this analyte was reported less than the EQL, and the result was less than 5 times the concentration of the analyte in the method blank.
5708R	21-11047	MD21-99-0065	VOCs	Benzene	The result for this analyte should be regarded as estimated (J) because the result was less than the reporting limit but greater than the method detection limit.

Table C-5.2-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5708R	21-11046	MD21-99-0059	VOCs	Trichloroethene	The result for this analyte should be regarded as estimated and biased high (J+) because the recovery for the associated surrogate was high.
5708R	21-11046	MD21-99-0060	VOCs	Toluene	The result for this analyte should be regarded as estimated and biased high (J+) because the recovery for the associated surrogate was high.

For request number 5699, 15 borehole samples were analyzed by Quanterra for PCBs and SVOCs. One of the samples, MD21-99-0072, was a field duplicate sample of sample MD21-99-0059.

- *PCBs.* The method blank results were below the reporting limits for all PCB congeners. The initial and continuing calibration verifications met acceptance criteria. Five samples had low surrogate recoveries. The data qualifiers applied to these samples (reporting limits estimated and biased low UJ-) are shown in Table C-5.2-1. The retention time window criteria and analyte breakdown criteria met acceptance criteria. The samples were extracted and analyzed within the method-required holding times. The results for both the sample and its field duplicate were all nondetects.
- *SVOCs.* The method blank was free of target analyte contamination except for bis(2-ethylhexyl)phthalate and diethylphthalate. Because of this laboratory contamination, the detections of bis(2-ethylhexyl)phthalate in five samples were qualified as nondetected, as shown in Table C-5.2-1. Seven sample results for diethylphthalate were also qualified as nondetected because of method blank contamination, as shown in Table C-5.2-1. The initial and continuing calibration verifications were within specified limits. Internal standard problems are listed below. Surrogate recoveries met acceptance criteria except for sample MD21-99-0059, which is discussed below. The samples were extracted and analyzed within the method-required holding times.
    - Semivolatile sample results for sample MD21-99-0059 were all nondetected. This sample was analyzed three times because of internal standard and surrogate recoveries that were well outside of specified QA ranges. The semivolatile results for this sample should be regarded as rejected (R) because of the serious deficiencies with the internal standard recoveries. Sample MD21-99-0072 is usable without qualification and will be used to replace the rejected results in the original sample. The results for this sample were all also nondetected for target analytes.
    - For sample MD21-99-0066, all the surrogate recoveries met acceptance criteria, but one internal standard, perylene-d12, was low. The Laboratory baseline validation had rejected all target analytes for this semivolatile analysis. The focused validation changed this because the surrogate recoveries met acceptance criteria. Now only the analytes associated with the perylene-d12 from SW-846 EPA Method 8270 have been qualified as estimated (UJ), as shown in Table C-5.2-1.

- For sample MD21-99-0069, all the surrogate recoveries met acceptance criteria. Three internal standards, naphthalene-d8, acenaphthene-d10, and phenanthrene-d10, were outside of acceptance criteria. The Laboratory baseline validation had rejected all target analytes for this semivolatile analysis. The focused validation changed this because the surrogate recoveries met acceptance criteria. Now only the analytes associated with the three low internal standards from SW-846 EPA Method 8270 have been qualified as estimated (UJ), as shown in Table C-5.2-1.

For request number 5708, Kemron Environmental Services analyzed 15 borehole samples.

- Acetone, 1,2-dichlorobenzene, and 1,2,4-trimethylbenzene were detected in the method blank. When detected, these target analytes have been qualified as nondetected, as shown in Table C-5.2-1. The initial and continuing calibration verifications met acceptance criteria. All internal standard recoveries were within specified ranges. Two results qualified as estimated and biased high (J+) because of high surrogate recoveries are presented in Table C-5.2-1. The holding time for all samples was met. The results for the sample (MD21-99-0059) and its field duplicate (MD21-99-0072) were all nondetects except for trichloroethene in sample MD21-99-0059, indicating acceptable method precision.

C-5.3 Radionuclide Data Review

Radionuclides qualified as nondetected (U) because the results were less than the minimum detectable activity and those qualified because the result was less than three times the 1-sigma TPU are summarized in Table C-5.3-1. These radionuclides are not repeated in the text below.

For request number 5694, seven borehole samples were analyzed by Paragon Analytics for gross alpha, beta, and gamma radiation; gamma-emitting radionuclides; and isotopic uranium.

- The method blank results were nondetects for both gross alpha and gross beta. The blank spike results and matrix spike results have an acceptance range of 75–125%. The blank spike recoveries for gross alpha and gross beta were 108% and 95% respectively, both within the acceptable range. The matrix spike recoveries also met acceptance criteria at 104% for gross alpha radiation and 100% for gross beta radiation. No data qualifiers were required for these results.
- For gross gamma radiation, the samples were prepared and analyzed using Paragon Analytics SOP 739R2. The gross gamma result for the method blank was nondetected. The LCS acceptance range is 75–125%. The LCS gross gamma recovery met acceptance criteria at 91%.
- For isotopic uranium, the samples were prepared using Paragon Analytics SOP 778R3. The samples were analyzed using chemical separation followed by alpha spectrometry according to Paragon Analytics SOP 714R4. The method blank results were below the minimum detectable concentrations for all three uranium isotopes (uranium-234, uranium-235, and uranium-238). The uranium-232 tracer yields met the control limits of 30–110% for all samples. The LCS control limits are 75–125%. The two LCS analytes spiked in the LCS met acceptance criteria. The LCS recovery for uranium-234 was 108%, and for uranium-238, it was 104%.
- For gamma-emitting radionuclides, the samples were prepared using Paragon Analytics SOP 739R2 and analyzed by Paragon Analytics SOP 713R4. The method blank results were all below the detection limits. The laboratory control limits are the known value 75–125%. The five LCS spiked analytes cobalt-57 (91% recovery), cobalt-60 (93%), cadmium-109 (95%), cesium-137 (99%), and americium-241 (89%) all met these criteria. Any radionuclide results rejected because of spectral interference are shown in Table C-5.3-1.

Table C-5.3-1
Radionuclide Data Quality Evaluation

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5694R	21-11044	MD21-99-0051	Gamma spectroscopy	Barium-140, cadmium-109, protactinium-231, selenium-75	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5694R	21-11044	MD21-99-0051	Gamma spectroscopy	Americium-241, annihilation radiation, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-233, protactinium-234m, radium-223, radium-224, radon-219, ruthenium-106, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5694R	21-11044	MD21-99-0052	Gamma spectroscopy	Americium-241, lead-211, protactinium-231, radium-226, radon-219, selenium-75, thallium-208, tin-113	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5694R	21-11044	MD21-99-0052	Gamma spectroscopy	Annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, manganese-54, mercury-203, neptunium-237, protactinium-233, protactinium-234m, radium-223, radium-224, ruthenium-106, sodium-22, strontium-85, thorium-227, thorium-234, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5694R	21-11044	MD21-99-0053	Gamma spectroscopy	Cadmium-109, cobalt-60, protactinium-231, protactinium-234m, radium-226, thallium-208	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5694R	21-11044	MD21-99-0053	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-233, radium-223, radium-224, radon-219, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5694R	21-11044	MD21-99-0054	Gamma spectroscopy	Cadmium-109, thallium-208	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5694R	21-11044	MD21-99-0054	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-231, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5694R	21-11045	MD21-99-0055	Gamma spectroscopy	Annihilation radiation	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5694R	21-11045	MD21-99-0055	Gamma spectroscopy	Americium-241, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-231, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5694R	21-11045	MD21-99-0056	Gamma spectroscopy	Barium-140, bismuth-212, cadmium-109, neptunium-237	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5694R	21-11045	MD21-99-0056	Gamma spectroscopy	Americium-241, annihilation radiation, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, manganese-54, mercury-203, protactinium-231, protactinium-233, protactinium-234m, radium-223, radium-224, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5694R	21-11045	MD21-99-0057	Gamma spectroscopy	Protactinium-231, protactinium-234m, radium-226	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5694R	21-11045	MD21-99-0057	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54 mercury-203, protactinium-233, radium-223, radium-224, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5694R	21-11044	MD21-99-0051	Gamma spectroscopy	Bismuth-211, bismuth-214, radium-226, uranium-235	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5694R	21-11044	MD21-99-0052	Gamma spectroscopy	Bismuth-211, cadmium-109, uranium-235	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5694R	21-11044	MD21-99-0053	Gamma spectroscopy	Actinium-228, bismuth-211, bismuth-214, ruthenium-106, yttrium-88	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5694R	21-11044	MD21-99-0054	Gamma spectroscopy	Actinium-228, bismuth-211, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5694R	21-11045	MD21-99-0055	Gamma spectroscopy	Bismuth-211, bismuth-214, cadmium-109, lead-214, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5694R	21-11045	MD21-99-0056	Gamma spectroscopy	Bismuth-211, bismuth-214, lead-211, radium-226, uranium-235	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5694R	21-11045	MD21-99-0057	Gamma spectroscopy	Bismuth-211, bismuth-214, cadmium-109, neptunium-237	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5694R	21-11044 21-11044	MD21-99-0051 MD21-99-0052	Isotopic uranium	Uranium-235	The results for this analyte should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5694R	21-11044 21-11045 21-11045	MD21-99-0054 MD21-99-0056 MD21-99-0057	Isotopic uranium	Uranium-235	The results for this analyte should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5701R	21-11045	MD21-99-0058	Gamma spectroscopy	Annihilation radiation, barium-140, cerium-139, cobalt-60, protactinium-231, tin-113	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11046	MD21-99-0059	Gamma spectroscopy	Annihilation radiation, mercury-203, neptunium-237, radium-226, sodium-22	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11046	MD21-99-0060	Gamma spectroscopy	Actinium-228, bismuth-211, cadmium-109, lanthanum-140, thallium-208	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11046	MD21-99-0061	Gamma spectroscopy	Actinium-228, protactinium-231, radium-224, sodium-22, tin-113, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11046	MD21-99-0062	Gamma spectroscopy	Cadmium-109, cobalt-60, protactinium-231	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11047	MD21-99-0063	Gamma spectroscopy	Annihilation radiation, cesium-137	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11047	MD21-99-0064	Gamma spectroscopy	Annihilation radiation, bismuth-211, cobalt-60, manganese-54	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11047	MD21-99-0065	Gamma spectroscopy	Annihilation radiation, cadmium-109, lanthanum-140, neptunium-237, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11047	MD21-99-0066	Gamma spectroscopy	Cobalt-57, protactinium-231	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11048	MD21-99-0067	Gamma spectroscopy	Annihilation radiation, cadmium-109, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11048	MD21-99-0068	Gamma spectroscopy	Americium-241, protactinium-231, protactinium-233, selenium-75	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5701R	21-11048	MD21-99-0069	Gamma spectroscopy	Radium-226, strontium-85	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11048	MD21-99-0070	Gamma spectroscopy	Cadmium-109, ruthenium-106	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11045	MD21-99-0071	Gamma spectroscopy	Mercury-203, radium-226	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11046	MD21-99-0072	Gamma spectroscopy	Annihilation radiation, cadmium-109, cesium-134	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11045	MD21-99-0058	Gamma spectroscopy	Americium-241, bismuth-212, cadmium-109, cerium-144, cesium-134, cesium-137, cobalt-57, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, sodium-22. strontium-85, thorium-227, thorium-234, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11046	MD21-99-0059	Gamma spectroscopy	Americium-241, barium-140, bismuth-212, cadmium-109, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, protactinium-231, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5701R	21-11046	MD21-99-0060	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11046	MD21-99-0061	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, cadmium-109, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, strontium-85, thorium-227, thorium-234, yttrium-88	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11046	MD21-99-0062	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11047	MD21-99-0063	Gamma spectroscopy	Americium-241, barium-140, bismuth-212, cadmium-109, cerium-139, cerium-144, cesium-134, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-231, protactinium-233, protactinium-234m, radium-223, radium-224, radium-226, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5701R	21-11047	MD21-99-0064	Gamma spectroscopy	Americium-241, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, europium-152, lanthanum-140, lead-211, mercury-203, neptunium-237, protactinium-231, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11047	MD21-99-0065	Gamma spectroscopy	Americium-241, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lead-211, manganese-54, mercury-203, protactinium-233, protactinium-234m, radium-223, radium-224, radon-219, ruthenium-106, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, yttrium-88	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11047	MD21-99-0066	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11048	MD21-99-0067	Gamma spectroscopy	Americium-241, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-231, protactinium-233, protactinium-234m, radium-223, radium-226, radon-219, ruthenium-106, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5701R	21-11048	MD21-99-0068	Gamma spectroscopy	Annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-234m, radium-223, radon-219, ruthenium-106, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11048	MD21-99-0069	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cadmium-109, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-231, protactinium-233, protactinium-234m, radium-223, radium-224, radon-219, ruthenium-106, selenium-75, sodium-22, thorium-227, thorium-234, tin-113, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11048	MD21-99-0070	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-231, protactinium-233, protactinium-234m, radium-223, radon-219, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11045	MD21-99-0071	Gamma spectroscopy	Americium-241, annihilation radiation, barium-140, bismuth-212, cadmium-109, cerium-139, cerium-144, cesium-134, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, neptunium-237, protactinium-231, protactinium-233, protactinium-234m, radium-223, radium-224, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5701R	21-11046	MD21-99-0072	Gamma spectroscopy	Americium-241, barium-140, bismuth-212, cerium-139, cerium-144, cesium-137, cobalt-57, cobalt-60, europium-152, lanthanum-140, lead-211, manganese-54, mercury-203, neptunium-237, protactinium-233, protactinium-234m, radium-223, radon-219, ruthenium-106, selenium-75, sodium-22, strontium-85, thorium-227, thorium-234, tin-113, uranium-235, yttrium-88, zinc-65	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5701R	21-11045	MD21-99-0058	Gamma spectroscopy	Actinium-228, bismuth-211, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11046	MD21-99-0059	Gamma spectroscopy	Bismuth-211, radium-224	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11046	MD21-99-0060	Gamma spectroscopy	Protactinium-231, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11046	MD21-99-0061	Gamma spectroscopy	Bismuth-211, bismuth-212, bismuth-214, radium-226, uranium-235	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11046	MD21-99-0062	Gamma spectroscopy	Actinium-228, bismuth-211, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11047 21-11045	MD21-99-0063 MD21-99-0071	Gamma spectroscopy	Bismuth-211	The results for this analyte should be regarded as rejected (R) because of spectral interference.
5701R	21-11047	MD21-99-0064	Gamma spectroscopy	Actinium-228, bismuth-214, cadmium-109, radium-224, radium-226, uranium-235	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11047	MD21-99-0065	Gamma spectroscopy	Actinium-228, bismuth-211, protactinium-231, radium-226, selenium-75, uranium-235	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11047	MD21-99-0066	Gamma spectroscopy	Bismuth-211, cadmium-109, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11048	MD21-99-0067	Gamma spectroscopy	Bismuth-211, radium-224, selenium-75	The results for these analytes should be regarded as rejected (R) because of spectral interference.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5701R	21-11048	MD21-99-0068	Gamma spectroscopy	Actinium-228, bismuth-211, bismuth-214, cadmium-109, cesium-134, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11048	MD21-99-0069	Gamma spectroscopy	Bismuth-211, uranium-235	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11048	MD21-99-0070	Gamma spectroscopy	Bismuth-211, bismuth-214, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11046	MD21-99-0072	Gamma spectroscopy	Actinium-228, bismuth-211, lead-214, protactinium-231, radium-224, radium-226	The results for these analytes should be regarded as rejected (R) because of spectral interference.
5701R	21-11047 21-11045	MD21-99-0065 MD21-99-0071	Isotopic uranium	Uranium-235	The results for this analyte should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty.
5701R	21-11045 21-11046 21-11046 21-11046 21-11047 21-11047 21-11047 21-11048 21-11048 21-11048 21-11048	MD21-99-0058 MD21-99-0059 MD21-99-0061 MD21-99-0062 MD21-99-0063 MD21-99-0064 MD21-99-0066 MD21-99-0067 MD21-99-0068 MD21-99-0069 MD21-99-0070	Isotopic uranium	Uranium-235	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity.
5711R	21-11044 21-11044 21-11044 21-11044 21-11045 21-11045 21-11045 21-11045 21-11046 21-11046 21-11046 21-11046 21-11047 21-11047 21-11047 21-11048 21-11048 21-11048 21-11045 21-11046	MD21-99-0143 MD21-99-0144 MD21-99-0145 MD21-99-0146 MD21-99-0147 MD21-99-0148 MD21-99-0149 MD21-99-0150 MD21-99-0151 MD21-99-0152 MD21-99-0153 MD21-99-0154 MD21-99-0155 MD21-99-0156 MD21-99-0158 MD21-99-0159 MD21-99-0161 MD21-99-0162 MD21-99-0163 MD21-99-0164	Isotopic plutonium	Plutonium238, plutonium-239	The results for these analytes should be regarded as nondetected (U) because the results were less than three times the 1-sigma uncertainty. The results for these analytes should be regarded as estimated (UJ) because the tracer recovery was low, between 10–30%.

Table C-5.3-1 (continued)

Request Number	Location ID	Sample ID	Analytical Suite	Analyte	Explanation
5711R	21-11048	MD21-99-0160	Isotopic plutonium	Plutonium238, plutonium-239	The results for these analytes should be regarded as nondetected (U) because the results were below the minimum detectable activity. The results for these analytes should be regarded as estimated (UJ) because the tracer recovery was low, between 10–30%.
5711R	21-11047	MD21-99-0157	Isotopic plutonium	Plutonium238, plutonium-239	The results for these analytes should be regarded as rejected (R) because the tracer recovery was low, less than 10%.

For request number 5701, 15 borehole samples were analyzed by Paragon Analytics for gross alpha, beta, and gamma radiation; gamma-emitting radionuclides; and isotopic uranium. Sample MD21-99-0072 was a field duplicate of sample MD21-99-0059.

- For gross alpha and beta radiation, the samples were prepared using Paragon Analytics SOP 702R12 and analyzed using Paragon Analytics SOP 724R5. The method blank results were nondetects for both gross alpha and gross beta. The blank spike results and matrix spike results have an acceptance range of 75–125%. The blank spike recoveries for gross alpha and gross beta were 114% and 103% respectively, both within the acceptable range. The matrix spike recoveries also met acceptance criteria at 110% for gross alpha radiation and 102% for gross beta radiation. No data qualifiers were required for these results.

- For gross gamma radiation, the sample were prepared and analyzed using Paragon Analytics SOP 739R2. The gross gamma result for the method blank was nondetected. The LCS acceptance range is 75–125%. The LCS gross gamma recovery met acceptance criteria at 86%.

- For isotopic uranium, the samples were prepared using Paragon Analytics SOP 778R3. The samples were analyzed using chemical separation followed by alpha spectrometry according to Paragon Analytics SOP 714R4. The method blank results were below the minimum detectable concentrations for all three uranium isotopes (uranium-234, uranium-235, and uranium-238). The uranium-232 tracer yields met the control limits of 30–110% for all samples. The LCS control limits are 75–125%. The two LCS analytes spiked in the LCS met acceptance criteria. The LCS recovery for uranium-234 was 99%, and for uranium-238, it was 101%.

- For gamma-emitting radionuclides, the samples were prepared using Paragon Analytics SOP 739R2 and analyzed by Paragon Analytics SOP 713R4. The method blank results were all below the detection limits for all analytes. The laboratory control limits are the known value ±25%. The five LCS spiked analytes cobalt-57 (92% recovery), cobalt-60 (96%), cadmium-109 (97%), cesium-137 (102%), and americium-241 (92%) all met these criteria. Any radionuclide results rejected because of spectral interference are shown in Table C-5.3-1.

For request number 5711, Quanterra analyzed 22 borehole samples for isotopic plutonium by chemical separation followed by alpha spectroscopy. These samples have different sample identification numbers

(MD21-99-0143 through MD21-99-1064) than the radionuclide samples in request number 5701 because they were sent to a different contract analytical laboratory at a later date than the original samples. These are, however, the same samples as in the original request (MD21-99-0058 through MD21-99-0072). Sample MD21-99-0164 is the field duplicate of sample MD21-99-0151.

- The method blank results were below detection limits for the plutonium isotopes. The tracer-recovery control limit is required to be between 30–110%. Radionuclide results are adjusted using the tracer recoveries. Analytes associated with tracer recoveries between 10–30% are qualified as estimated. Plutonium isotopes qualified because of low tracer recoveries are presented in Table C-5.3-1. The plutonium results for sample MD21-99-0157 were rejected (R) because the tracer recovery was less than 10%.

Table C-5.3-2 shows the RPDs between the sample MD21-99-0164 and the field duplicate MD21-99-0151. Analytes that were not detected in either the sample or the duplicate were excluded. Gamma spectroscopy analytes rejected because of spectral interference in both samples are also excluded. All RPDs are within the control limits of 35%, except gross gamma radiation. The 66% RPD between the sample and the field duplicate is most likely attributed to both gross gamma results being detects below the reporting limit. These results near the IDL have greater variability. For isotopic plutonium the sample and field duplicate pair are MD21-99-0151 and MD21-99-0164. No plutonium isotopes were detected in either sample.

Table C-5.3-2
Radionuclide and Radiation Field Duplicate RPDs

Sample ID	Analytical Suite	Analyte Code	RPD (%)
MD21-99-0059	Gamma spectroscopy	Actinium-228	33
MD21-99-0059	Gamma spectroscopy	Bismuth-214	35
MD21-99-0059	Gamma spectroscopy	Lead-212	16
MD21-99-0059	Gamma spectroscopy	Lead-214	30
MD21-99-0059	Gamma spectroscopy	Potassium-40	10
MD21-99-0059	Gamma spectroscopy	Thallium-208	21
MD21-99-0059	Gross alpha radiation	Gross alpha radiation	15
MD21-99-0059	Gross beta radiation	Gross beta radiation	20
MD21-99-0059	Gross gamma radiation	Gross gamma radiation	66
MD21-99-0059	Isotopic uranium	Uranium-234	1
MD21-99-0059	Isotopic uranium	Uranium-238	0

APPENDIX C REFERENCES

EPA (US Environmental Protection Agency), February 1994. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," EPA-540/R-94-013, Office of Solid Waste and Emergency Response, Washington, DC. (EPA 1994, 48639)

LANL (Los Alamos National Laboratory), July 1995. "Statement of Work – Analytical Support," Revision 2, RFP No. 9-XS1-Q4257, Los Alamos, New Mexico. (LANL 1995, 49738)

LANL (Los Alamos National Laboratory), March 1996. "Quality Assurance Project Plan Requirements for Sampling and Analysis," Los Alamos National Laboratory report LA-UR-96-441, Los Alamos, New Mexico. (LANL 1996, 54609)

Ryti, R., and P. Longmire, September 22, 1998. "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory report LA-UR-98-4847, Los Alamos, New Mexico. (Ryti and Longmire 1998, 59730)

Appendix D

Analytical Suites and Results

APPENDIX D ANALYTICAL SUITES AND RESULTS

D-1.0 TARGET ANALYTES AND DETECTION LIMITS

Tables D-1.0-1 through D-1.0-4 include the maximum required reporting limits or quantitation limits in accordance with the Environmental Restoration Project analytical services statement of work for contract laboratories (LANL 1995, 49738.1) and the "Quality Assurance Project Plan Requirements for Sampling and Analysis" (LANL 1996, 54609). In most cases, the reporting limits for the analytes were significantly lower than the detection or quantitation limits reported in these tables. The sample-specific detection or quantitation limits for each analyte are accessible in the Facility for Information Management, Analysis, and Display database. In addition, summary tables presented throughout this report also include these limits as appropriate.

Table D-1.0-1
Target Analytes and Contract-Required Detection Limits for Inorganic Chemicals

Analyte	EPA[a] Sample Preparation Method	Analytical Technique	CRDL[b]
Aluminum	3050A	EPA Method 6010B, ICPES[c]	40
Antimony	3050A	EPA Method 6010B, ICPES	12
Arsenic	3050A	EPA Method 6010B, ICPES	2
Barium	3050A	EPA Method 6010B, ICPES	40
Beryllium	3050A	EPA Method 6010B, ICPES	1
Cadmium	3050A	EPA Method 6010B, ICPES	1
Calcium	3050A	EPA Method 6010B, ICPES	1000
Chromium	3050A	EPA Method 6010B, ICPES	2
Cobalt	3050A	EPA Method 6010B, ICPES	10
Copper	3050A	EPA Method 6010B, ICPES	5
Iron	3050A	EPA Method 6010B, ICPES	20
Lead	3050A	EPA Method 6010B, ICPES	0.6
Magnesium	3050A	EPA Method 6010B, ICPES	1000
Manganese	3050A	EPA Method 6010B, ICPES	3
Mercury	7471	EPA Method 7471, CVAA[d]	0.1
Nickel	3050A	EPA Method 6010B, ICPES	8
Potassium	3050A	EPA Method 6010B, ICPES	1000
Selenium	3050A	EPA Method 6010B, ICPES	1
Silver	3050A	EPA Method 6010B, ICPES	2
Sodium	3050A	EPA Method 6010B, ICPES	1000
Thallium	3050A	EPA Method 6010B, ICPES	2
Vanadium	3050A	EPA Method 6010B, ICPES	10
Zinc	3050A	EPA Method 6010B, ICPES	4

[a] EPA = Environmental Protection Agency

[b] CRDL = contract-required detection limit.

[c] ICPES = inductively coupled plasma emission spectroscopy.

[d] CVAA = cold vapor atomic absorption.

Table D-1.0-2
Target Analytes and Maximum Required Quantitation Limits for Radionuclides

Analyte	Soils/Solids EQL[a] (pCi/g)	Analytical Technique[b]
Plutonium-238; -239, and -240	0.1	Alpha spectroscopy
Uranium-234, -235, and -238	0.1	Alpha spectroscopy
Gamma-emitting isotopes[c]	Americium-241: 1, cesium-137: 1, lead-210: 2, radium-226: 1, and thorium-234: 1	Gamma spectroscopy

[a] EQL = estimated quantitation limit.

[b] The Los Alamos National Laboratory (Laboratory) methods for these analytes are contained in Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance (LANL 1992, 31793).

[c] EQLs are not specified for the other gamma-emitting isotopes commonly analyzed; they are determined on a case-specific basis.

Table D-1.0-3
SVOC[a] Target Analytes and Maximum Required Quantitation Limits

Target Analyte	Soil/Solids EQL[b] (mg/kg)	Target Analyte	Soils/Solids EQL[b] (mg/kg)
Acenaphthene	330	4,6-Dinitro-2-methylphenol	1600
Acenaphthylene	330	2,4-Dinitrotoluene	330
Aniline	660	2,6-Dinitrotoluene	330
Anthracene	330	Di-n-octyl phthalate	330
Azobenzene	660	Bis(2-ethylhexyl)phthalate	330
Benz(a)anthracene	330	Fluoranthene	330
Benzoic acid	3300	Fluorene	330
Benzo(b)fluoranthene	330	Hexachlorobenzene	330
Benzo(k)fluoranthene	330	Hexachlorobutadiene	330
Benzo(g,h,i)perylene	330	Hexachlorocyclopentadiene	330
Benzo(a)pyrene	330	Hexachloroethane	330
Benzyl alcohol	1300	Indeno(1,2,3-cd)pyrene	330
Bis(2-chloroethoxy)methane	330	Isophorone	330
Bis(2-chloroethyl)ether	330	2-Methylnaphthalene	330
4-Bromophenyl phenylether	330	2-Methylphenol	330
Butylbenzylphthalate	330	4-Methylphenol	330
4-Chloroaniline	1300	Naphthalene	330
4-Chloro-3-methylphenol	660	2-Nitroaniline	1600
2-Chloronaphthalene	330	3-Nitroaniline	1600
2-Chlorophenol	330	4-Nitroaniline	660
4-Chlorophenyl phenylether	330	Nitrobenzene	330
Chrysene	330	2-Nitrophenol	330
Dibenz(a,h)anthracene	330	4-Nitrophenol	1600
Dibenzofuran	330	N-Nitrosodimethylamine	330
1,2-Dichlorobenzene	330	N-Nitrosodiphenylamine	330

Table D-1.0-3 (continued)

Target Analyte	Soil/Solids EQL[b] (mg/kg)	Target Analyte	Soils/Solids EQL[b] (mg/kg)
1,3-Dichlorobenzene	330	N-Nitroso-di-n-propylamine	330
1,4-Dichlorobenzene	330	2,2'-oxybis(1-Chloropropane)	330
3,3'-Dichlorobenzidine	660	Pentachlorophenol	1600
2,4-Dichlorophenol	330	Phenanthrene	330
Diethylphthalate	330	Phenol	330
Dimethyl phthalate	330	Pyrene	330
2,4-Dimethylphenol	330	1,2,4-Trichlorobenzene	330
2,4-Dinitrophenol	1600	2,4,5-Trichlorophenol	1600
Di-n-butylphthalate	330	2,4,6-Trichlorophenol	330

[a] SVOC = semivolatile organic compound.

[b] EQLs for the samples are not adjusted for dry weight. EQLs are based on no gel permeation chromatography (GPC) cleanup being performed. The contract laboratories' GPC equipment determines the sample-specific EQL based on the volume of extract the GPC equipment uses. However, the contract laboratories are requested, if possible, to report sample-specific EQLs of no more than twice the value listed in the table.

Table D-1.0-4
PCB[a] Target Analytes And Maximum Required Quantitation Limits

Analyte[b]	Soils/Solids EQL[c] (μg/kg)
Aroclor-1016	33
Aroclor-1221	66
Aroclor-1232	33
Aroclor-1242	33
Aroclor-1248	33
Aroclor-1254	33
Aroclor-1260	33

[a] PCB = polychlorinated biphenyl.

[b] All analyses were done by EPA contract laboratory program Method OLM01.8 or the equivalent EPA Method 8081. These methods are based on solvent extraction, concentration, and gas chromatography/electron capture detection and quantitation.

[c] EQLs for the samples are not adjusted for dry weight. EQLs are based on no GPC cleanup being performed. The contract laboratories' GPC equipment determines the sample-specific EQL based on the volume of extract the GPC equipment uses. However, the contract laboratories are requested, if possible, to report sample-specific EQLs of no more than twice the value listed in the table.

Efforts were made to ensure that detection limits for inorganic analytes were below Laboratory background values. For this investigation, all nondetected inorganic chemicals had reporting limits below the Laboratory background value for Bandelier Tuff Units Qbt 2,3,4. In some cases this was achieved by reporting values down to the instrument detection limit.

For this investigation, all samples were analyzed undiluted, and all CRDLs were met for semivolatile organic analytes. All polychlorinated biphenyl (PCB) analyses were run undiluted, and all required EQLs were achieved.

D-2.0 ANALYTE SUITES AND DATA SUMMARY

Table D-2.0-1 presents the analyte suites and request numbers (RNs) for each sample collected during this investigation. Each RN includes a batch of samples sent to a specific off-site contract analytical laboratory for a specific suite of analyses, and the RNs can be used to track the original data packages from the off-site contract analytical laboratories.

Table D-2.0-1
Summary of Data taken at Potential Release Site 21-005

Location ID	Sample ID	Sample Type	Depth (ft)	Media[a]	Gamma Spectroscopy	Gross Alpha and Gross Beta Radiation	Gross Gamma Radiation	Isotopic Plutonium	Isotopic Uranium	EPA Target Analyte List Metals	Nitrate as Nitrogen	PCBs	SVOCs	VOCs[a]
21-11044	MD21-99-0051	Grab	4.5–5	Qbt3	5694R	5694R	5694R	NA[b]	5694R	5693R	5693R	5692R	5692R	5692R
21-11044	MD21-99-0052	Grab	9.5–10	Qbt3	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11044	MD21-99-0053	Grab	14.5–15	Qbt3	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11044	MD21-99-0054	Grab	19.5–20	Qbt3	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11045	MD21-99-0055	Grab	2.5–3.5	Qbt3	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11045	MD21-99-0056	Grab	7–7.5	Qbt3	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11045	MD21-99-0057	Grab	7.5–10	Qbt3	5694R	5694R	5694R	NA	5694R	5693R	5693R	5692R	5692R	5692R
21-11045	MD21-99-0058	Grab	14.5–15	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0059	Grab	4–5	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0060	Grab	9.5–10	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0061	Grab	13.75–14.5	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0062	Grab	19.5–20	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11047	MD21-99-0063	Grab	4.5–5	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11047	MD21-99-0064	Grab	9.5–10	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11047	MD21-99-0065	Grab	14.5–15	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11047	MD21-99-0066	Grab	19.5–20	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11048	MD21-99-0067	Grab	4.5–5	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11048	MD21-99-0068	Grab	9.5–10	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11048	MD21-99-0069	Grab	14.5–15	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11048	MD21-99-0070	Grab	19.5–20	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11045	MD21-99-0071	Grab	19.5–20	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11046	MD21-99-0072	FD	4–5	Qbt3	5701R	5701R	5701R	NA	5701R	5700R	5700R	5699R	5699R	5708R
21-11044	MD21-99-0143	Grab	4.5–5	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11044	MD21-99-0144	Grab	9.5–10	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA

Table D-2.0-1 (continued)

Location ID	Sample ID	Sample Type	Depth (ft)	Media*	Gamma Spectroscopy	Gross Alpha and Gross Beta Radiation	Gross gamma radiation	Isotopic Plutonium	Isotopic Uranium	EPA Target Analyte List Metals	Nitrate as Nitrogen	PCBs	SVOCs	VOCs
21-11044	MD21-99-0145	Grab	14–15	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11044	MD21-99-0146	Grab	19.5–20	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0147	Grab	2.5–3.5	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0148	Grab	7–7.5	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0149	Grab	9.5–10	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0150	Grab	14.5–15	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0151	Grab	4–5	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0152	Grab	9.5–10	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0153	Grab	13.75–14.5	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0154	Grab	19.5–20	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11047	MD21-99-0155	Grab	4.5–5	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11047	MD21-99-0156	Grab	9.5–10	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11047	MD21-99-0157	Grab	14.5–15	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11047	MD21-99-0158	Grab	19.5–20	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11048	MD21-99-0159	Grab	4.5–5	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11048	MD21-99-0160	Grab	9.5–10	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11048	MD21-99-0161	Grab	14.5–15	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11048	MD21-99-0162	Grab	19.5–20	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11045	MD21-99-0163	Grab	19.5–20	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA
21-11046	MD21-99-0164	Grab	4–5	Qbt3	NA	NA	NA	5711R	NA	NA	NA	NA	NA	NA

[a] VOC = volatile organic compound.

[b] NA = not analyzed.

Tables D-2.0-2 through D-2.0-7 present analytical results for inorganic and organic chemicals and radionuclides.

Table D-2.0-2
Analytical Results for Inorganic Chemicals from Potential Release Site 21-005

Sample ID	Location ID	Depth (ft)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MD21-99-0051	21-11044	4.5–5	477	0.23 (J)	1.4 (J)	7.1 (J)	0.14 (J)	0.01 (U)	271 (J)	1.3 (J)	0.69 (J)	0.89 (J)	6120 (J+)	3
MD21-99-0052	21-11044	9.5–10	9660	0.38 (J)	2.3 (J)	66.1	1.1 (J)	0.01 (U)	1770	6.3	2.4 (J)	5.1	12000 (J+)	6.4
MD21-99-0053	21-11044	14.5–15	280	0.19 (U)	1.2 (J)	3 (J)	0.24 (J)	0.01 (U)	793 (J)	0.93 (J)	0.56 (J)	0.72 (J)	5430 (J+)	1.9
MD21-99-0054	21-11044	19.5–20	419	0.2 (U)	1.6 (J)	3.8 (J)	0.28 (J)	0.01 (U)	824 (J)	1.8 (J)	0.51 (J)	0.95 (J)	4700 (J+)	1.8
MD21-99-0055	21-11045	2.5–3.5	2820	0.53 (J)	1.7 (J)	23 (J)	0.32 (J)	0.01 (U)	752 (J)	2 (J)	0.82 (J)	0.94 (J)	7440 (J+)	3.6
MD21-99-0056	21-11045	7–7.5	1530	0.36 (J)	2.1 (J)	4.6 (J)	0.4 (J)	0.01 (U)	401 (J)	4.3	0.59 (J)	1.2 (J)	6480 (J+)	3.1
MD21-99-0057	21-11045	9.5–10	751	0.33 (J)	1.7 (J)	5.5 (J)	0.23 (J)	0.01 (U)	927 (J)	1.8 (J)	0.54 (J)	0.99 (J)	5860 (J+)	2.7
MD21-99-0058	21-11045	14.5–15	207	0.3 (J)	1.3 (J)	2.5 (J)	0.24 (J)	0.01 (U)	735 (J)	0.87 (J)	0.53 (J)	0.7 (J)	5110 (J+)	1.8
MD21-99-0059	21-11046	4–5	3350	0.45 (J)	1.5 (J)	22.7 (J)	0.44 (J)	0.01 (U)	681 (J)	2.9	1.9 (J)	2.1 (J)	7700 (J+)	4
MD21-99-0060	21-11046	9.5–10	835	0.23 (J)	1.6 (J)	4.9 (J)	0.18 (J)	0.01 (U)	892 (J)	1.9 (J)	0.52 (J)	2.4 (J)	6300 (J+)	3.3
MD21-99-0061	21-11046	13.75–14.5	6300	0.2 (U)	2.1 (J)	45.6	0.63 (J)	0.01 (U)	944 (J)	5.2	1.1 (J)	2.9 (J)	9450 (J+)	3.9
MD21-99-0062	21-11046	19.5–20	937	0.21(J)	1.9 (J)	4.8 (J)	0.3 (J)	0.01 (U)	733 (J)	5.1	0.57 (J)	0.94 (J)	4960 (J+)	1.6
MD21-99-0063	21-11047	4.5–5	1400	0.24 (J)	1.2 (J)	5.4 (J)	0.33 (J)	0.01 (U)	343 (J)	2.5	0.67 (J)	0.91 (J)	6580 (J+)	2.9
MD21-99-0064	21-11047	9.5–10	290	0.38 (J)	1.4 (J)	5.2 (J)	0.28 (J)	0.01 (U)	875 (J)	2.9	0.54 (J)	0.79 (J)	5450 (J+)	2.1
MD21-99-0065	21-11047	14.5–15	249	0.24(J)	1.5 (J)	3 (J)	0.32 (J)	0.01 (U)	874 (J)	9	0.66 (J)	0.99 (J)	5470 (J+)	1.5
MD21-99-0066	21-11047	19.5–20	197	0.19 (U)	1.5 (J)	3 (J)	0.3 (J)	0.01 (U)	765 (J)	8.4	0.56 (J)	0.89 (J)	4570 (J+)	1.4
MD21-99-0067	21-11048	4.5–5	2950	0.28 (J)	1.6 (J)	24.2 (J)	0.35 (J)	0.02 (U)	1010 (J)	3.7	1.8 (J)	3.1 (J)	13100 (J+)	5.4
MD21-99-0068	21-11048	9.5–10	315	0.22 (J)	1.1 (J)	5.3 (J)	0.18 (J)	0.01 (U)	237 (J)	5.5	0.54 (J)	0.79 (J)	5340 (J+)	1.8
MD21-99-0069	21-11048	14.5–15	304	0.32 (J)	1.2 (J)	2.9 (J)	0.28 (J)	0.01 (U)	722 (J)	1.6 (J)	0.56 (J)	0.68 (J)	5470 (J+)	1.9
MD21-99-0070	21-11048	19.5–20	725	0.33 (J)	1.9 (J)	4.3 (J)	0.26 (J)	0.01 (U)	797 (J)	7.8	0.6 (J)	1.3 (J)	5260 (J+)	1.8
MD21-99-0071	21-11045	19.5–20	620	0.27(J)	1.6 (J)	4.5 (J)	0.34 (J)	0.01 (U)	910 (J)	11.4	0.55 (J)	2.1 (J)	5200 (J+)	2.2
MD21-99-0072	21-11046	4–5	2710	0.24 (J)	1.4 (J)	20.5 (J)	0.41 (J)	0.01 (U)	568 (J)	2.8	1.8 (J)	2 (J)	7860 (J+)	4.2

Note: Geomorphic units are Qbt 2,3,4. Result units are mg/kg.

Table D-2.0-2 (continued)

Sample ID	Location ID	Depth (ft)	Magnesium	Manganese	Mercury	Nickel	Nitrate	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
MD21-99-0051	21-11044	4.5–5	123 (J)	145	0.01 (U)	1.5 (J)	2.3 (U)	125 (J)	0.12 (U)	0.03 (U)	68.6 (J)	0.12 (U)	2 (J)	23.5
MD21-99-0052	21-11044	9.5–10	1960	158	0.01 (U)	7.9	2.4 (U)	1380	0.31 (J)	0.03 (U)	184 (J)	0.34 (U)	11.4 (J)	24.1
MD21-99-0053	21-11044	14.5–15	129 (J)	225	0.01 (U)	0.99 (J)	2.1 (U)	128 (J)	0.12 (U)	0.03 (U)	89.8 (J)	0.12 (U)	1.2 (J)	20.7
MD21-99-0054	21-11044	19.5–20	171 (J)	176	0.01 (U)	1.6 (J)	2.2 (U)	167 (J)	0.12 (U)	0.03 (U)	135 (J)	0.12 (U)	1.3 (J)	24.4
MD21-99-0055	21-11045	2.5–3.5	421 (J)	113	0.01 (U)	1.8 (J)	2.3 (U)	292 (J)	0.13 (U)	0.03 (U)	116 (J)	0.13 (U)	3.8 (J)	15.3
MD21-99-0056	21-11045	7–7.5	393 (J)	152	0.01 (U)	3.9 (J)	2.2 (U)	223 (J)	0.24 (J)	0.03 (U)	63.5 (J)	0.12 (U)	3.2 (J)	18.6
MD21-99-0057	21-11045	9.5–10	217 (J)	176	0.01 (U)	2.3 (J)	2.2 (U)	160 (J)	0.12 (U)	0.03 (U)	88.5 (J)	0.12 (U)	1.7 (J)	23.1
MD21-99-0058	21-11045	14.5–15	127 (J)	219	0.01 (U)	1.2 (J)	2.2 (U)	109 (J)	0.12 (U)	0.03 (U)	78.3 (J)	0.12 (U)	1.2 (J)	21.8
MD21-99-0059	21-11046	4–5	493 (J)	208	0.01 (U)	4.1 (J)	2.4 (U)	328 (J)	0.13 (U)	0.03 (U)	66.6 (J)	0.13 (U)	4.4 (J)	39.2
MD21-99-0060	21-11046	9.5–10	246 (J)	155	0.01 (U)	1.7 (J)	2.3 (U)	153 (J)	0.13 (U)	0.03 (U)	65 (J)	0.13 (U)	2.4 (J)	21.5
MD21-99-0061	21-11046	13.75–14.5	944 (J)	205	0.01 (U)	4.8 (J)	2.3 (U)	826 (J)	0.12 (U)	0.03 (U)	417 (J)	0.12 (U)	6.6 (J)	25.8
MD21-99-0062	21-11046	19.5–20	208 (J)	187	0.01 (U)	3.2 (J)	2.2 (U)	182 (J)	0.12 (U)	0.03 (U)	86 (J)	0.12 (U)	1.7 (J)	25.5
MD21-99-0063	21-11047	4.5–5	258 (J)	169	0.01 (U)	2.6 (J)	2.2 (U)	189 (J)	0.12 (U)	0.03 (U)	53.1 (J)	0.12 (U)	2.9 (J)	22.7
MD21-99-0064	21-11047	9.5–10	168 (J)	207	0.01 (U)	2.2 (J)	2.2 (U)	143 (J)	0.12 (U)	0.03 (U)	84.3 (J)	0.12 (U)	1.4 (J)	23.9
MD21-99-0065	21-11047	14.5–15	127 (J)	226	0.01 (U)	5.2 (J)	2.1 (U)	125 (J)	0.12 (U)	0.03 (U)	80.1 (J)	0.12 (U)	1.4 (J)	22.8
MD21-99-0066	21-11047	19.5–20	114 (J)	187	0.01 (U)	4.3 (J)	2.1 (U)	137 (J)	0.12 (U)	0.03 (U)	91.4 (J)	0.12 (U)	1 (J)	25.2
MD21-99-0067	21-11048	4.5–5	604 (J)	177	0.01 (U)	3.7 (J)	2.3 (U)	402 (J)	0.25 (U)	0.03 (U)	128 (J)	0.25 (U)	7.4 (J)	27.4
MD21-99-0068	21-11048	9.5–10	118 (J)	193	0.01 (U)	3.9 (J)	2.2 (U)	110 (J)	0.12 (U)	0.03 (U)	60.9 (J)	0.12 (U)	1.5 (J)	22.3
MD21-99-0069	21-11048	14.5–15	125 (J)	233	0.01 (U)	1.7 (J)	2.2 (U)	118 (J)	0.12 (U)	0.03 (U)	75.8 (J)	0.12 (U)	1.3 (J)	22.1
MD21-99-0070	21-11048	19.5–20	188 (J)	197	0.01 (U)	5 (J)	2.2 (U)	148 (J)	0.12 (U)	0.03 (U)	60.1 (J)	0.12 (U)	1.6 (J)	25.8
MD21-99-0071	21-11045	19.5–20	211 (J)	215	0.01 (U)	2.7 (J)	2.2 (U)	148 (J)	0.12 (U)	0.03 (U)	55.9 (J)	0.12 (U)	1.4 (J)	26.9
MD21-99-0072	21-11046	4–5	443 (J)	220	0.01 (U)	4 (J)	2.4 (U)	285 (J)	0.13 (U)	0.03 (U)	63.3 (J)	0.13 (U)	4.1 (J)	41.4

Table D-2.0-3
Analytical Results for Semivolatile Organic Compounds from Potential Release Site 21-005

Sample ID	Location ID	Depth (ft)	Acenaphthene	Acenaphthylene	Aniline	Anthracene	Azobenzene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene
MD21-99-0051	21-11044	4.5–5	0.38 (UJ-)	0.38 (UJ-)	0.77 (UJ)	0.38 (UJ-)	0.77 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)
MD21-99-0052	21-11044	9.5–10	0.39 (U)	0.39 (U)	0.79 (U)	0.39 (U)	0.79 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)
MD21-99-0053	21-11044	14.5–15	0.35 (U)	0.35 (U)	0.71 (U)	0.35 (U)	0.71 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)
MD21-99-0054	21-11044	19.5–20	0.36 (U)	0.36 (U)	0.72 (U)	0.36 (U)	0.72 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0055	21-11045	2.5–3.5	0.38 (U)	0.38 (U)	0.76 (U)	0.38 (U)	0.76 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)
MD21-99-0056	21-11045	7–7.5	0.37 (U)	0.37 (U)	0.74 (U)	0.37 (U)	0.74 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0057	21-11045	9.5–10	0.36 (UJ-)	0.36 (UJ-)	0.72 (UJ-)	0.36 (UJ-)	0.72 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)
MD21-99-0058	21-11045	14.5–15	0.36 (U)	0.36 (U)	0.71 (U)	0.36 (U)	0.71 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0059	21-11046	4–5	0.4 (R)	0.4 (R)	0.79 (R)	0.4 (R)	0.79 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)
MD21-99-0060	21-11046	9.5–10	0.39 (U)	0.39 (U)	0.78 (U)	0.39 (U)	0.78 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)
MD21-99-0061	21-11046	13.75–14.5	0.36 (U)	0.36 (U)	0.73 (U)	0.36 (U)	0.73 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0062	21-11046	19.5–20	0.36 (U)	0.36 (U)	0.73 (U)	0.36 (U)	0.73 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0063	21-11047	4.5–5	0.36 (U)	0.36 (U)	0.72 (U)	0.36 (U)	0.72 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0064	21-11047	9.5–10	0.37 (U)	0.37 (U)	0.74 (U)	0.37 (U)	0.74 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0065	21-11047	14.5–15	0.35 (U)	0.35 (U)	0.7 (U)	0.35 (U)	0.7 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)
MD21-99-0066	21-11047	19.5–20	0.35 (U)	0.35 (U)	0.71 (U)	0.35 (U)	0.71 (U)	0.35 (UJ)	0.35 (UJ)	0.35 (UJ)	0.35 (UJ)	0.35 (UJ)
MD21-99-0067	21-11048	4.5–5	0.38 (U)	0.38 (U)	0.76 (U)	0.38 (U)	0.76 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)
MD21-99-0068	21-11048	9.5–10	0.37 (U)	0.37 (U)	0.75 (U)	0.37 (U)	0.75 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0069	21-11048	14.5–15	0.37 (UJ)	0.37 (UJ)	0.74 (U)	0.37 (UJ)	0.74 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0070	21-11048	19.5–20	0.36 (U)	0.36 (U)	0.71 (U)	0.36 (U)	0.71 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0071	21-11045	19.5–20	0.36 (U)	0.36 (U)	0.72 (U)	0.36 (U)	0.72 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0072	21-11046	4–5	0.39 (U)	0.39 (U)	0.78 (U)	0.39 (U)	0.78 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)

Note: Geomorphic units are Qbt 2,3,4. Result units are mg/kg.

Table D-2.0-3 (continued)

Sample ID	Location ID	Depth (ft)	Benzoic Acid	Benzyl Alcohol	Bis(2-chloroethoxy)methane	Bis(2-chloroethyl)ether	Bis(2-ethylhexyl)phthalate	Bromophenyl-phenylether[4-]	Butylbenzylphthalate	Carbazole	Chloro-3-methylphenol	Chloroaniline[4-]
MD21-99-0051	21-11044	4.5–5	3.8 (UJ-)	1.5 (UJ-)	3.8 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	NA*	0.77 (UJ-)	0.77 (UJ-)
MD21-99-0052	21-11044	9.5–10	3.9 (U)	1.6 (U)	3.9 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	NA	0.79 (U)	0.79 (U)
MD21-99-0053	21-11044	14.5–15	3.5 (U)	1.4 (U)	3.5 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	NA	0.71 (U)	0.71 (U)
MD21-99-0054	21-11044	19.5–20	3.6 (U)	1.4 (U)	3.6 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	NA	0.72 (U)	0.72 (U)
MD21-99-0055	21-11045	2.5–3.5	3.8 (U)	1.5 (U)	3.8 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	NA	0.76 (U)	0.76 (U)
MD21-99-0056	21-11045	7–7.5	3.7 (U)	1.5 (U)	3.7 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	NA	0.74 (U)	0.74 (U)
MD21-99-0057	21-11045	9.5–10	3.6 (UJ-)	1.4 (UJ-)	3.6 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	NA	0.72 (UJ-)	0.72 (UJ-)
MD21-99-0058	21-11045	14.5–15	3.6 (U)	1.4 (U)	3.6 (U)	0.36 (U)	0.1 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.71 (U)	1.4 (U)
MD21-99-0059	21-11046	4–5	4 (R)	1.6 (R)	4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.79 (R)	1.6 (R)
MD21-99-0060	21-11046	9.5–10	3.9 (U)	1.6 (U)	3.9 (U)	0.39 (U)	0.082 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.78 (U)	1.6 (U)
MD21-99-0061	21-11046	13.75–14.5	3.6 (U)	1.5 (U)	3.6 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.73 (U)	1.5 (U)
MD21-99-0062	21-11046	19.5–20	3.6 (U)	1.4 (U)	3.6 (U)	0.36 (U)	0.062 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.73 (U)	1.4 (U)
MD21-99-0063	21-11047	4.5–5	3.6 (U)	1.4 (U)	3.6 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.72 (U)	1.4 (U)
MD21-99-0064	21-11047	9.5–10	3.7 (U)	1.5 (U)	3.7 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.74 (U)	1.5 (U)
MD21-99-0065	21-11047	14.5–15	3.5 (U)	1.4 (U)	3.5 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.7 (U)	1.4 (U)
MD21-99-0066	21-11047	19.5–20	3.5 (U)	1.4 (U)	3.5 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.71 (U)	1.4 (U)
MD21-99-0067	21-11048	4.5–5	3.8 (U)	1.5 (U)	3.8 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.76 (U)	1.5 (U)
MD21-99-0068	21-11048	9.5–10	3.7 (U)	1.5 (U)	3.7 (U)	0.37 (U)	0.062 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.75 (U)	1.5 (U)
MD21-99-0069	21-11048	14.5–15	3.7 (UJ)	1.5 (U)	3.7 (UJ)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.74 (UJ)	1.5 (UJ)
MD21-99-0070	21-11048	19.5–20	3.6 (U)	1.4 (U)	3.6 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.71 (U)	1.4 (U)
MD21-99-0071	21-11045	19.5–20	3.6 (U)	1.4 (U)	3.6 (U)	0.36 (U)	0.049 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.72 (U)	1.4 (U)
MD21-99-0072	21-11046	4–5	3.9 (U)	1.6 (U)	3.9 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.78 (U)	1.6 (U)

Table D-2.0-3 (continued)

Sample ID	Location ID	Depth (ft)	Chloronaphthalene[2-]	Chlorophenol[2-]	Chloro-3-methylphenol[4-]	Chrysene	Di-n-butylphthalate	Di-n-octylphthalate	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]
MD21-99-0051	21-11044	4.5–5	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)
MD21-99-0052	21-11044	9.5–10	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)
MD21-99-0053	21-11044	14.5–15	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)
MD21-99-0054	21-11044	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0055	21-11045	2.5–3.5	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)
MD21-99-0056	21-11045	7–7.5	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0057	21-11045	9.5–10	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)
MD21-99-0058	21-11045	14.5–15	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0059	21-11046	4–5	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)
MD21-99-0060	21-11046	9.5–10	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)
MD21-99-0061	21-11046	13.75–14.5	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0062	21-11046	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0063	21-11047	4.5–5	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0064	21-11047	9.5–10	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0065	21-11047	14.5–15	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)
MD21-99-0066	21-11047	19.5–20	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (UJ)	0.35 (U)	0.35 (UJ)	0.35 (UJ)
MD21-99-0067	21-11048	4.5–5	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)
MD21-99-0068	21-11048	9.5–10	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0069	21-11048	14.5–15	0.37 (UJ)	0.37 (U)	0.37 (UJ)	0.37 (U)	0.37 (UJ)	0.37 (UJ)	0.37 (U)	0.37 (UJ)	0.37 (U)	0.37 (U)
MD21-99-0070	21-11048	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0071	21-11045	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0072	21-11046	4–5	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)

Table D-2.0-3 (continued)

Sample ID	Location ID	Depth (ft)	Dichlorobenzene[1,4-]	Dichlorobenzidine[3,3'-]	Dichlorophenol[2,4-]	Diethylphthalate	Dimethyl Phthalate	Dimethylphenol[2,4-]	Dinitro-2-methylphenol	Dinitrophenol[2,4-]	Dinitrotoluene[2,4-]	Dinitrotoluene[2,6-]
MD21-99-0051	21-11044	4.5–5	0.38 (UJ-)	0.77 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	1.9 (UJ-)	1.9 (UJ-)	0.38 (UJ-)	0.38 (UJ-)
MD21-99-0052	21-11044	9.5–10	0.39 (U)	0.79 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	2 (U)	2 (U)	0.39 (U)	0.39 (U)
MD21-99-0053	21-11044	14.5–15	0.35 (U)	0.71 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	1.8 (U)	1.8 (U)	0.35 (U)	0.35 (U)
MD21-99-0054	21-11044	19.5–20	0.36 (U)	0.72 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.36 (U)	0.36 (U)
MD21-99-0055	21-11045	2.5–3.5	0.38 (U)	0.76 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	1.9 (U)	1.9 (U)	0.38 (U)	0.38 (U)
MD21-99-0056	21-11045	7–7.5	0.37 (U)	0.74 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	1.8 (U)	1.8 (U)	0.37 (U)	0.37 (U)
MD21-99-0057	21-11045	9.5–10	0.36 (UJ-)	0.72 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	1.8 (UJ-)	1.8 (UJ-)	0.36 (UJ-)	0.36 (UJ-)
MD21-99-0058	21-11045	14.5–15	0.36 (U)	0.71 (U)	0.36 (U)	0.042 (U)	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.36 (U)	0.36 (U)
MD21-99-0059	21-11046	4–5	0.4 (R)	0.79 (R)	0.4 (R)	0.39 (U)	0.4 (R)	0.4 (R)	2 (R)	2 (R)	0.4 (R)	0.4 (R)
MD21-99-0060	21-11046	9.5–10	0.39 (U)	0.78 (U)	0.39 (U)	0.051 (U)	0.39 (U)	0.39 (U)	1.9 (U)	1.9 (U)	0.39 (U)	0.39 (U)
MD21-99-0061	21-11046	13.75–14.5	0.36 (U)	0.73 (U)	0.36 (U)	0.04 (U)	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.36 (U)	0.36 (U)
MD21-99-0062	21-11046	19.5–20	0.36 (U)	0.73 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.36 (U)	0.36 (U)
MD21-99-0063	21-11047	4.5–5	0.36 (U)	0.72 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.36 (U)	0.36 (U)
MD21-99-0064	21-11047	9.5–10	0.37 (U)	0.74 (U)	0.37 (U)	0.064 (U)	0.37 (U)	0.37 (U)	1.8 (U)	1.8 (U)	0.37 (U)	0.37 (U)
MD21-99-0065	21-11047	14.5–15	0.35 (U)	0.7 (U)	0.35 (U)	0.078 (U)	0.35 (U)	0.35 (U)	1.7 (U)	1.7 (U)	0.35 (U)	0.35 (U)
MD21-99-0066	21-11047	19.5–20	0.35 (UJ)	0.71 (U)	0.35 (UJ)	0.35 (U)	0.35 (UJ)	0.35 (UJ)	1.8 (U)	1.8 (U)	0.35 (U)	0.35 (U)
MD21-99-0067	21-11048	4.5–5	0.38 (U)	0.76 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	1.9 (U)	1.9 (U)	0.38 (U)	0.38 (U)
MD21-99-0068	21-11048	9.5–10	0.37 (U)	0.75 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	1.9 (U)	1.9 (U)	0.37 (U)	0.37 (U)
MD21-99-0069	21-11048	14.5–15	0.37 (U)	0.74 (U)	0.37 (U)	0.37 (UJ)	0.37 (UJ)	0.37 (UJ)	1.8 (UJ)	1.8 (UJ)	0.37 (UJ)	0.37 (UJ)
MD21-99-0070	21-11048	19.5–20	0.36 (U)	0.71 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.36 (U)	0.36 (U)
MD21-99-0071	21-11045	19.5–20	0.36 (U)	0.72 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.36 (U)	0.36 (U)
MD21-99-0072	21-11046	4–5	0.39 (U)	0.78 (U)	0.39 (U)	0.1 (U)	0.39 (U)	0.39 (U)	2 (U)	2 (U)	0.39 (U)	0.39 (U)

Table D-2.0-3 (continued)

Sample ID	Location ID	Depth (ft)	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno(1,2,3-cd)pyrene	Isophorone	Methylnaphthalene[2-]	Methylphenol[2-]
MD21-99-0051	21-11044	4.5–5	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)
MD21-99-0052	21-11044	9.5–10	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)
MD21-99-0053	21-11044	14.5–15	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)
MD21-99-0054	21-11044	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0055	21-11045	2.5–3.5	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)
MD21-99-0056	21-11045	7–7.5	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0057	21-11045	9.5–10	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)
MD21-99-0058	21-11045	14.5–15	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0059	21-11046	4–5	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)
MD21-99-0060	21-11046	9.5–10	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)
MD21-99-0061	21-11046	13.75–14.5	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0062	21-11046	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0063	21-11047	4.5–5	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0064	21-11047	9.5–10	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0065	21-11047	14.5–15	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)
MD21-99-0066	21-11047	19.5–20	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (UJ)	0.35 (U)	0.35 (U)	0.35 (U)
MD21-99-0067	21-11048	4.5–5	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)
MD21-99-0068	21-11048	9.5–10	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)
MD21-99-0069	21-11048	14.5–15	0.37 (UJ)	0.37 (UJ)	0.37 (UJ)	0.37 (UJ)	0.37 (UJ)	0.37 (U)	0.37 (U)	0.37 (UJ)	0.37 (UJ)	0.37 (U)
MD21-99-0070	21-11048	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0071	21-11045	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)
MD21-99-0072	21-11046	4–5	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)

Table D-2.0-3 (continued)

Sample ID	Location ID	Depth (ft)	Methylphenol[4-]	Naphthalene	Nitroaniline[2-]	Nitroaniline[3-]	Nitroaniline[4-]	Nitrobenzene	Nitrophenol[2-]	Nitrophenol[4-]	Nitroso-N-methylethylamine[N-]	Nitroso-di-n-propylamine[N-]
MD21-99-0051	21-11044	4.5–5	0.38 (UJ-)	0.38 (UJ-)	1.9 (UJ-)	1.9 (UJ-)	0.77 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	1.9 (UJ-)	0.38 (UJ-)	0.38 (UJ-)
MD21-99-0052	21-11044	9.5–10	0.39 (U)	0.39 (U)	2 (U)	2 (U)	0.79 (U)	0.39 (U)	0.39 (U)	2 (U)	0.39 (U)	0.39 (U)
MD21-99-0053	21-11044	14.5–15	0.35 (U)	0.35 (U)	1.8 (U)	1.8 (U)	0.71 (U)	0.35 (U)	0.35 (U)	1.8 (U)	0.35 (U)	0.35 (U)
MD21-99-0054	21-11044	19.5–20	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.72 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)	0.36 (U)
MD21-99-0055	21-11045	2.5–3.5	0.38 (U)	0.38 (U)	1.9 (U)	1.9 (U)	0.76 (U)	0.38 (U)	0.38 (U)	1.9 (U)	0.38 (U)	0.38 (U)
MD21-99-0056	21-11045	7–7.5	0.37 (U)	0.37 (U)	1.8 (U)	1.8 (U)	0.74 (U)	0.37 (U)	0.37 (U)	1.8 (U)	0.37 (U)	0.37 (U)
MD21-99-0057	21-11045	9.5–10	0.36 (UJ-)	0.36 (UJ-)	1.8 (UJ-)	1.8 (UJ-)	0.72 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	1.8 (UJ-)	0.36 (UJ-)	0.36 (UJ-)
MD21-99-0058	21-11045	14.5–15	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.71 (U)	0.36 (U)	0.36 (U)	1.8 (U)	NA	0.36 (U)
MD21-99-0059	21-11046	4–5	0.4 (R)	0.4 (R)	2 (R)	2 (R)	0.79 (R)	0.4 (R)	0.4 (R)	2 (R)	NA	0.4 (R)
MD21-99-0060	21-11046	9.5–10	0.39 (U)	0.39 (U)	1.9 (U)	1.9 (U)	0.78 (U)	0.39 (U)	0.39 (U)	1.9 (U)	NA	0.39 (U)
MD21-99-0061	21-11046	13.75–14.5	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.73 (U)	0.36 (U)	0.36 (U)	1.8 (U)	NA	0.36 (U)
MD21-99-0062	21-11046	19.5–20	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.73 (U)	0.36 (U)	0.36 (U)	1.8 (U)	NA	0.36 (U)
MD21-99-0063	21-11047	4.5–5	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.72 (U)	0.36 (U)	0.36 (U)	1.8 (U)	NA	0.36 (U)
MD21-99-0064	21-11047	9.5–10	0.37 (U)	0.37 (U)	1.8 (U)	1.8 (U)	0.74 (U)	0.37 (U)	0.37 (U)	1.8 (U)	NA	0.37 (U)
MD21-99-0065	21-11047	14.5–15	0.35 (U)	0.35 (U)	1.7 (U)	1.7 (U)	0.7 (U)	0.35 (U)	0.35 (U)	1.7 (U)	NA	0.35 (U)
MD21-99-0066	21-11047	19.5–20	0.35 (U)	0.35 (U)	1.8 (U)	1.8 (U)	0.71 (U)	0.35 (U)	0.35 (U)	1.8 (U)	NA	0.35 (U)
MD21-99-0067	21-11048	4.5–5	0.38 (U)	0.38 (U)	1.9 (U)	1.9 (U)	0.76 (U)	0.38 (U)	0.38 (U)	1.9 (U)	NA	0.38 (U)
MD21-99-0068	21-11048	9.5–10	0.37 (U)	0.37 (U)	1.9 (U)	1.9 (U)	0.75 (U)	0.37 (U)	0.37 (U)	1.9 (U)	NA	0.37 (U)
MD21-99-0069	21-11048	14.5–15	0.37 (U)	0.37 (UJ)	1.8 (UJ)	1.8 (UJ)	0.74 (UJ)	0.37 (UJ)	0.37 (U)	1.8 (UJ)	NA	0.37 (U)
MD21-99-0070	21-11048	19.5–20	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.71 (U)	0.36 (U)	0.36 (U)	1.8 (U)	NA	0.36 (U)
MD21-99-0071	21-11045	19.5–20	0.36 (U)	0.36 (U)	1.8 (U)	1.8 (U)	0.72 (U)	0.36 (U)	0.36 (U)	1.8 (U)	NA	0.36 (U)
MD21-99-0072	21-11046	4–5	0.39 (U)	0.39 (U)	2 (U)	2 (U)	0.78 (U)	0.39 (U)	0.39 (U)	2 (U)	NA	0.39 (U)

Table D-2.0-3 (continued)

Sample ID	Location ID	Depth (ft)	Nitrosodimethylamine[N-]	Nitrosodiphenylamine[N-]	Oxybis(1-chloropropane)[2,2'-]	Pentachlorophenol	Phenanthrene	Phenol	Pyrene	Trichlorobenzene[1,2,4-]	Trichlorophenol[2,4,5]	Trichlorophenol[2,4,6]
MD21-99-0051	21-11044	4.5–5	NA	0.38 (UJ-)	0.38 (UJ-)	1.9 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	0.38 (UJ-)	1.9 (UJ-)	0.38 (UJ-)
MD21-99-0052	21-11044	9.5–10	NA	0.39 (U)	0.39 (U)	2 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	2 (U)	0.39 (U)
MD21-99-0053	21-11044	14.5–15	NA	0.35 (U)	0.35 (U)	1.8 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	1.8 (U)	0.35 (U)
MD21-99-0054	21-11044	19.5–20	NA	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)
MD21-99-0055	21-11045	2.5–3.5	NA	0.38 (U)	0.38 (U)	1.9 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	1.9 (U)	0.38 (U)
MD21-99-0056	21-11045	7–7.5	NA	0.37 (U)	0.37 (U)	1.8 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	1.8 (U)	0.37 (U)
MD21-99-0057	21-11045	9.5–10	NA	0.36 (UJ-)	0.36 (UJ-)	1.8 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	0.36 (UJ-)	1.8 (UJ-)	0.36 (UJ-)
MD21-99-0058	21-11045	14.5–15	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)
MD21-99-0059	21-11046	4–5	0.4 (R)	0.4 (R)	0.4 (R)	2 (R)	0.4 (R)	0.4 (R)	0.4 (R)	0.4 (R)	2 (R)	0.4 (R)
MD21-99-0060	21-11046	9.5–10	0.39 (U)	0.39 (U)	0.39 (U)	1.9 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	1.9 (U)	0.39 (U)
MD21-99-0061	21-11046	13.75–14.5	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)
MD21-99-0062	21-11046	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)
MD21-99-0063	21-11047	4.5–5	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)
MD21-99-0064	21-11047	9.5–10	0.37 (U)	0.37 (U)	0.37 (U)	1.8 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	1.8 (U)	0.37 (U)
MD21-99-0065	21-11047	14.5–15	0.35 (U)	0.35 (U)	0.35 (U)	1.7 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	1.7 (U)	0.35 (U)
MD21-99-0066	21-11047	19.5–20	0.35 (U)	0.35 (U)	0.35 (U)	1.8 (U)	0.35 (U)	0.35 (U)	0.35 (U)	0.35 (U)	1.8 (U)	0.35 (U)
MD21-99-0067	21-11048	4.5–5	0.38 (U)	0.38 (U)	0.38 (U)	1.9 (U)	0.38 (U)	0.38 (U)	0.38 (U)	0.38 (U)	1.9 (U)	0.38 (U)
MD21-99-0068	21-11048	9.5–10	0.37 (U)	0.37 (U)	0.37 (U)	1.9 (U)	0.37 (U)	0.37 (U)	0.37 (U)	0.37 (U)	1.9 (U)	0.37 (U)
MD21-99-0069	21-11048	14.5–15	0.37 (UJ)	0.37 (U)	0.37 (U)	1.8 (UJ)	0.37 (UJ)	0.37 (U)	0.37 (U)	0.37 (U)	1.8 (UJ)	0.37 (UJ)
MD21-99-0070	21-11048	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)
MD21-99-0071	21-11045	19.5–20	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)	0.36 (U)	0.36 (U)	0.36 (U)	1.8 (U)	0.36 (U)
MD21-99-0072	21-11046	4–5	0.39 (U)	0.39 (U)	0.39 (U)	2 (U)	0.39 (U)	0.39 (U)	0.39 (U)	0.39 (U)	2 (U)	0.39 (U)

*NA = not analyzed

Table D-2.0-4
Analytical Results for Volatile Organic Compounds from Potential Release Site 21-005

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	Butanone[2-]	Butylbenzene[n-]
MD21-99-0051	21-11044	4.5–5	0.023 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.023 (U)	0.006 (U)
MD21-99-0052	21-11044	9.5–10	0.024 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.024 (U)	0.006 (U)
MD21-99-0053	21-11044	14.5–15	0.01 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.021 (U)	0.005 (U)
MD21-99-0054	21-11044	19.5–20	0.022 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.022 (U)	0.005 (U)
MD21-99-0055	21-11045	2.5–3.5	0.023 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.011 (U)	0.023 (U)	0.006 (U)
MD21-99-0056	21-11045	7–7.5	0.022 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.011 (U)	0.022 (U)	0.006 (U)
MD21-99-0057	21-11045	9.5–10	0.022 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.022 (U)	0.005 (U)
MD21-99-0058	21-11045	14.5–15	0.0055 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)	0.028 (U)	0.007 (U)
MD21-99-0059	21-11046	4–5	0.0059 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.017 (U)	0.034 (U)	0.0085 (U)
MD21-99-0060	21-11046	9.5–10	0.007 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.024 (U)	0.006 (U)
MD21-99-0061	21-11046	13.75–14.5	0.0044 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.012 (U)	0.025 (U)	0.0062 (U)
MD21-99-0062	21-11046	19.5–20	0.0033 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.012 (U)	0.024 (U)	0.0061 (U)
MD21-99-0063	21-11047	4.5–5	0.0046 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)	0.026 (U)	0.0066 (U)
MD21-99-0064	21-11047	9.5–10	0.0053 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)	0.022 (U)	0.0056 (U)
MD21-99-0065	21-11047	14.5–15	0.0044 (U)	0.00033 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.011 (U)	0.021 (U)	0.0053 (U)
MD21-99-0066	21-11047	19.5–20	0.0057 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)	0.028 (U)	0.007 (U)
MD21-99-0067	21-11048	4.5–5	0.0049 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)	0.022 (U)	0.0056 (U)
MD21-99-0068	21-11048	9.5–10	0.027 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.013 (U)	0.027 (U)	0.0067 (U)
MD21-99-0069	21-11048	14.5–15	0.011 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)	0.026 (U)	0.0066 (U)
MD21-99-0070	21-11048	19.5–20	0.0063 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.014 (U)	0.028 (U)	0.0071 (U)
MD21-99-0071	21-11045	19.5–20	0.0043 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.011 (U)	0.022 (U)	0.0054 (U)
MD21-99-0072	21-11046	4–5	0.0053 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.024 (U)	0.006 (U)

Note: Geomorphic units are Qbt 2,3,4. Result units are mg/kg.

Table D-2.0-4 (continued)

Sample ID	Location ID	Depth (ft)	Butylbenzene[sec-]	Butylbenzene[tert-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane
MD21-99-0051	21-11044	4.5–5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)	0.012 (U)
MD21-99-0052	21-11044	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)	0.012 (U)
MD21-99-0053	21-11044	14.5–15	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)	0.011 (U)
MD21-99-0054	21-11044	19.5–20	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)	0.011 (U)
MD21-99-0055	21-11045	2.5–3.5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.011 (U)	0.006 (U)	0.011 (U)
MD21-99-0056	21-11045	7–7.5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.011 (U)	0.006 (U)	0.011 (U)
MD21-99-0057	21-11045	9.5–10	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)	0.011 (U)
MD21-99-0058	21-11045	14.5–15	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)	0.007 (U)	0.014 (U)
MD21-99-0059	21-11046	4–5	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.017 (U)	0.0085 (U)	0.017 (U)
MD21-99-0060	21-11046	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)	0.012 (U)
MD21-99-0061	21-11046	13.75–14.5	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.012 (U)	0.0062 (U)	0.012 (U)
MD21-99-0062	21-11046	19.5–20	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.012 (U)	0.0061 (U)	0.012 (U)
MD21-99-0063	21-11047	4.5–5	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)	0.0066 (U)	0.013 (U)
MD21-99-0064	21-11047	9.5–10	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)	0.0056 (U)	0.011 (U)
MD21-99-0065	21-11047	14.5–15	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.011 (U)	0.0053 (U)	0.011 (U)
MD21-99-0066	21-11047	19.5–20	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)	0.007 (U)	0.014 (U)
MD21-99-0067	21-11048	4.5–5	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)	0.0056 (U)	0.011 (U)
MD21-99-0068	21-11048	9.5–10	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.013 (U)	0.0067 (U)	0.013 (U)
MD21-99-0069	21-11048	14.5–15	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)	0.0066 (U)	0.013 (U)
MD21-99-0070	21-11048	19.5–20	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.014 (U)	0.0071 (U)	0.014 (U)
MD21-99-0071	21-11045	19.5–20	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.011 (U)	0.0054 (U)	0.011 (U)
MD21-99-0072	21-11046	4–5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)	0.012 (U)

Table D-2.0-4 (continued)

Sample ID	Location ID	Depth (ft)	Chlorotoluene[2-]	Chlorotoluene[4-]	Dibromo-3-chloropropane[1,2-]	Dibromoethane[1,2-]	Dibromomethane	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]	Dichlorobenzene[1,4-]	Dichlorodifluoromethane
MD21-99-0051	21-11044	4.5–5	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)
MD21-99-0052	21-11044	9.5–10	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)
MD21-99-0053	21-11044	14.5–15	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)
MD21-99-0054	21-11044	19.5–20	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)
MD21-99-0055	21-11045	2.5–3.5	0.006 (U)	0.006 (U)	0.011 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.011 (U)
MD21-99-0056	21-11045	7–7.5	0.006 (U)	0.006 (U)	0.011 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.011 (U)
MD21-99-0057	21-11045	9.5–10	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)
MD21-99-0058	21-11045	14.5–15	0.007 (U)	0.007 (U)	0.014 (U)	0.007 (U)	0.007 (U)	0.00039 (U)	0.007 (U)	0.007 (U)	0.014 (U)
MD21-99-0059	21-11046	4–5	0.0085 (U)	0.0085 (U)	0.017 (U)	0.0085 (U)	0.0085 (U)	0.00046 (U)	0.0085 (U)	0.0085 (U)	0.017 (U)
MD21-99-0060	21-11046	9.5–10	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)	0.006 (U)	0.00035 (U)	0.006 (U)	0.006 (U)	0.012 (U)
MD21-99-0061	21-11046	13.75–14.5	0.0062 (U)	0.0062 (U)	0.012 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.012 (U)
MD21-99-0062	21-11046	19.5–20	0.0061 (U)	0.0061 (U)	0.012 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.012 (U)
MD21-99-0063	21-11047	4.5–5	0.0066 (U)	0.0066 (U)	0.013 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)
MD21-99-0064	21-11047	9.5–10	0.0056 (U)	0.0056 (U)	0.011 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)
MD21-99-0065	21-11047	14.5–15	0.0053 (U)	0.0053 (U)	0.011 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.011 (U)
MD21-99-0066	21-11047	19.5–20	0.007 (U)	0.007 (U)	0.014 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)
MD21-99-0067	21-11048	4.5–5	0.0056 (U)	0.0056 (U)	0.011 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)
MD21-99-0068	21-11048	9.5–10	0.0067 (U)	0.0067 (U)	0.013 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.013 (U)
MD21-99-0069	21-11048	14.5–15	0.0066 (U)	0.0066 (U)	0.013 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)
MD21-99-0070	21-11048	19.5–20	0.0071 (U)	0.0071 (U)	0.014 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.014 (U)
MD21-99-0071	21-11045	19.5–20	0.0054 (U)	0.0054 (U)	0.011 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.011 (U)
MD21-99-0072	21-11046	4–5	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)

Table D-2.0-4 (continued)

Sample ID	Location ID	Depth (ft)	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloroethene[trans-1,2-]	Dichloropropane[1,2-]	Dichloropropane[1,3-]	Dichloropropane[2,2-]	Dichloropropene[1,1-]
MD21-99-0051	21-11044	4.5–5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0052	21-11044	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0053	21-11044	14.5–15	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)
MD21-99-0054	21-11044	19.5–20	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)
MD21-99-0055	21-11045	2.5–3.5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0056	21-11045	7–7.5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0057	21-11045	9.5–10	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)
MD21-99-0058	21-11045	14.5–15	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)	0.014 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)
MD21-99-0059	21-11046	4–5	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.017 (U)	0.017 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)
MD21-99-0060	21-11046	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.012 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0061	21-11046	13.75–14.5	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.012 (U)	0.012 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)
MD21-99-0062	21-11046	19.5–20	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.012 (U)	0.012 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)
MD21-99-0063	21-11047	4.5–5	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)	0.013 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)
MD21-99-0064	21-11047	9.5–10	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)	0.011 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)
MD21-99-0065	21-11047	14.5–15	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.011 (U)	0.011 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)
MD21-99-0066	21-11047	19.5–20	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)	0.014 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)
MD21-99-0067	21-11048	4.5–5	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)	0.011 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)
MD21-99-0068	21-11048	9.5–10	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.013 (U)	0.013 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)
MD21-99-0069	21-11048	14.5–15	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)	0.013 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)
MD21-99-0070	21-11048	19.5–20	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.014 (U)	0.014 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)
MD21-99-0071	21-11045	19.5–20	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.011 (U)	0.011 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)
MD21-99-0072	21-11046	4–5	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.012 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)

Table D-2.0-4 (continued)

Sample ID	Location ID	Depth (ft)	Dichloropropene[cis-1,3-]	Dichloropropene[trans-1,3-]	Ethylbenzene	Hexanone[2-]	Iodomethane	Isopropylbenzene	Isopropyltoluene[4-]	Methyl-2-pentanone[4-]	Methylene Chloride
MD21-99-0051	21-11044	4.5–5	0.006 (U)	0.006 (U)	0.006 (U)	0.023 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.023 (U)	0.006 (U)
MD21-99-0052	21-11044	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.024 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.024 (U)	0.006 (U)
MD21-99-0053	21-11044	14.5–15	0.005 (U)	0.005 (U)	0.005 (U)	0.021 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.021 (U)	0.005 (U)
MD21-99-0054	21-11044	19.5–20	0.005 (U)	0.005 (U)	0.005 (U)	0.022 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.022 (U)	0.005 (U)
MD21-99-0055	21-11045	2.5–3.5	0.006 (U)	0.006 (U)	0.006 (U)	0.023 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.023 (U)	0.006 (U)
MD21-99-0056	21-11045	7–7.5	0.006 (U)	0.006 (U)	0.006 (U)	0.022 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.022 (U)	0.006 (U)
MD21-99-0057	21-11045	9.5–10	0.005 (U)	0.005 (U)	0.005 (U)	0.022 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.022 (U)	0.005 (U)
MD21-99-0058	21-11045	14.5–15	0.007 (U)	0.007 (U)	0.007 (U)	0.028 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.028 (U)	0.007 (U)
MD21-99-0059	21-11046	4–5	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.034 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.034 (U)	0.0085 (U)
MD21-99-0060	21-11046	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.024 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.024 (U)	0.006 (U)
MD21-99-0061	21-11046	13.75–14.5	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.025 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.025 (U)	0.0062 (U)
MD21-99-0062	21-11046	19.5–20	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.024 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.024 (U)	0.0061 (U)
MD21-99-0063	21-11047	4.5–5	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.026 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.026 (U)	0.0066 (U)
MD21-99-0064	21-11047	9.5–10	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.022 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.022 (U)	0.0056 (U)
MD21-99-0065	21-11047	14.5–15	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.021 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.021 (U)	0.0053 (U)
MD21-99-0066	21-11047	19.5–20	0.007 (U)	0.007 (U)	0.007 (U)	0.028 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.028 (U)	0.007 (U)
MD21-99-0067	21-11048	4.5–5	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.022 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.022 (U)	0.0056 (U)
MD21-99-0068	21-11048	9.5–10	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.027 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.027 (U)	0.0067 (U)
MD21-99-0069	21-11048	14.5–15	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.026 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.026 (U)	0.0066 (U)
MD21-99-0070	21-11048	19.5–20	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.028 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.028 (U)	0.0071 (U)
MD21-99-0071	21-11045	19.5–20	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.022 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.022 (U)	0.0054 (U)
MD21-99-0072	21-11046	4–5	0.006 (U)	0.006 (U)	0.006 (U)	0.024 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.024 (U)	0.006 (U)

Table D-2.0-4 (continued)

Sample ID	Location ID	Depth (ft)	Propylbenzene[1-]	Styrene	Tetrachloroethane[1,1,1,2-]	Tetrachloroethane[1,1,2,2-]	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,2-]	Trichloroethane[1,1,1-]
MD21-99-0051	21-11044	4.5–5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0052	21-11044	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0053	21-11044	14.5–15	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)
MD21-99-0054	21-11044	19.5–20	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)
MD21-99-0055	21-11045	2.5–3.5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0056	21-11045	7–7.5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0057	21-11045	9.5–10	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)
MD21-99-0058	21-11045	14.5–15	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)
MD21-99-0059	21-11046	4–5	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)
MD21-99-0060	21-11046	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.00088 (J+)	0.006 (U)	0.006 (U)	0.006 (U)
MD21-99-0061	21-11046	13.75–14.5	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)
MD21-99-0062	21-11046	19.5–20	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)
MD21-99-0063	21-11047	4.5–5	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)
MD21-99-0064	21-11047	9.5–10	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)
MD21-99-0065	21-11047	14.5–15	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)
MD21-99-0066	21-11047	19.5–20	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)
MD21-99-0067	21-11048	4.5–5	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)
MD21-99-0068	21-11048	9.5–10	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)
MD21-99-0069	21-11048	14.5–15	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)
MD21-99-0070	21-11048	19.5–20	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)
MD21-99-0071	21-11045	19.5–20	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)
MD21-99-0072	21-11046	4–5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)

Table D-2.0-4 (continued)

Sample ID	Location ID	Depth (ft)	Trichloroethene	Trichlorofluoromethane	Trichloropropane[1,2,3-]	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Vinyl Chloride	Xylene (Total)
MD21-99-0051	21-11044	4.5–5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)
MD21-99-0052	21-11044	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)
MD21-99-0053	21-11044	14.5–15	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)
MD21-99-0054	21-11044	19.5–20	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)
MD21-99-0055	21-11045	2.5–3.5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.011 (U)	0.006 (U)
MD21-99-0056	21-11045	7–7.5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.011 (U)	0.006 (U)
MD21-99-0057	21-11045	9.5–10	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.005 (U)	0.011 (U)	0.005 (U)
MD21-99-0058	21-11045	14.5–15	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)	0.007 (U)
MD21-99-0059	21-11046	4–5	0.00054 (J+)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.0085 (U)	0.017 (U)	0.0085 (U)
MD21-99-0060	21-11046	9.5–10	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)
MD21-99-0061	21-11046	13.75–14.5	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.0062 (U)	0.012 (U)	0.0062 (U)
MD21-99-0062	21-11046	19.5–20	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.0061 (U)	0.012 (U)	0.0061 (U)
MD21-99-0063	21-11047	4.5–5	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)	0.0066 (U)
MD21-99-0064	21-11047	9.5–10	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.00037 (U)	0.0056 (U)	0.011 (U)	0.0056 (U)
MD21-99-0065	21-11047	14.5–15	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.0053 (U)	0.011 (U)	0.0053 (U)
MD21-99-0066	21-11047	19.5–20	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.007 (U)	0.014 (U)	0.007 (U)
MD21-99-0067	21-11048	4.5–5	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.0056 (U)	0.011 (U)	0.0056 (U)
MD21-99-0068	21-11048	9.5–10	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.0067 (U)	0.013 (U)	0.0067 (U)
MD21-99-0069	21-11048	14.5–15	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.0066 (U)	0.013 (U)	0.0066 (U)
MD21-99-0070	21-11048	19.5–20	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.0071 (U)	0.014 (U)	0.0071 (U)
MD21-99-0071	21-11045	19.5–20	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.0054 (U)	0.011 (U)	0.0054 (U)
MD21-99-0072	21-11046	4–5	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.006 (U)	0.012 (U)	0.006 (U)

Table D-2.0-5
Analytical Results for Polychlorinated Biphenyls from Potential Release Site 21-005

Sample ID	Location ID	Depth (ft)	Aroclor-1016	Aroclor-1221	Aroclor-1232	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1262	Aroclor-1268
MD21-99-0051	21-11044	4.5–5	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)
MD21-99-0052	21-11044	9.5–10	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)
MD21-99-0053	21-11044	14.5–15	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)
MD21-99-0054	21-11044	19.5–20	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)
MD21-99-0055	21-11045	2.5–3.5	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)
MD21-99-0056	21-11045	7–7.5	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)
MD21-99-0057	21-11045	9.5–10	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)
MD21-99-0058	21-11045	14.5–15	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)
MD21-99-0059	21-11046	4–5	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)
MD21-99-0060	21-11046	9.5–10	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)
MD21-99-0061	21-11046	13.75–14.5	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)
MD21-99-0062	21-11046	19.5–20	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)	0.036 (U)
MD21-99-0063	21-11047	4.5–5	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)
MD21-99-0064	21-11047	9.5–10	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)
MD21-99-0065	21-11047	14.5–15	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)	0.035 (U)
MD21-99-0066	21-11047	19.5–20	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)
MD21-99-0067	21-11048	4.5–5	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)	0.038 (U)
MD21-99-0068	21-11048	9.5–10	0.037 (UJ-)	0.037 (UJ-)	0.037 (UJ-)	0.037 (UJ-)	0.037 (UJ-)	0.037 (UJ-)	0.037 (UJ-)	0.037 (UJ-)	0.037 (UJ-)
MD21-99-0069	21-11048	14.5–15	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)	0.037 (U)
MD21-99-0070	21-11048	19.5–20	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)
MD21-99-0071	21-11045	19.5–20	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)	0.036 (UJ-)
MD21-99-0072	21-11046	4–5	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)	0.039 (U)

Note: Geomorphic units are Qbt 2,3,4. Result units are mg/kg.

Table D-2.0-6
Analytical Results for Alpha-Emitting Radionuclides from Potential Release Site 21-005

Sample ID	Location ID	Depth (ft)	Plutonium-238		Plutonium-239		Uranium-234		Uranium-235		Uranium-238	
			Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty
MD21-99-0051	21-11044	4.5–5	NA[a]	—[b]	NA	—	0.799	0.075	0.044	0.017 (U)	0.626	0.063
MD21-99-0052	21-11044	9.5–10	NA	—	NA	—	0.644	0.064	0.0086	0.0069 (U)	0.638	0.063
MD21-99-0053	21-11044	14.5–15	NA	—	NA	—	0.632	0.06	0.043	0.014	0.62	0.059
MD21-99-0054	21-11044	19.5–20	NA	—	NA	—	0.796	0.071	0.032	0.011 (U)	0.793	0.071
MD21-99-0055	21-11045	2.5–3.5	NA	—	NA	—	0.839	0.075	0.055	0.016	0.772	0.071
MD21-99-0056	21-11045	7–7.5	NA	—	NA	—	0.779	0.076	0.041	0.015 (U)	0.758	0.075
MD21-99-0057	21-11045	9.5–10	NA	—	NA	—	0.843	0.077	0.038	0.013 (U)	0.964	0.085
MD21-99-0058	21-11045	14.5–15	NA	—	NA	—	0.88	0.11	0.027	0.023 (U)	0.77	0.1
MD21-99-0059	21-11046	4–5	NA	—	NA	—	1.03	0.12	0.055	0.026 (U)	1.02	0.12
MD21-99-0060	21-11046	9.5–10	NA	—	NA	—	0.66	0.09	0.101	0.033	0.621	0.087
MD21-99-0061	21-11046	13.75–14.5	NA	—	NA	—	0.77	0.1	0	0.017 (U)	0.762	0.1
MD21-99-0062	21-11046	19.5–20	NA	—	NA	—	0.672	0.097	0.018	0.019 (U)	0.7	0.1
MD21-99-0063	21-11047	4.5–5	NA	—	NA	—	0.805	0.087	0.031	0.019 (U)	0.823	0.087
MD21-99-0064	21-11047	9.5–10	NA	—	NA	—	0.98	0.12	0.019	0.02 (U)	1	0.12
MD21-99-0065	21-11047	14.5–15	NA	—	NA	—	0.79	0.11	0.062	0.028 (U)	0.87	0.11
MD21-99-0066	21-11047	19.5–20	NA	—	NA	—	0.94	0.13	0.025	0.022 (U)	0.585	0.096
MD21-99-0067	21-11048	4.5–5	NA	—	NA	—	0.86	0.11	0.029	0.02 (U)	0.87	0.11
MD21-99-0068	21-11048	9.5–10	NA	—	NA	—	0.76	0.1	0.055	0.026 (U)	0.587	0.088
MD21-99-0069	21-11048	14.5–15	NA	—	NA	—	0.68	0.1	0.032	0.022 (U)	0.658	0.098
MD21-99-0070	21-11048	19.5–20	NA	—	NA	—	0.791	0.091	0.03	0.018 (U)	0.822	0.094
MD21-99-0071	21-11045	19.5–20	NA	—	NA	—	0.819	0.092	0.051	0.021 (U)	0.821	0.092
MD21-99-0072	21-11046	4–5	NA	—	NA	—	1.04	0.11	0.079	0.026	1.02	0.1
MD21-99-0143	21-11044	4.5–5	0	3.05 (UJ)	-6.01	3.55 (UJ)	NA	—	NA	—	NA	—
MD21-99-0144	21-11044	9.5–10	9.79	0.5 (UJ)	0	3.75 (UJ)	NA	—	NA	—	NA	—
MD21-99-0145	21-11044	14–15	-1.84	1.3 (UJ)	0	1.4 (UJ)	NA	—	NA	—	NA	—

Note: Geomorphic units are Qbt 2,3,4. Result units are pCi/g.

Table D-2.0-6 (continued)

Sample ID	Location ID	Depth (ft)	Plutonium-238		Plutonium-239		Uranium-234		Uranium-235		Uranium-238	
			Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty
MD21-99-0146	21-11044	19.5–20	1.38	1.4 (UJ)	-2.21	1.6 (UJ)	NA	—	NA	—	NA	—
MD21-99-0147	21-11045	2.5–3.5	0	1.8 (UJ)	-1.16	1.15 (UJ)	NA	—	NA	—	NA	—
MD21-99-0148	21-11045	7–7.5	1.81	2.2 (UJ)	0	2.65 (UJ)	NA	—	NA	—	NA	—
MD21-99-0149	21-11045	9.5–10	-5.81	4.2 (UJ)	3.34	3.65 (UJ)	NA	—	NA	—	NA	—
MD21-99-0150	21-11045	14.5–15	0	0.5 (UJ)	-6.52	4.7 (UJ)	NA	—	NA	—	NA	—
MD21-99-0151	21-11046	4–5	-9.89	0.5 (UJ)	-4.94	3.55 (UJ)	NA	—	NA	—	NA	—
MD21-99-0152	21-11046	9.5–10	-2.5	2.5 (UJ)	-4.99	3.6 (UJ)	NA	—	NA	—	NA	—
MD21-99-0153	21-11046	13.75–14.5	1.91	1.9 (UJ)	0	2.35 (UJ)	NA	—	NA	—	NA	—
MD21-99-0154	21-11046	19.5–20	0	2.25 (UJ)	1.84	1.85 (UJ)	NA	—	NA	—	NA	—
MD21-99-0155	21-11047	4.5–5	1.58	1.6 (UJ)	-2.53	1.8 (UJ)	NA	—	NA	—	NA	—
MD21-99-0156	21-11047	9.5–10	0	2.7 (UJ)	-1.76	1.75 (UJ)	NA	—	NA	—	NA	—
MD21-99-0157	21-11047	14.5–15	-5.76	4.15 (U)	0	4.4 (U)	NA	—	NA	—	NA	—
MD21-99-0158	21-11047	19.5–20	-7.3	3.75 (UJ)	2.28	2.3 (UJ)	NA	—	NA	—	NA	—
MD21-99-0159	21-11048	4.5–5	6.86	4.95 (UJ)	-5.49	3.95 (UJ)	NA	—	NA	—	NA	—
MD21-99-0160	21-11048	9.5–10	3.42	3.9 (UJ)	3.55	3.9 (UJ)	NA	—	NA	—	NA	—
MD21-99-0161	21-11048	14.5–15	2.06	2.5 (UJ)	-1.96	2 (UJ)	NA	—	NA	—	NA	—
MD21-99-0162	21-11048	19.5–20	0	3.15 (UJ)	-4.09	2.95 (UJ)	NA	—	NA	—	NA	—
MD21-99-0163	21-11045	19.5–20	6.94	4.6 (UJ)	-4.14	3 (UJ)	NA	—	NA	—	NA	—
MD21-99-0164	21-11046	4–5	-7.73	4.6 (UJ)	2.7	3.25 (UJ)	NA	—	NA	—	—	—

[a] NA = not analyzed.

[b] A dash indicates there is no uncertainty because there was no result.

Table D-2.0-7
Analytical Results for Gamma-Emitting Radionuclides from Potential Release Site 21-005

Sample ID	Location ID	Depth (ft)	Actinium-228		Americium-241		Annihilation Radiation		Barium-140		Bismuth-211	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	1.7	0.385	0.15	0.205 (U)	-0.1	0.095 (U)	0.28	0.26 (U)	NR*	(R)
MD21-99-0052	21-11044	9.5–10	1.31	0.32	0.3	0.2 (U)	0.05	0.09 (U)	-0.19	0.2 (U)	NR	(R)
MD21-99-0053	21-11044	14.5–15	1.18	0.36 (R)	-0.06	0.235 (U)	-0.13	0.08 (U)	-0.07	0.28 (U)	0	0 (R)
MD21-99-0054	21-11044	19.5–20	0.8	0.375 (R)	0.04	0.185 (U)	-0.04	0.085 (U)	0.01	0.21 (U)	NR	(R)
MD21-99-0055	21-11045	2.5–3.5	1.7	0.325	-0.27	0.23 (U)	0.15	0.1 (U)	0.03	0.195 (U)	3	0.6 (R)
MD21-99-0056	21-11045	7–7.5	1.55	0.335	-0.3	0.16 (U)	-0.15	0.075 (U)	0.39	0.235 (U)	NR	(R)
MD21-99-0057	21-11045	9.5–10	1.52	0.34	-0.25	0.22 (U)	-0.13	0.085 (U)	-0.37	0.25 (U)	NR	(R)
MD21-99-0058	21-11045	14.5–15	1.29	0.345 (R)	0.19	0.235 (U)	0.16	0.1 (U)	0.41	0.24 (U)	1.4	0.6 (R)
MD21-99-0059	21-11046	4–5	1.49	0.335	-0.27	0.195 (U)	0.15	0.105 (U)	0.05	0.315 (U)	NR	(R)
MD21-99-0060	21-11046	9.5–10	0.74	0.39 (U)	0.09	0.23 (U)	-0.06	0.075 (U)	0.09	0.22 (U)	0.8	0.6 (U)
MD21-99-0061	21-11046	13.75–14.5	0.43	0.24 (U)	-0.34	0.185 (U)	-0.02	0.085 (U)	0.05	0.255 (U)	0	0 (R)
MD21-99-0062	21-11046	19.5–20	1.38	0.355 (R)	-0.22	0.2 (U)	-0.03	0.065 (U)	0.26	0.215 (U)	NR	(R)
MD21-99-0063	21-11047	4.5–5	1.44	0.35	0	0.195 (U)	0.12	0.09 (U)	0.22	0.195 (U)	1.7	0.55 (R)
MD21-99-0064	21-11047	9.5–10	1.01	0.355 (R)	-0.1	0.235 (U)	0.18	0.105 (U)	0.02	0.255 (U)	0.8	0.65 (U)
MD21-99-0065	21-11047	14.5–15	1.55	0.345 (R)	-0.21	0.165 (U)	0.18	0.095 (U)	-0.18	0.21 (U)	NR	(R)
MD21-99-0066	21-11047	19.5–20	1.64	0.31	-0.04	0.215 (U)	-0.16	0.065 (U)	-0.1	0.195 (U)	NR	(R)
MD21-99-0067	21-11048	4.5–5	1.19	0.245	-0.2	0.14 (U)	0.13	0.085 (U)	-0.14	0.19 (U)	NR	(R)
MD21-99-0068	21-11048	9.5–10	1.04	0.33 (R)	0.3	0.26 (U)	-0.18	0.075 (U)	-0.04	0.165 (U)	1.2	0.55 (R)
MD21-99-0069	21-11048	14.5–15	1.19	0.29	0.04	0.18 (U)	-0.14	0.065 (U)	-0.34	0.235 (U)	NR	(R)
MD21-99-0070	21-11048	19.5–20	1.62	0.375	-0.05	0.22 (U)	-0.11	0.07 (U)	-0.02	0.19 (U)	NR	(R)
MD21-99-0071	21-11045	19.5–20	1.73	0.35	-0.22	0.195 (U)	-0.03	0.08 (U)	-0.03	0.21 (U)	NR	(R)
MD21-99-0072	21-11046	4–5	1.07	0.32 (R)	0.04	0.22 (U)	0.2	0.1 (U)	0.03	0.22 (U)	3.1	0.65 (R)

Note: Geomorphic units are Qbt 2,3,4. Result units are pCi/g.

Table D-2.0-7 (continued)

Sample ID	Location ID	Depth (ft)	Bismuth-212		Bismuth-214		Cadmium-109		Cerium-139		Cerium-144	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	-1.7	2.25 (U)	1.03	0.245 (R)	1.3	1.15 (R)	0.013	0.035 (U)	0.13	0.175 (U)
MD21-99-0052	21-11044	9.5–10	-2.8	2.7 (U)	1.5	0.255	2.1	0.9 (R)	0.028	0.032 (U)	0.17	0.18 (U)
MD21-99-0053	21-11044	14.5–15	1.9	1.3 (U)	0.98	0.22 (R)	1	1.15 (U)	-0.029	0.0285 (U)	-0.01	0.22 (U)
MD21-99-0054	21-11044	19.5–20	-1.3	2.95 (U)	1.52	0.26	0.9	0.8 (U)	-0.011	0.029 (U)	-0.08	0.175 (U)
MD21-99-0055	21-11045	2.5–3.5	-1.1	1.55 (U)	0.75	0.175 (R)	3.3	1.1 (R)	-0.001	0.029 (U)	0.14	0.185 (U)
MD21-99-0056	21-11045	7–7.5	3.5	1.75 (U)	0.94	0.2 (R)	2.3	1.45 (U)	0.011	0.029 (U)	0	0.175 (U)
MD21-99-0057	21-11045	9.5–10	2.4	2.45 (U)	1.12	0.23 (R)	2.6	1.2 (R)	-0.031	0.031 (U)	0.29	0.21 (U)
MD21-99-0058	21-11045	14.5–15	1.8	1.95 (U)	1.21	0.23	0.6	0.95 (U)	0.042	0.0285 (U)	0.19	0.195 (U)
MD21-99-0059	21-11046	4–5	2.3	2.3 (U)	1.6	0.26	-0.4	1.05 (U)	0.014	0.0285 (U)	-0.29	0.19 (U)
MD21-99-0060	21-11046	9.5–10	2.3	2.6 (U)	0.97	0.21	1.5	1.05 (U)	0.004	0.026 (U)	0.07	0.19 (U)
MD21-99-0061	21-11046	13.75–14.5	5.7	2.4 (R)	1.09	0.23 (R)	-0.4	0.95 (U)	0.018	0.0315 (U)	-0.02	0.185 (U)
MD21-99-0062	21-11046	19.5–20	1.8	1.85 (U)	1.46	0.225	1	1 (U)	0.028	0.0285 (U)	0.06	0.19 (U)
MD21-99-0063	21-11047	4.5–5	1.8	2.2 (U)	1.18	0.21	-0.6	0.7 (U)	-0.009	0.025 (U)	0.24	0.165 (U)
MD21-99-0064	21-11047	9.5–10	-1.7	2 (U)	1.05	0.215 (R)	2.4	1.15 (R)	0.025	0.029 (U)	-0.07	0.185 (U)
MD21-99-0065	21-11047	14.5–15	-0.5	2.35 (U)	1.3	0.225	2.8	1.55 (U)	0.028	0.027 (U)	0.23	0.165 (U)
MD21-99-0066	21-11047	19.5–20	-1.5	2.75 (U)	1.33	0.25	3.1	1.15 (R)	-0.011	0.0245 (U)	0.12	0.19 (U)
MD21-99-0067	21-11048	4.5–5	0.2	1.65 (U)	1.05	0.185	1.6	1 (U)	-0.02	0.023 (U)	0.08	0.145 (U)
MD21-99-0068	21-11048	9.5–10	1.5	2.55 (U)	1.55	0.24 (R)	2.8	1.15 (R)	-0.007	0.0305 (U)	-0.19	0.175 (U)
MD21-99-0069	21-11048	14.5–15	0	2.35 (U)	1.67	0.24	-1.5	0.8 (U)	0.023	0.025 (U)	0.19	0.17 (U)
MD21-99-0070	21-11048	19.5–20	0	2.4 (U)	0.94	0.195 (R)	1.7	1 (U)	-0.009	0.03 (U)	-0.32	0.2 (U)
MD21-99-0071	21-11045	19.5–20	1.8	2.95 (U)	1.27	0.225	0.1	0.8 (U)	0.006	0.029 (U)	0	0.19 (U)
MD21-99-0072	21-11046	4–5	0	2.9 (U)	1.12	0.24	1.4	1.1 (U)	-0.038	0.026 (U)	0.26	0.21 (U)

Table D-2.0-7 (continued)

Sample ID	Location ID	Depth (ft)	Cesium-134		Cesium-137		Cobalt-57		Cobalt-60		Europium-152	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	-0.083	0.0485 (U)	-0.03	0.06 (U)	-0.012	0.022 (U)	-0.09	0.07 (U)	-0.02	0.125 (U)
MD21-99-0052	21-11044	9.5–10	0.048	0.048 (U)	-0.002	0.038 (U)	0.008	0.021 (U)	0	0.07 (U)	-0.14	0.09 (U)
MD21-99-0053	21-11044	14.5–15	0	0.07 (U)	0.03	0.06 (U)	-0.021	0.0295 (U)	0.09	0.065 (U)	0.05	0.11 (U)
MD21-99-0054	21-11044	19.5–20	0.038	0.0485 (U)	-0.042	0.0415 (U)	0.002	0.021 (U)	-0.09	0.06 (U)	0.01	0.11 (U)
MD21-99-0055	21-11045	2.5–3.5	-0.03	0.055 (U)	0.01	0.06 (U)	-0.029	0.0235 (U)	-0.05	0.06 (U)	0.11	0.115 (U)
MD21-99-0056	21-11045	7–7.5	0.009	0.0485 (U)	-0.1	0.05 (U)	0.004	0.017 (U)	-0.04	0.065 (U)	0.09	0.115 (U)
MD21-99-0057	21-11045	9.5–10	-0.02	0.06 (U)	-0.03	0.055 (U)	0.008	0.027 (U)	-0.01	0.08 (U)	-0.06	0.125 (U)
MD21-99-0058	21-11045	14.5–15	-0.06	0.055 (U)	-0.045	0.0425 (U)	-0.035	0.0215 (U)	0.08	0.065 (U)	-0.09	0.115 (U)
MD21-99-0059	21-11046	4–5	-0.02	0.05 (U)	-0.021	0.049 (U)	-0.004	0.019 (U)	0.07	0.06 (U)	-0.01	0.095 (U)
MD21-99-0060	21-11046	9.5–10	0.04	0.055 (U)	-0.037	0.041 (U)	-0.033	0.024 (U)	-0.09	0.06 (U)	0.05	0.125 (U)
MD21-99-0061	21-11046	13.75–14.5	0.03	0.065 (U)	-0.05	0.055 (U)	0.019	0.022 (U)	-0.06	0.075 (U)	-0.14	0.115 (U)
MD21-99-0062	21-11046	19.5–20	0.074	0.042 (U)	-0.03	0.055 (U)	0.005	0.0235 (U)	0.07	0.065 (U)	-0.07	0.105 (U)
MD21-99-0063	21-11047	4.5–5	-0.029	0.0415 (U)	0.061	0.049 (U)	0.008	0.018 (U)	-0.04	0.075 (U)	-0.06	0.085 (U)
MD21-99-0064	21-11047	9.5–10	0.02	0.0475 (U)	-0.03	0.055 (U)	-0.017	0.024 (U)	0.08	0.06 (U)	-0.16	0.13 (U)
MD21-99-0065	21-11047	14.5–15	0.026	0.033 (U)	0.03	0.05 (U)	-0.019	0.0175 (U)	0.01	0.075 (U)	0.07	0.105 (U)
MD21-99-0066	21-11047	19.5–20	-0.01	0.055 (U)	-0.07	0.055 (U)	0.03	0.0245 (U)	0.04	0.055 (U)	0.2	0.12 (U)
MD21-99-0067	21-11048	4.5–5	-0.05	0.039 (U)	0.021	0.0435 (U)	-0.026	0.016 (U)	-0.06	0.055 (U)	0.04	0.085 (U)
MD21-99-0068	21-11048	9.5–10	0.12	0.05 (R)	0.06	0.065 (U)	-0.051	0.021 (U)	0	0.075 (U)	-0.1	0.115 (U)
MD21-99-0069	21-11048	14.5–15	0.068	0.045 (U)	-0.075	0.041 (U)	0.002	0.019 (U)	0.07	0.06 (U)	0.03	0.1 (U)
MD21-99-0070	21-11048	19.5–20	-0.03	0.05 (U)	0.04	0.05 (U)	0.035	0.0245 (U)	0.049	0.0405 (U)	-0.04	0.12 (U)
MD21-99-0071	21-11045	19.5–20	0.067	0.0455 (U)	-0.052	0.0455 (U)	-0.053	0.019 (U)	-0.05	0.065 (U)	-0.08	0.115 (U)
MD21-99-0072	21-11046	4–5	0.08	0.06 (U)	-0.08	0.06 (U)	0.009	0.028 (U)	-0.04	0.07 (U)	-0.08	0.115 (U)

Table D-2.0-7 (continued)

Sample ID	Location ID	Depth (ft)	Gross Gamma Radiation		Lanthanum-140		Lead-211		Lead-212		Lead-214	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	13.55	0.585	0.3	1 (U)	-1.7	1.25 (U)	1.38	0.225	1.17	0.235
MD21-99-0052	21-11044	9.5–10	11.64	0.515	-2.1	1.35 (U)	0.6	0.95 (U)	1.12	0.2	1.15	0.205
MD21-99-0053	21-11044	14.5–15	12.16	0.52	-3.1	1.7 (U)	0.3	1.2 (U)	1.29	0.22	0.91	0.205
MD21-99-0054	21-11044	19.5–20	8.23	0.335	0.8	1.25 (U)	1.4	1.2 (U)	1.49	0.215	1.33	0.205
MD21-99-0055	21-11045	2.5–3.5	11	0.47	0	1.4 (U)	0.7	1.15 (U)	1.16	0.195	0.83	0.17 (R)
MD21-99-0056	21-11045	7–7.5	7.61	0.32	0.2	0.85 (U)	2.2	1 (R)	0.88	0.18	1.18	0.2
MD21-99-0057	21-11045	9.5–10	7.21	0.32	-0.3	1.7 (U)	0.6	0.95 (U)	1.11	0.215	1.08	0.22
MD21-99-0058	21-11045	14.5–15	12.38	0.495	-1.1	1.3 (U)	1.1	0.9 (U)	1.41	0.195	0.9	0.18
MD21-99-0059	21-11046	4–5	13.44	0.58	-4.1	1.75 (U)	0.3	1.1 (U)	1.8	0.24	1.62	0.225
MD21-99-0060	21-11046	9.5–10	11.07	0.475	1.9	1.1 (U)	0	1.05 (U)	1.22	0.18	0.93	0.18
MD21-99-0061	21-11046	13.75–14.5	7.91	0.335	-0.1	2.15 (U)	0.4	1.15 (U)	1.25	0.2	1.08	0.205
MD21-99-0062	21-11046	19.5–20	12.3	0.485	-2.2	1.8 (U)	1.1	1.2 (U)	1.49	0.2	0.82	0.17
MD21-99-0063	21-11047	4.5–5	8.1	0.32	-3.9	2.1 (U)	0.4	0.9 (U)	1.11	0.185	0.72	0.17
MD21-99-0064	21-11047	9.5–10	7.81	0.32	-2.9	2.45 (U)	0.7	1.1 (U)	1.41	0.21	1.13	0.195
MD21-99-0065	21-11047	14.5–15	8.19	0.32	0.6	0.6 (U)	0.6	0.85 (U)	1.42	0.2	1.19	0.195
MD21-99-0066	21-11047	19.5–20	8.06	0.315	-1.2	1.4 (U)	1.5	1.15 (U)	1.17	0.18	1	0.175
MD21-99-0067	21-11048	4.5–5	8.16	0.305	-0.8	1.05 (U)	0.3	0.8 (U)	1.41	0.175	0.85	0.15
MD21-99-0068	21-11048	9.5–10	7.49	0.305	-0.4	1.65 (U)	1.4	1 (U)	1.16	0.185	0.7	0.175
MD21-99-0069	21-11048	14.5–15	8.34	0.325	-2	1.85 (U)	-0.9	1 (U)	1.47	0.2	0.98	0.185
MD21-99-0070	21-11048	19.5–20	7.69	0.305	-3.6	2.45 (U)	-0.6	0.95 (U)	1.08	0.165	1.03	0.175
MD21-99-0071	21-11045	19.5–20	8.47	0.345	0.2	2.35 (U)	0	1.3 (U)	1.25	0.205	1.41	0.21
MD21-99-0072	21-11046	4–5	6.8	0.3	-3.4	2.45 (U)	0.3	1.15 (U)	1.54	0.215	1.2	0.2 (R)

Table D-2.0-7 (continued)

Sample ID	Location ID	Depth (ft)	Manganese-54		Mercury-203		Neptunium-237		Potassium-40		Protactinium-231	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	0.03	0.055 (U)	0.042	0.0495 (U)	-0.38	0.295 (U)	38.9	4.6	2.8	1.75 (U)
MD21-99-0052	21-11044	9.5–10	0.03	0.06 (U)	-0.024	0.045 (U)	-0.38	0.265 (U)	27.5	3.6	2	1.35 (U)
MD21-99-0053	21-11044	14.5–15	0	0.055 (U)	-0.036	0.0495 (U)	-0.18	0.325 (U)	31.4	3.9	2.5	1.7 (U)
MD21-99-0054	21-11044	19.5–20	0.053	0.0495 (U)	-0.033	0.04 (U)	-0.18	0.23 (U)	33.1	3.95	0.1	1.3 (U)
MD21-99-0055	21-11045	2.5–3.5	0	0.0435 (U)	0.024	0.0475 (U)	-0.72	0.305 (U)	21.7	2.85	0.6	1.55 (U)
MD21-99-0056	21-11045	7–7.5	0	0.065 (U)	-0.02	0.0395 (U)	0.67	0.42 (U)	32	3.85	1.4	1.35 (U)
MD21-99-0057	21-11045	9.5–10	-0.11	0.07 (U)	-0.033	0.0475 (U)	0.76	0.345 (R)	32.3	4	2	1.65 (U)
MD21-99-0058	21-11045	14.5–15	0.06	0.0495 (U)	-0.06	0.0495 (U)	-0.6	0.275 (U)	27	3.35	2.7	1.45 (U)
MD21-99-0059	21-11046	4–5	0	0.065 (U)	0.063	0.048 (U)	0.65	0.33 (U)	27.9	3.7	1.6	1.25 (U)
MD21-99-0060	21-11046	9.5–10	-0.14	0.06 (U)	0.046	0.0495 (U)	-0.41	0.3 (U)	25.6	3.3	3.6	1.45 (R)
MD21-99-0061	21-11046	13.75–14.5	0.033	0.042 (U)	-0.1	0.047 (U)	0.15	0.29 (U)	29.1	3.6	1.8	1.5 (U)
MD21-99-0062	21-11046	19.5–20	0.001	0.0375 (U)	-0.025	0.0405 (U)	0.05	0.275 (U)	29.1	3.5	1.8	1.35 (U)
MD21-99-0063	21-11047	4.5–5	0.012	0.0425 (U)	0.012	0.0335 (U)	0.09	0.21 (U)	32.3	3.65	-0.4	1.1 (U)
MD21-99-0064	21-11047	9.5–10	0.11	0.055 (U)	-0.03	0.055 (U)	-0.54	0.325 (U)	33.4	4.05	1.7	1.45 (U)
MD21-99-0065	21-11047	14.5–15	0.048	0.048 (U)	0.012	0.041 (U)	0.82	0.445 (U)	31.3	3.7	4.5	1.4 (R)
MD21-99-0066	21-11047	19.5–20	0	0.0475 (U)	0.037	0.0455 (U)	-0.9	0.305 (U)	31.3	3.6	2.6	1.35 (U)
MD21-99-0067	21-11048	4.5–5	-0.017	0.037 (U)	-0.001	0.036 (U)	0.35	0.22 (U)	32	3.5	0.4	1.05 (U)
MD21-99-0068	21-11048	9.5–10	-0.03	0.06 (U)	0.056	0.047 (U)	-0.24	0.315 (U)	33.6	4.05	2.6	1.5 (U)
MD21-99-0069	21-11048	14.5–15	0.01	0.055 (U)	-0.016	0.0405 (U)	0.46	0.265 (U)	29.8	3.5	0.4	1.25 (U)
MD21-99-0070	21-11048	19.5–20	-0.035	0.0455 (U)	-0.049	0.038 (U)	-0.5	0.295 (U)	27.9	3.4	0.8	1.3 (U)
MD21-99-0071	21-11045	19.5–20	-0.1	0.055 (U)	0.07	0.05 (U)	-0.14	0.25 (U)	29.2	3.65	0.5	1.2 (U)
MD21-99-0072	21-11046	4–5	-0.04	0.065 (U)	-0.012	0.05 (U)	-0.75	0.32 (U)	25.3	3.4	3.7	1.55 (R)

Table D-2.0-7 (continued)

Sample ID	Location ID	Depth (ft)	Protactinium-233		Protactinium-234M		Radium-223		Radium-224		Radium-226	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	0.02	0.1 (U)	-6	11.5 (U)	0.4	0.85 (U)	-6	1.6 (U)	3.5	1.25 (R)
MD21-99-0052	21-11044	9.5–10	-0.14	0.07 (U)	7	8 (U)	-0.3	0.75 (U)	-10.4	1.55 (U)	2.7	1.55 (U)
MD21-99-0053	21-11044	14.5–15	0	0.085 (U)	19	9.5 (U)	-0.1	0.9 (U)	-7.4	1.45 (U)	2.4	1.55 (U)
MD21-99-0054	21-11044	19.5–20	-0.09	0.07 (U)	-3	7.5 (U)	-1.2	0.75 (U)	NR	(R)	2.7	1.05 (R)
MD21-99-0055	21-11045	2.5–3.5	-0.02	0.09 (U)	9	7.5 (U)	-0.7	0.85 (U)	3.8	1.65 (R)	2.9	0.95 (R)
MD21-99-0056	21-11045	7–7.5	0.05	0.07 (U)	8	11.5 (U)	-0.5	0.7 (U)	-6.8	1.35 (U)	2.8	1.35 (R)
MD21-99-0057	21-11045	9.5–10	-0.1	0.07 (U)	14	9 (U)	0.6	0.85 (U)	-5.6	1.4 (U)	1.3	1 (U)
MD21-99-0058	21-11045	14.5–15	0.11	0.075 (U)	-3	10 (U)	0.6	0.7 (U)	NR	(R)	2.8	0.9 (R)
MD21-99-0059	21-11046	4–5	-0.03	0.08 (U)	10	8 (U)	-0.2	0.8 (U)	NR	(R)	2.7	1.55 (U)
MD21-99-0060	21-11046	9.5–10	0.07	0.075 (U)	6	8 (U)	-1	0.7 (U)	NR	(R)	2	0.85 (R)
MD21-99-0061	21-11046	13.75–14.5	0.04	0.085 (U)	12	10.5 (U)	-0.5	0.7 (U)	2.5	1.5 (U)	3.2	1.1 (R)
MD21-99-0062	21-11046	19.5–20	0.08	0.07 (U)	-5	9.5 (U)	0	0.7 (U)	NR	(R)	2.2	0.85 (R)
MD21-99-0063	21-11047	4.5–5	-0.1	0.055 (U)	0	10.5 (U)	-0.3	0.7 (U)	-5.5	1.25 (U)	0.6	0.8 (U)
MD21-99-0064	21-11047	9.5–10	0.04	0.08 (U)	17	10 (U)	-0.1	0.8 (U)	NR	(R)	3.1	1.4 (R)
MD21-99-0065	21-11047	14.5–15	-0.06	0.07 (U)	4	10 (U)	-1.1	0.65 (U)	-8.6	1.4 (U)	3	1.25 (R)
MD21-99-0066	21-11047	19.5–20	0	0.09 (U)	-9	12 (U)	0.3	0.85 (U)	NR	(R)	2.6	0.95 (R)
MD21-99-0067	21-11048	4.5–5	-0.05	0.055 (U)	-6	7.5 (U)	-0.8	0.55 (U)	3.3	1.55 (R)	1.1	0.8 (U)
MD21-99-0068	21-11048	9.5–10	0.14	0.085 (U)	-10	12 (U)	-0.5	0.75 (U)	5.3	2.4 (R)	2.1	0.95 (R)
MD21-99-0069	21-11048	14.5–15	0.04	0.065 (U)	-7	8 (U)	0.1	0.7 (U)	-7.3	1.35 (U)	2	1.25 (U)
MD21-99-0070	21-11048	19.5–20	-0.01	0.065 (U)	8	10 (U)	1.1	0.85 (U)	NR	(R)	2.9	0.9 (R)
MD21-99-0071	21-11045	19.5–20	0.03	0.08 (U)	6	9 (U)	0	0.65 (U)	-7.4	1.5 (U)	2.4	1.55 (U)
MD21-99-0072	21-11046	4–5	0.06	0.085 (U)	10	7 (U)	0.5	1 (U)	4	1.4 (R)	2.8	1.05 (R)

Table D-2.0-7 (continued)

Sample ID	Location ID	Depth (ft)	Radon-219		Ruthenium-106		Selenium-75		Sodium-22	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	-0.2	0.55 (U)	-0.1	0.55 (U)	0.09	0.05 (U)	0	0.065 (U)
MD21-99-0052	21-11044	9.5–10	0.51	0.415 (U)	0.02	0.38 (U)	0.069	0.0475 (U)	-0.02	0.08 (U)
MD21-99-0053	21-11044	14.5–15	-0.2	0.55 (U)	1.1	0.55 (R)	0.04	0.055 (U)	-0.03	0.075 (U)
MD21-99-0054	21-11044	19.5–20	0.19	0.42 (U)	0.39	0.45 (U)	0.04	0.05 (U)	0.05	0.0455 (U)
MD21-99-0055	21-11045	2.5–3.5	-0.6	0.55 (U)	0.4	0.6 (U)	-0.052	0.043 (U)	-0.11	0.085 (U)
MD21-99-0056	21-11045	7–7.5	0.33	0.46 (U)	0.28	0.45 (U)	-0.017	0.043 (U)	-0.08	0.075 (U)
MD21-99-0057	21-11045	9.5–10	0	0.6 (U)	0	0.6 (U)	-0.05	0.055 (U)	0.02	0.065 (U)
MD21-99-0058	21-11045	14.5–15	0.4	0.55 (U)	0.28	0.41 (U)	-0.074	0.0485 (U)	0.06	0.07 (U)
MD21-99-0059	21-11046	4–5	0.3	0.5 (U)	-0.17	0.435 (U)	-0.123	0.044 (U)	0.14	0.075 (U)
MD21-99-0060	21-11046	9.5–10	0.3	0.55 (U)	-0.21	0.485 (U)	0.043	0.045 (U)	0.05	0.075 (U)
MD21-99-0061	21-11046	13.75–14.5	-0.3	0.6 (U)	0.1	0.43 (U)	-0.057	0.047 (U)	0.12	0.07 (U)
MD21-99-0062	21-11046	19.5–20	-0.4	0.5 (U)	-0.18	0.4 (U)	-0.003	0.046 (U)	0.02	0.065 (U)
MD21-99-0063	21-11047	4.5–5	0.48	0.425 (U)	0.35	0.42 (U)	0.053	0.04 (U)	0.08	0.06 (U)
MD21-99-0064	21-11047	9.5–10	0	0.5 (U)	-0.1	0.5 (U)	-0.02	0.05 (U)	-0.03	0.07 (U)
MD21-99-0065	21-11047	14.5–15	0.77	0.45 (U)	-0.19	0.385 (U)	0.101	0.0475 (R)	-0.05	0.065 (U)
MD21-99-0066	21-11047	19.5–20	-0.08	0.5 (U)	0.1	0.5 (U)	0.005	0.0495 (U)	0.02	0.075 (U)
MD21-99-0067	21-11048	4.5–5	0.05	0.385 (U)	-0.38	0.385 (U)	0.085	0.04 (R)	0.038	0.0485 (U)
MD21-99-0068	21-11048	9.5–10	0.4	0.55 (U)	0.23	0.495 (U)	0.087	0.049 (U)	0.03	0.06 (U)
MD21-99-0069	21-11048	14.5–15	-0.06	0.465 (U)	-0.39	0.335 (U)	-0.095	0.038 (U)	0	0.065 (U)
MD21-99-0070	21-11048	19.5–20	-0.28	0.385 (U)	0.72	0.395 (U)	-0.037	0.0425 (U)	-0.09	0.075 (U)
MD21-99-0071	21-11045	19.5–20	0.26	0.495 (U)	0.27	0.435 (U)	-0.079	0.034 (U)	-0.04	0.065 (U)
MD21-99-0072	21-11046	4–5	0.1	0.55 (U)	-0.4	0.5 (U)	0.03	0.06 (U)	-0.02	0.06 (U)

Table D-2.0-7 (continued)

Sample ID	Location ID	Depth (ft)	Strontium-85		Thallium-208		Thorium-227		Thorium-234	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	0.06	0.08 (U)	0.52	0.125	-0.33	0.26 (U)	-0.1	1.35 (U)
MD21-99-0052	21-11044	9.5–10	-0.11	0.065 (U)	0.36	0.15 (U)	-0.34	0.27 (U)	-1.3	1.2 (U)
MD21-99-0053	21-11044	14.5–15	-0.05	0.065 (U)	0.26	0.14 (U)	-0.31	0.27 (U)	-1.8	1.5 (U)
MD21-99-0054	21-11044	19.5–20	-0.07	0.065 (U)	0.37	0.125 (U)	-0.21	0.275 (U)	-1.8	1.2 (U)
MD21-99-0055	21-11045	2.5–3.5	-0.06	0.065 (U)	0.47	0.11	0.11	0.27 (U)	-3.7	1.4 (U)
MD21-99-0056	21-11045	7–7.5	-0.06	0.06 (U)	0.36	0.115	-0.25	0.2 (U)	-0.1	1.25 (U)
MD21-99-0057	21-11045	9.5–10	-0.09	0.07 (U)	0.45	0.125	-0.64	0.295 (U)	-3.5	1.6 (U)
MD21-99-0058	21-11045	14.5–15	-0.04	0.06 (U)	0.42	0.12	-0.25	0.25 (U)	-1.1	1.4 (U)
MD21-99-0059	21-11046	4–5	-0.15	0.07 (U)	0.38	0.125	-0.06	0.265 (U)	-2.6	1.3 (U)
MD21-99-0060	21-11046	9.5–10	-0.03	0.065 (U)	0.33	0.125 (U)	-0.38	0.23 (U)	-5.1	1.4 (U)
MD21-99-0061	21-11046	13.75–14.5	-0.1	0.065 (U)	0.38	0.115	-0.33	0.25 (U)	-2.2	1.35 (U)
MD21-99-0062	21-11046	19.5–20	-0.08	0.05 (U)	0.68	0.12	-0.44	0.225 (U)	-3.8	1.3 (U)
MD21-99-0063	21-11047	4.5–5	0	0.05 (U)	0.58	0.105	0.05	0.22 (U)	-3	1.1 (U)
MD21-99-0064	21-11047	9.5–10	-0.16	0.06 (U)	0.44	0.12	-0.1	0.26 (U)	-4.5	1.45 (U)
MD21-99-0065	21-11047	14.5–15	-0.05	0.055 (U)	0.47	0.105	-0.29	0.225 (U)	-1.1	1.1 (U)
MD21-99-0066	21-11047	19.5–20	-0.08	0.055 (U)	0.36	0.11	-0.46	0.255 (U)	-2	1.35 (U)
MD21-99-0067	21-11048	4.5–5	-0.08	0.05 (U)	0.49	0.1	-0.07	0.185 (U)	-1.7	1 (U)
MD21-99-0068	21-11048	9.5–10	-0.06	0.06 (U)	0.61	0.125	-0.23	0.245 (U)	-1.3	1.45 (U)
MD21-99-0069	21-11048	14.5–15	0.12	0.055 (U)	0.48	0.12	-0.17	0.225 (U)	-1.5	1.1 (U)
MD21-99-0070	21-11048	19.5–20	0.033	0.048 (U)	0.44	0.125	-0.09	0.23 (U)	-3.1	1.35 (U)
MD21-99-0071	21-11045	19.5–20	-0.12	0.055 (U)	0.57	0.135	-0.27	0.235 (U)	-0.8	1.25 (U)
MD21-99-0072	21-11046	4–5	-0.02	0.055 (U)	0.47	0.13	-0.72	0.265 (U)	-1.3	1.45 (U)

Table D-2.0-7 (continued)

Sample ID	Location ID	Depth (ft)	Tin-113		Uranium-235		Yttrium-88		Zinc-65	
			Results	Uncertainty	Results	Uncertainty	Results	Uncertainty	Results	Uncertainty
MD21-99-0051	21-11044	4.5–5	-0.05	0.055 (U)	0.19	0.075 (R)	-0.02	0.055 (U)	-0.01	0.175 (U)
MD21-99-0052	21-11044	9.5–10	0.08	0.06 (U)	0.17	0.07 (R)	0	0.075 (U)	0.17	0.13 (U)
MD21-99-0053	21-11044	14.5–15	-0.034	0.0425 (U)	0.07	0.065 (U)	0.15	0.06 (R)	0.01	0.13 (U)
MD21-99-0054	21-11044	19.5–20	-0.015	0.0495 (U)	0.09	0.06 (U)	-0.04	0.065 (U)	0.09	0.095 (U)
MD21-99-0055	21-11045	2.5–3.5	-0.01	0.055 (U)	0.07	0.06 (U)	0.04	0.07 (U)	-0.08	0.14 (U)
MD21-99-0056	21-11045	7–7.5	-0.081	0.0435 (U)	0.12	0.06 (R)	-0.11	0.06 (U)	0.14	0.14 (U)
MD21-99-0057	21-11045	9.5–10	0.03	0.06 (U)	-0.02	0.065 (U)	0.02	0.07 (U)	-0.09	0.16 (U)
MD21-99-0058	21-11045	14.5–15	0.08	0.055 (U)	0.03	0.05 (U)	0.009	0.0485 (U)	-0.06	0.1 (U)
MD21-99-0059	21-11046	4–5	0.01	0.055 (U)	0.12	0.065 (U)	-0.19	0.065 (U)	-0.11	0.13 (U)
MD21-99-0060	21-11046	9.5–10	-0.08	0.055 (U)	0.03	0.05 (U)	-0.05	0.06 (U)	0.03	0.135 (U)
MD21-99-0061	21-11046	13.75–14.5	0.08	0.05 (U)	0.13	0.065 (R)	-0.02	0.07 (U)	0.09	0.135 (U)
MD21-99-0062	21-11046	19.5–20	-0.01	0.05 (U)	0.05	0.05 (U)	0.01	0.06 (U)	-0.11	0.14 (U)
MD21-99-0063	21-11047	4.5–5	0	0.0375 (U)	0.047	0.049 (U)	0.06	0.055 (U)	-0.08	0.14 (U)
MD21-99-0064	21-11047	9.5–10	-0.05	0.05 (U)	0.16	0.065 (R)	-0.09	0.065 (U)	-0.08	0.15 (U)
MD21-99-0065	21-11047	14.5–15	0.017	0.0415 (U)	0.16	0.06 (R)	-0.13	0.06 (U)	0.11	0.1 (U)
MD21-99-0066	21-11047	19.5–20	-0.024	0.0435 (U)	0.11	0.055 (U)	0.05	0.07 (U)	-0.22	0.16 (U)
MD21-99-0067	21-11048	4.5–5	0.019	0.0415 (U)	0.084	0.0465 (U)	-0.01	0.05 (U)	0.09	0.085 (U)
MD21-99-0068	21-11048	9.5–10	0.01	0.06 (U)	0.06	0.06 (U)	0.005	0.0485 (U)	-0.18	0.135 (U)
MD21-99-0069	21-11048	14.5–15	0.016	0.0445 (U)	0.12	0.055 (R)	0.06	0.055 (U)	0	0.125 (U)
MD21-99-0070	21-11048	19.5–20	-0.03	0.055 (U)	0.06	0.055 (U)	0.01	0.065 (U)	0.08	0.155 (U)
MD21-99-0071	21-11045	19.5–20	0.06	0.05 (U)	0.22	0.07 (R)	-0.07	0.065 (U)	-0.15	0.14 (U)
MD21-99-0072	21-11046	4–5	-0.06	0.06 (U)	0.08	0.065 (U)	0.07	0.07 (U)	0.05	0.185 (U)

*NR = not reported due to spectral interference.

APPENDIX D REFERENCES

LANL, July 1, 1995. "Statement of Work (formerly called Requirements Document) – Analytical Support," (RFP Number 9-XS1-Q4257) (Revision 2 – July, 1995)." (LANL, 1995, 49738.1)

LANL, March 1996. "Quality Assurance Project Plan Requirements for Sampling and Analysis," Los Alamos National Laboratory report LA UR-96-441 Los Alamos, New Mexico. (LANL 1996, 54609)

LANL, October 31, 1992. "Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance," Los Alamos National Laboratory manual LA-10300-M, Vol. 1, Los Alamos, New Mexico. (LANL 1992, 31793)

Appendix E

Statistical Analyses

APPENDIX E STATISTICAL ANALYSES

No statistical analyses were conducted for Potential Release Site 21-005.

Appendix F

Risk Assessment Calculations

APPENDIX F RISK ASSESSMENT CALCULATIONS

F-1.0 RISK ASSESSMENT

No human health risk assessment was conducted for Potential Release Site (PRS) 21-005.

F-2.0 FATE AND TRANSPORT INFORMATION FOR INORGANIC CHEMICALS OF POTENTIAL CONCERN

Several inorganic chemicals were detected at concentrations greater than background in a sample collected beneath the bottom of the pit. These inorganic chemicals (aluminum, barium, nickel, and selenium) were considered to be potentially the result of a release from the pit and are discussed below with respect to potential fate and transport in the environment. This section of the appendix presents specific chemical properties that affect the fate and transport of chemicals identified as chemicals of potential concern (COPCs) at PRS 21-005. Information presented here on the fate and transport of inorganic chemicals in the soil is taken from the toxicological profiles from the Agency for Toxic Substances and Disease Registry (ATSDR 1997, 56531).

The fate and distribution of chemicals in the environment are determined by several variables that can interact in numerous ways: i.e., physicochemical properties of the individual chemical and the physical transport systems such as rainwater or snowmelt runoff. The asphalt parking lot that covers PRS 21-005 prevents physical transport processes. The soil on the top of DP Mesa is Hackroy sandy loam, which consists of very shallow to shallow, well-drained soils that formed in material weathered from tuff on mesa tops. The Hackroy soil exhibits slow permeability and low available-water capacities. It ranges from mildly alkaline at 0–25 cm to neutral at 25–30 cm.

The physicochemical properties such as water solubility, soils adsorption, and vaporization are all important in determining the routes by which an inorganic chemical, or metal, may enter the environment and be distributed. In general, metallic cations are quite insoluble in soil, especially if the soil is not too acidic. Adsorption to particulate matter is a major mechanism by which chemicals are removed from solution and is dependent upon the soil type. Vaporization from soil and water is a function of the vapor pressure of a chemical, as well as temperature, degree of adsorption, soil properties, and soil water content. Metals, however, are not among the volatile or semivolatile chemicals. The relative retention of metals by soil is in the following order: lead, antimony, copper, chromium, zinc, nickel, cobalt, and cadmium (ATSDR 1997, 56531). Specific information on the inorganic chemicals detected at concentrations greater than background in the sampling at PRS 21-005 is presented below.

F-2.1 Aluminum

F-2.1.1 Prediction of Chemical Valence States

Aluminum only has one oxidation state: +3.

F-2.1.2 Affinity of Aluminum for Soil, Water, and Air

Because aluminum has only one oxidation state, its behavior or fate and transport in the environment depends upon its interaction with the characteristics of the local environmental system. Aluminum partitions between solid and liquid phases by reacting and complexing with water molecules and electron-rich anions, such as chloride, fluoride, sulfate, nitrate, phosphate, and negatively charged functional groups, on humic materials and clay. In general, decreasing pH results in an increase in mobility for

monomeric forms of aluminum, which could explain the increased concentrations of aluminum in the samples collected at the nitric acid pit.

In addition to the effect of pH on mobility, the type of acid that enters environmental systems has been shown to be important. In a study, nitric acid was found to leach more aluminum from soil columns representative of high-elevation forest-floor soils than sulfuric acid because of the ability of aluminum to form a more soluble salt with nitrate. However, in mineral horizons below the forest floor, the study found that concentrations of aluminum leached by the acids did not differ from controls. The minerals present were thus able to prevent further aluminum migration.

The adsorption of aluminum onto clay surfaces can be a significant factor in controlling aluminum mobility in the environment, and these adsorption reactions, measured in one study at pH 3.0–4.1, have been observed to be very rapid. However, clays may act either as a sink or a source for soluble aluminum, depending on the degree of aluminum saturation on the clay surface (ATSDR 1997, 56531).

F-2.1.3 Potential for Uptake

The mobilization of aluminum by acid rain (and by nitric acid in the nitric acid pit) results in more aluminum available for plant uptake. Plant species differ considerably in their ability to take up and translocate aluminum to aboveground parts (ATSDR 1997, 56531).

F-2.2 Barium

F-2.2.1 Prediction of Chemical Valence States

Under natural conditions, barium will form compounds in the +2 oxidation state.

F-2.2.2 Affinity of Barium for Soil, Water, and Air

Elemental barium is oxidized readily in moist air. The residence time of barium in the atmosphere may be several days; this is dependent upon the size of the particulate formed, the chemical nature of the particulate, and environmental factors such as rainfall. The barium ion (Ba^{+2}) is stable under the pH-Eh range of natural systems. However, natural and treated waters usually contain sufficient sulfate so that a barium ion concentration of more than 1000–1500 mg/l cannot be maintained in solution.

Barium reacts with metal oxides and hydroxides in soil and is subsequently adsorbed onto soil particulates. Barium added to soils may either be taken up by vegetation or transported through soil with precipitation. Relative to the amount of barium found in soils, little is bioconcentrated by plants. However, this transport pathway has not been comprehensively studied (ATSDR 1997, 56531).

F-2.2.3 Potential for Uptake

Some plants bioconcentrate barium from the soil. Brazil nuts have notably high concentrations of barium (3000–4000 ppm). Barium was found to bioconcentrate in marine plants by a factor of 1000 times the level present in the water. Bioconcentration factors in marine animals, plankton, and in brown algae of 100, 120, and 260, respectively, have been reported (ATSDR 1997, 56531).

F-2.3 Nickel

F-2.3.1 Prediction of Chemical Valence States

While nickel can exist in oxidation states -1, 0, +2, +3, and +4, its only important oxidation state is Ni^{+2} under natural environmental conditions. The divalent state of nickel forms an extensive series of compounds and is the only important oxidation state in aqueous systems. Other oxidation states occur in special complexes and oxides (ATSDR 1997, 56531).

F-2.3.2 Affinity of Nickel for Soil, Water, and Air

Nickel and nickel compounds have negligible vapor pressures. Therefore, volatilization of nickel from the soil into the air is not expected to be a pathway of concern.

Nickel is strongly adsorbed by soil. Nickel is a natural constituent of soil and is transported into streams and waterways in runoff either because of natural weathering or from disturbed soil. Much of the nickel released into waterways as runoff is associated with particulate matter; it is transported and settles out in areas of active sedimentation (ATSDR 1997, 56531).

F-2.3.3 Potential for Uptake

Nickel is not accumulated in significant amounts by aquatic organisms. The range of BCFs (bioconcentration factors) appears to be 40–100 in fish and 100–259 in invertebrates. The lack of significant bioaccumulation of nickel in aquatic organisms, voles, and rabbits would indicate that nickel is not biomagnified in the food chain (ATSDR 1997, 56531).

F-2.4 Selenium

F-2.4.1 Prediction of Chemical Valence States

Selenium is stable in four valence states: -2, 0, +4, and +6. The heavy metal selenides (-2) are insoluble in water, as is elemental selenium. The inorganic alkali selenites (+4) and selenates (+6) are soluble in water and are therefore more bioavailable.

F-2.4.2 Affinity of Selenium for Soil, Water, and Air

The primary determinant of selenium concentrations in the soil is the selenium content of the parent bedrock materials that release selenium by way of weathering processes and leaching. Natural weathering processes are thought to release about 100,000–200,000 metric tons of selenium per year. Atmospheric deposition of selenium also contributes to selenium in the soil. In the past, selenium was used in pesticide products, but, because of its stability in soils and subsequent contamination of food crops, its use in pesticide products is now restricted (ATSDR 1997, 56531).

F-2.4.3 Potential for Uptake

The soluble selenates are readily taken up by plants and converted to organic compounds such as selenomethionine, selenocysteine, dimethyl selenide, and dimethyl diselenide. Selenium is bioaccumulated by aquatic organisms and may also biomagnify in aquatic organisms (ATSDR 1997, 56531).

F-3.0 ECOLOGICAL SCOPING CHECKLIST

Part A—Scoping Meeting Documentation

Site ID	PRS 21-005
Form of Site Releases (solid, liquid, vapor) Describe all relevant known or suspected *mechanisms* of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential *areas* of release. Reference locations on a map, as appropriate.	This PRS was an acid pit in Technical Area (TA) 21 (TA-21-70) installed in 1946 to dispose of classified documents. The pit was partially aboveground and was a 3-ft-square by 4-ft-deep reinforced concrete structure. The concrete structure, except for the slab at the bottom, was removed in 1967 and disposed of at Material Disposal Area G. The only material known to be used at this site was concentrated nitric acid. There were no known releases at this site. Any releases would have been as liquid (HNO_3) from spills or leaks. The soil under and around the pit would have received any releases from the pit.
List of Primary Impacted Media Indicate all that apply.	Surface soil – X – May have been impacted from spills Surface Water/Sediment – Not applicable Subsurface – XX – Primary impacted medium if the pit had leaked Groundwater – Not applicable Other, explain – Not applicable
Facility for Information Management, Analysis, and Display (FIMAD) Vegetation Class Based on Arcview Vegetation Coverage Indicate all that apply.	Water – Not applicable Bare Ground/Unvegetated – Not applicable Spruce/fir/aspen/mixed conifer – Not applicable Ponderosa pine – Not applicable Piñon juniper/juniper savannah – Not applicable Grassland/shrubland – There is a small area of grass/weeds/wildflowers about 10 ft wide and about 6 ft north of the pit. Developed – The PRS is within the developed portion of TA-21. It is located approximately 100 ft east of building TA-21-30 in an asphalt parking area and about the same distance south of building TA-21-31.
Is threatened and endangered (T&E) species habitat present? If applicable, list species known or suspected that use the site for breeding or foraging.	The PRS is entirely within an area of potential Mexican spotted owl nesting habitat and within an area in which the spotted owl can be conservatively assumed to forage at a medium frequency. It is also in the vicinity of potential peregrine falcon nesting habitat, approximately 1600 ft away and within an area in which the falcon can conservatively be assumed to forage at a relatively high frequency. The PRS is within an area in which the bald eagle is conservatively assumed to forage at a relatively low frequency.
Provide a list, of neighboring/ contiguous/ upgradient sites; include a brief summary of COPCs and the form of releases for relevant sites, and reference a map, as appropriate. Use this information to evaluate the need to aggregate sites for screening.	There are no other PRSs immediately adjacent to or contiguous with the acid pit. However, the site is within the TA-21 complex; there are numerous other PRSs in the general vicinity. The nearest PRS was 21-002(b), which was a former drum storage structure (TA-21-38); it is located approximately 50 ft southeast of Building TA-21-31 and approximately 75 ft northeast of PRS 21-005. The structure was a 10-ft high, 15-ft by 36-ft wood frame building built in 1945 and decommissioned in 1966. The COPCs for this PRS may include radionuclides, inorganic chemicals, and organic chemicals. The next closest PRS is C-21-024, which is the location of a former warehouse and associated soil; it is located approximately 125 ft east of PRS 21-005. This structure has been demolished and disposed of at TA-54, Area G, Pit 4. The COPCs for this PRS are unknown but assumed to be similar to other TA-21 sites. Because the pit is a subsurface structure, releases from other PRSs would not influence this site.

Surface Water Erosion Potential Information

Surface Water Erosion Potential Information Summarize information from the standard operating procedure 2.01, including the runoff subscore (maximum of 46), terminal point of surface water transport, slope, and surface water run-on sources.	The erosion matrix score for this PRS is 17.5, with 6.9 for runoff (visible evidence of discharge [5.0] and terminates in a ditch [1.9]) and 7.0 for run-on (structures adversely affecting run on) scores. The score also reflects it is a mesa top site (1.0), ground cover is >75% (1.3), and slope is 0-10% (1.3). No potential exists for soil erosion at this site. The runoff appears to terminate along an access road into a bar ditch on the northeast side of building TA-21-30.

Part B—Site Visit Documentation

Site ID	PRS 21-005
Date of Site Visit	6/30/99
Site Visit Conducted by	Richard Mirenda

Receptor Information

Estimate Cover	Relative vegetative cover (high, medium, low, none) = none Relative wetland cover (high, medium, low, none) = none Relative structures/asphalt cover (high, medium, low, none) = high. PRS was covered by asphalt is in a paved parking area next to building TA-21-30.
Field Notes on the FIMAD Vegetation Class to Assist in Ground-Truthing the Arcview Information	FIMAD has the area classified as developed. Site visit confirms that this PRS is within the developed portion of TA-21.
Field Notes on T&E Habitat (if applicable) Consider the need for a site visit by a T&E subject matter expert to support the use of the site by T&E receptors.	The PRS is below the surface and in the middle of a developed TA. This area does not provide any habitat for nesting or foraging for the T&E species.
Are ecological receptors present at the site? (yes/no/uncertain) Describe the general types of receptors present at the site (terrestrial and aquatic), and make notes on the quality of habitat present at the site.	No. The area is an asphalt-paved parking lot next to a building. The area to the south is also a paved parking area, and to the north is building TA-21-31 and more pavement. There is no available habitat for foraging or nesting for terrestrial receptors, and no burrowing activity has occurred at the site. There is also no aquatic habitat present on the mesa top.

Contaminant Transport Information

Surface Water Transport Field notes should summarize the erosion potential, including a discussion of the terminal point of surface water transport, if applicable.	The area is relatively flat (<10% slope), and there is no evidence of erosion on site or in the area around the site. Any surface runoff would flow to the north towards DP Canyon, which is located about 300 ft from the PRS.

Are there any off-site transport pathways (surface water, air, or groundwater)? (yes/no/uncertain)	No. The acid pit was a subsurface structure made of reinforced concrete. The entire structure has been removed, and there is no evidence of a release. Surface water may have been a viable pathway if there were any spills of nitric acid on the surface. However, this would have been a minor pathway and transitory in nature (i.e., nitric acid would have evaporated quickly. Subsurface off-site transport is unlikely due to the nature of the PRS.
Is an interim action (IA) needed to limit off-site transport? (yes/no/uncertain) Provide explanation/ recommendation to project lead for IA strategic management decision point (SMDP).	No. The structure has been removed and is below ground.

Ecological Effects Information

Physical Disturbance Provide list of major types of disturbances, including erosion and construction activities; review historical aerial photos where appropriate.	The major physical disturbances are the facilities presently associated with past and present operations at TA-21. The area is considered to be developed with several buildings near the PRS and asphalt-paved areas at and around the site. Additional physical disturbance is connected with the sampling, which involved the excavation and removal of the pavement and dirt from the site.
Are there obvious ecological effects? (yes/no/uncertain) Provide an explanation and apparent cause (e.g., contamination, physical disturbance, other).	No. Other than the development of the entire area, no obvious ecological effects are apparent.
IA needed to limit apparent ecological effects? (yes/no/uncertain) Provide explanation and recommendations to mitigate apparent exposure pathways to project lead for IA SMDP.	No. The site is developed, and there are no obvious ecological effects.

No Exposure/Transport Pathways

If there are no complete exposure pathways to ecological receptors on site and no transport pathways to off-site receptors, the remainder of the checklist should not be completed. Stop here and provide additional explanation/justification for proposing an ecological no further action recommendation (if needed). At a minimum, the potential for future transport should include likelihood that future construction activities could make contamination more available for exposure or transport.

The site is in a developed area and is situated beneath an asphalt-paved parking area. Based on the low-level inorganic chemicals detected above background and the low-level organic chemical detects in and around the site, a release from the acid pit may have occurred. However, because of the nature of the PRS (subsurface, under asphalt, developed area) ecological receptors are not present on site. Transport pathways to off site receptors are not complete because the pit was a reinforced concrete structure, so leaks from the pit would have been unlikely, and it was located under asphalt. Therefore, an ecological no further action is recommended for PRS 21-005.

Signatures and certifications:

Checklist completed by (provide name, organization and phone number):

Name (printed): Richard Mirenda, Ph.D.
Name (signature): Richard Mirenda
Organization: MK/PMC
Phone number: (505)662-1329

Date Completed: 6/30/99

Verification by a member of ER Project Ecological Risk Task Team (provide name, organization and phone number):

Name (printed): LARS SOLGOLT
Name (signature): Lars F Solgolt
Organization: E/ER
Phone number: 7-2256

APPENDIX F REFERENCE

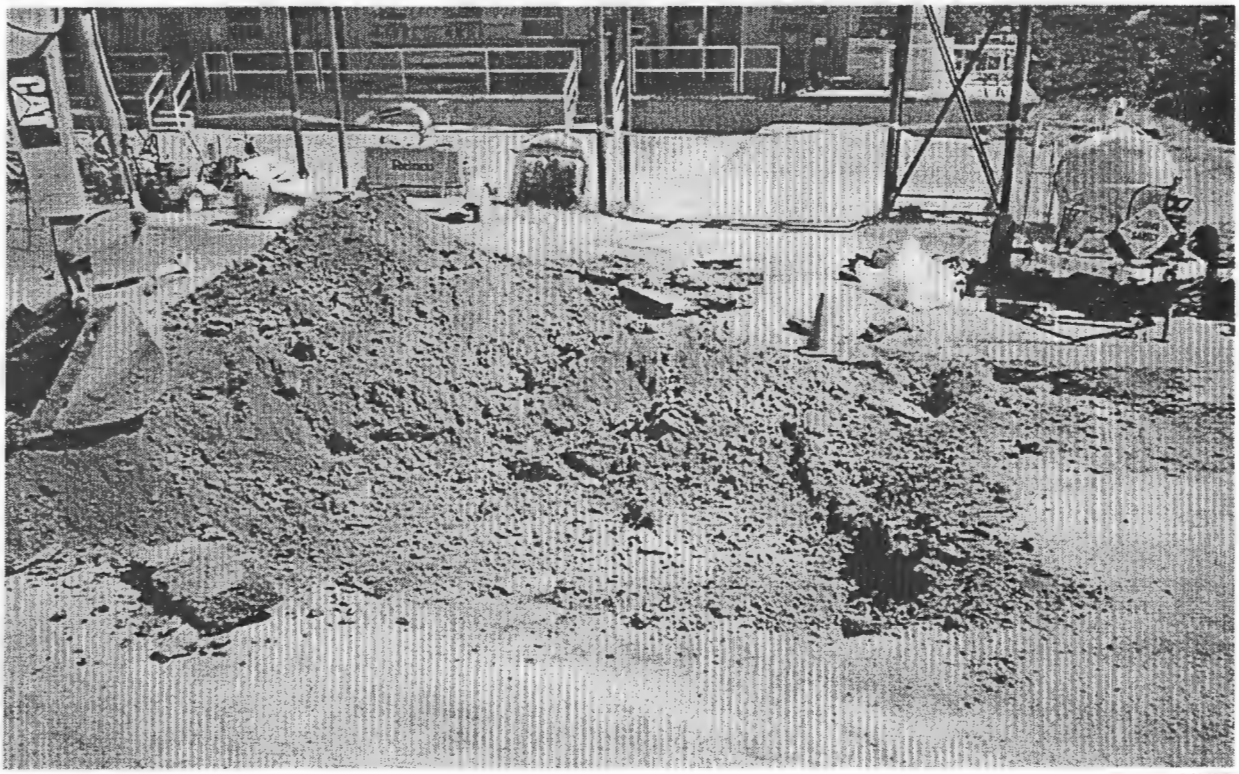
Agency for Toxic Substances and Disease Registry (ATSDR), 1997. "ATSDR's Toxicological Profiles on CD-ROM." (ATSDR, 56531)

Appendix G

Photographs

6/8/99

Figure G-1. Excavating former location of acid pit to determine exact location of the former pit

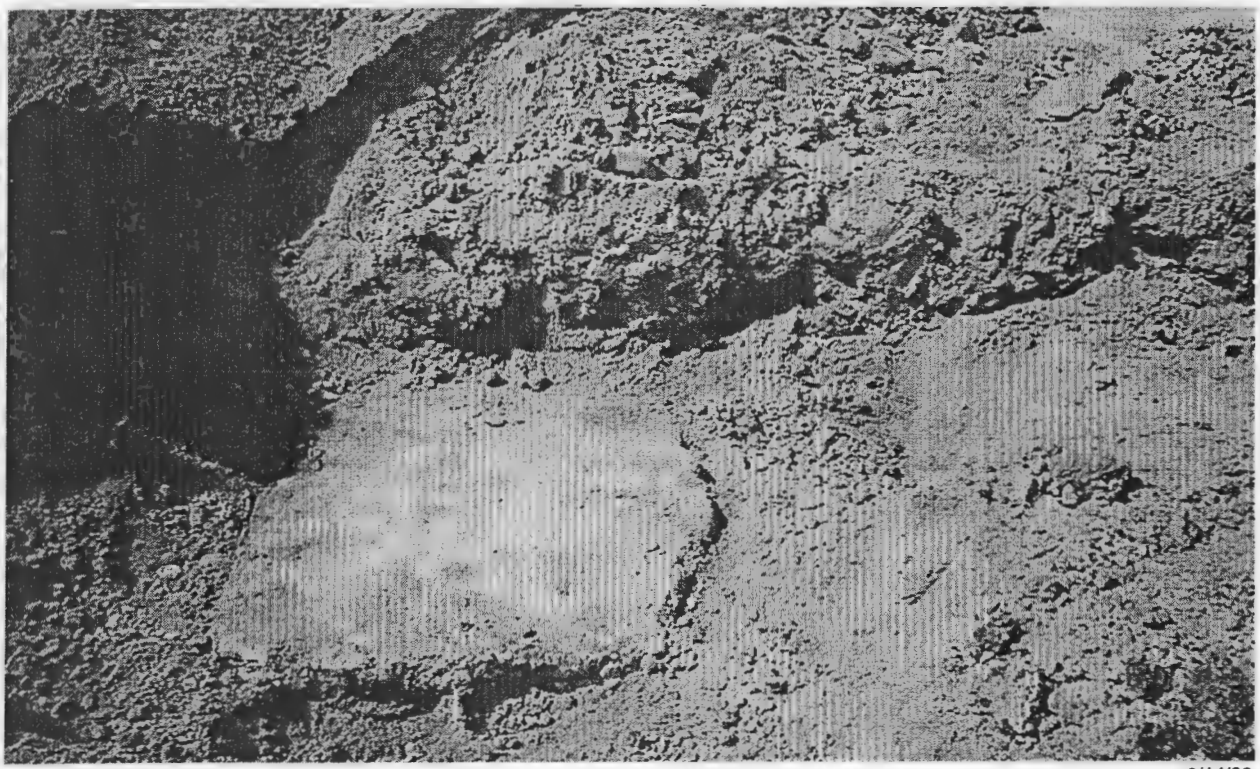


6/8/99

Figure G-2. Excavated area showing relatively flat tuff surface

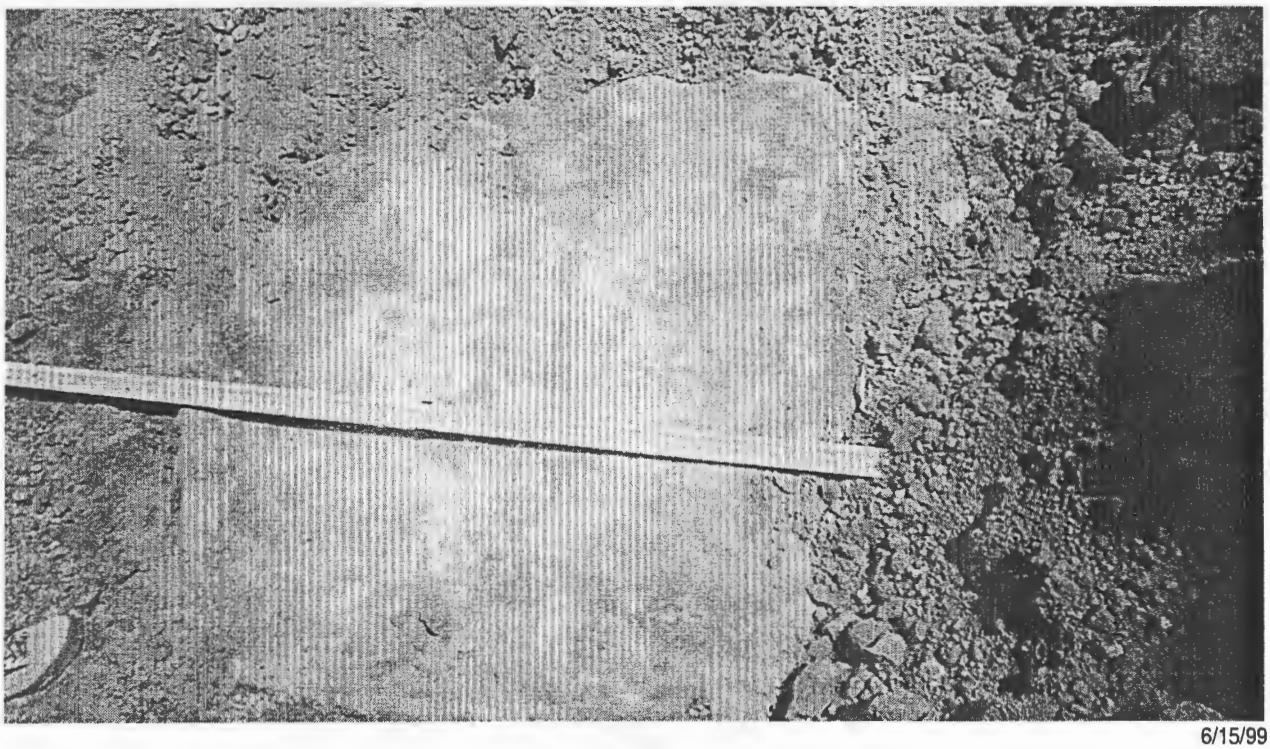
6/15/99

Figure G-3. Excavated area showing relatively flat tuff surface



6/14/99

Figure G-4. Former acid pit bottom as found during excavation

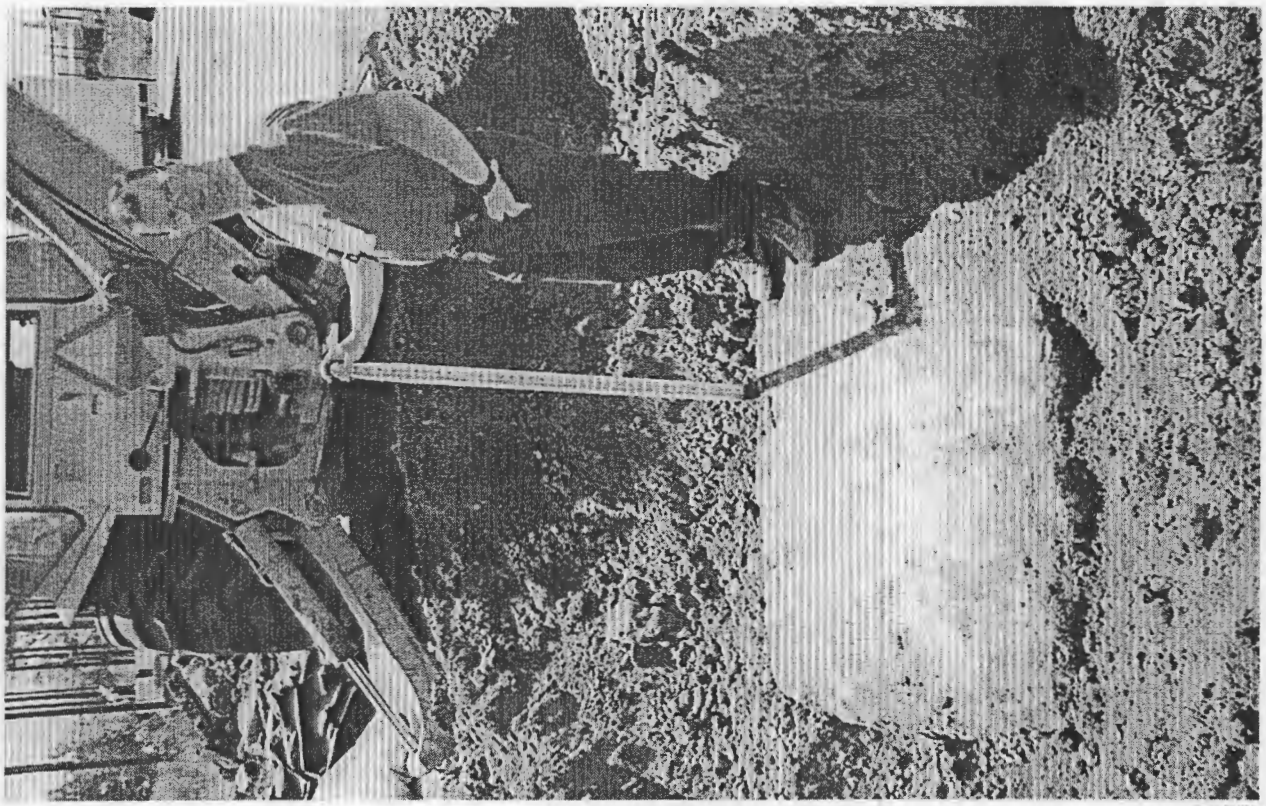


6/15/99

Figure G-5. Acid pit bottom (survey staff for scale)

6/15/99

Figure G-6. Acid pit bottom before removal



6/15/99

Figure G-7. Acid pit bottom before removal

6/15/99

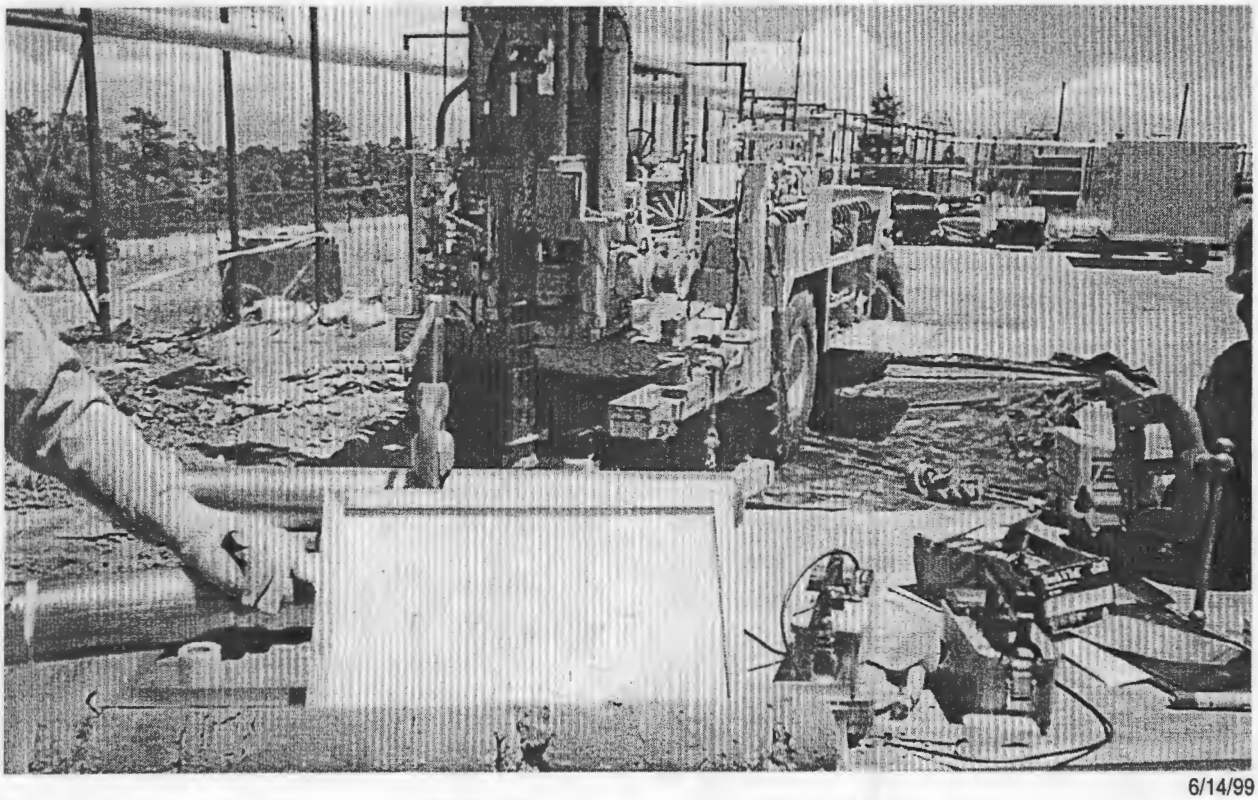
Figure G-8. Removal of acid pit bottom with backhoe

6/14/99

Figure G-9. Location 21-11044 (pit center), run 1, 0 to 2.5 ft (bgs)

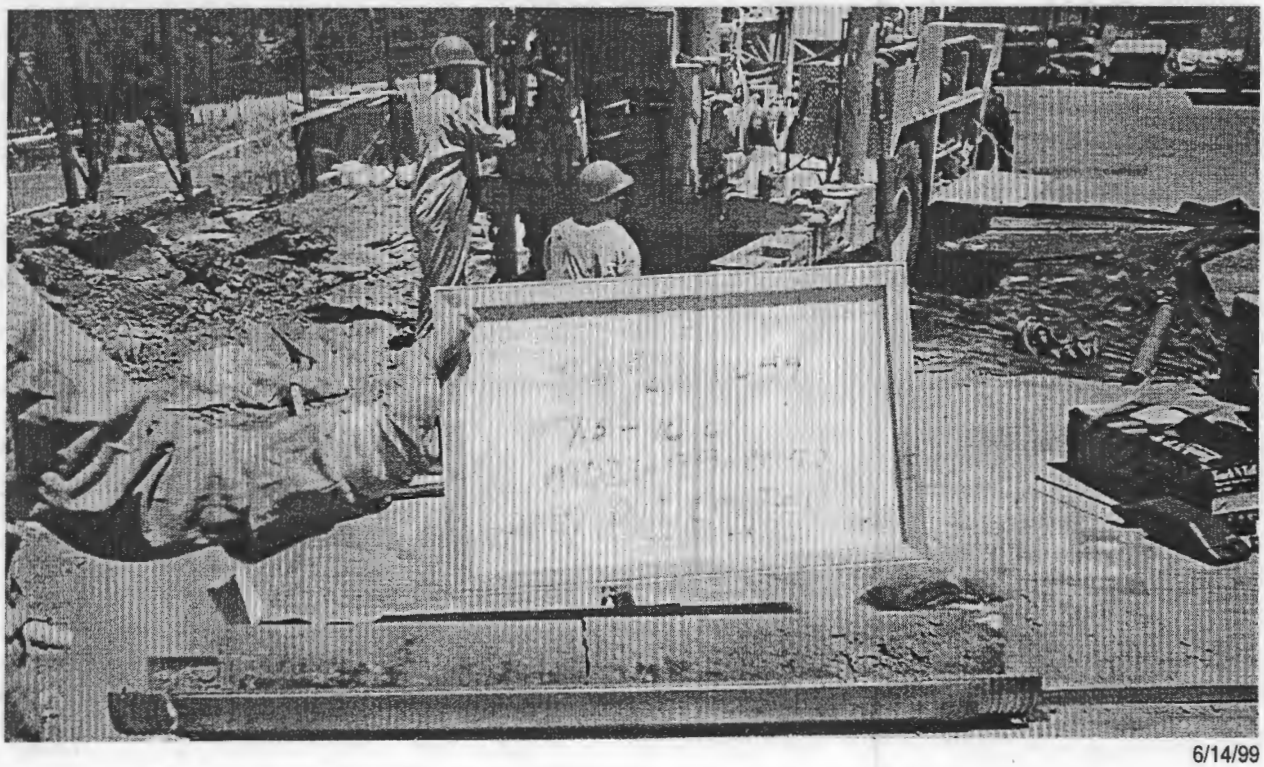
6/14/99

Figure G-10. Location 21-11044 (pit center), run 2, 2.5 to 5.0 ft (bgs), sample number MD21-99-0051



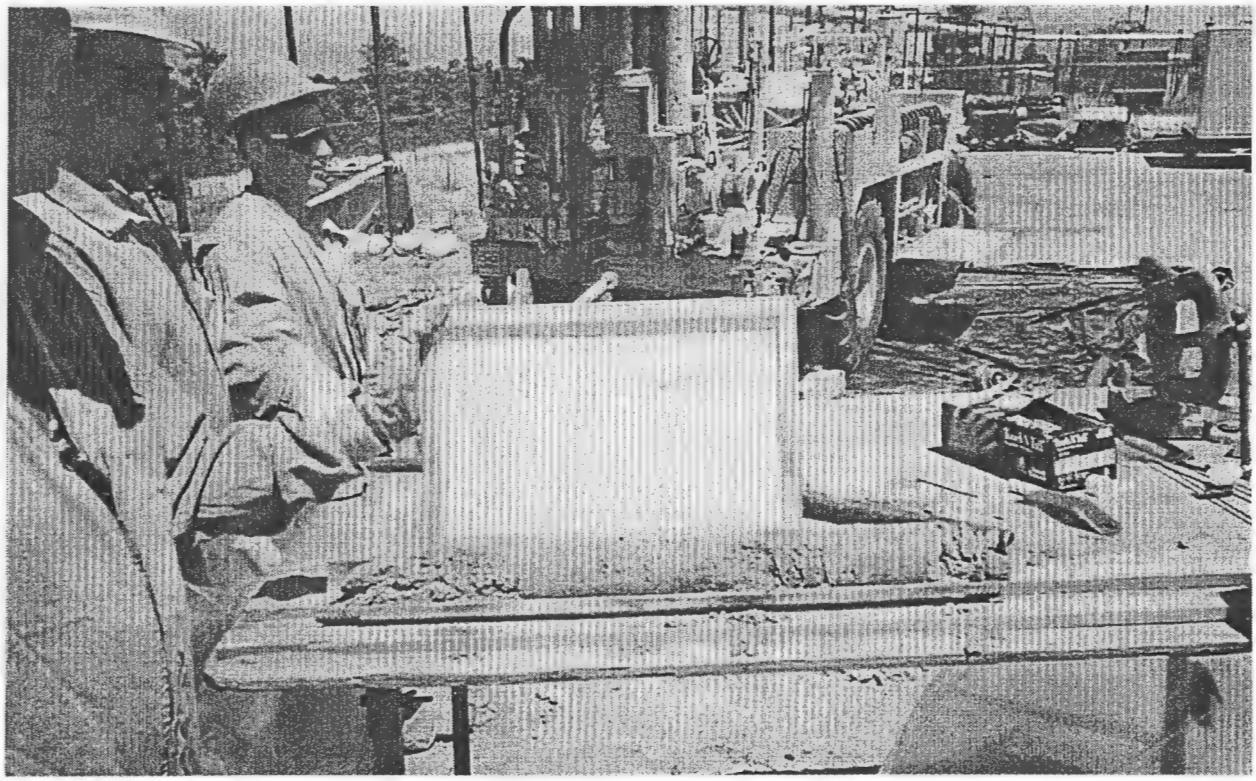
6/14/99

Figure G-11. Location 21-11044 (pit center), run 3, 5.0 to 7.5 ft (bgs)



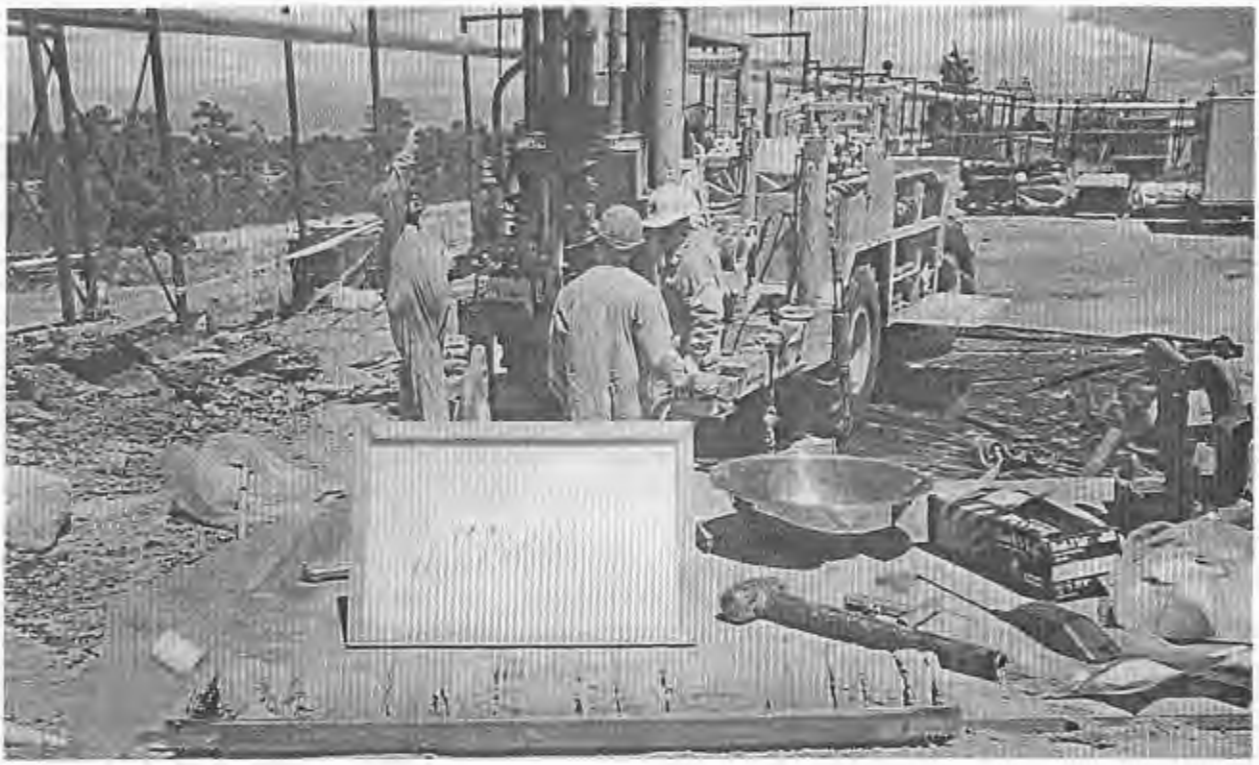
6/14/99

Figure G-12. Location 21-11044 (pit center), run 4, 7.5 to 10.0 ft (bgs), sample number MD21-99-0052



6/14/99

Figure G-13. Location 21-11044 (pit center), run 5, 10.0 to 12.5 ft (bgs)



6/14/99

Figure G-14. Location 21-11044 (pit center), run 6, 12.5 to 15.0 ft (bgs), sample number MD21-99-0053

6/14/99

Figure G-15. Location 21-11044 (pit center), run 7, 15.0 to 17.5 ft (bgs)

6/14/99

Figure G-16. Location 21-11045 (5 ft west of pit center), run 1, 0 to 2.5 ft (bgs)

6/14/99

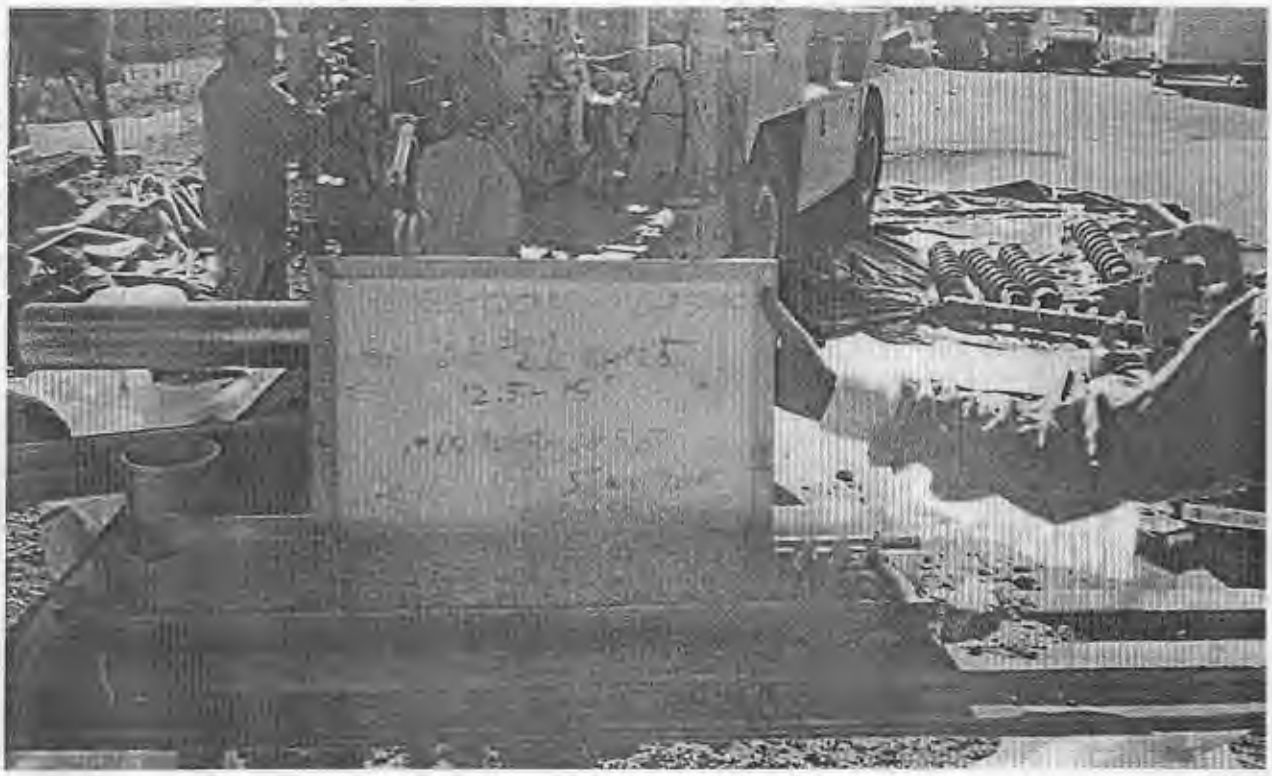
Figure G-17. Location 21-11045 (5 ft west of pit center), run 3, 5.0 to 7.5 ft (bgs), sample number MD21-99-0056 (fractures)

6/14/99

Figure G-18. Location 21-11045 (5 ft west of pit center), run 4, 7.5 to 10.0 ft (bgs), sample number MD21-99-0057

6/14/99

Figure G-19. Location 21-11045 (5 ft west of pit center), run 5, 10.0 to 12.5 ft (bgs)

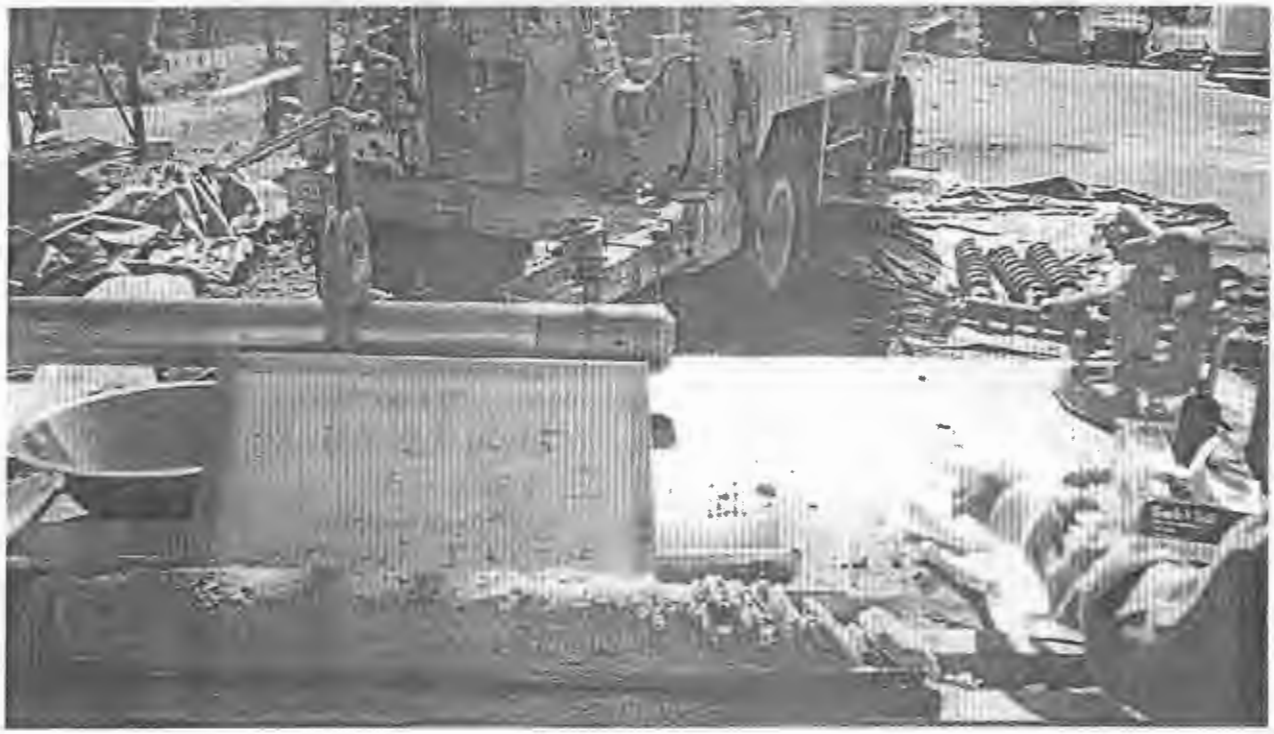


6/14/99

Figure G-20. Location 21-11045 (5 ft west of pit center), run 6, 12.5 to 15.0 ft (bgs), sample number MD21-99-0058

6/15/99

Figure G-21. Location 21-11045 (5 ft west of pit center), run 7, 15.0 to 17.5 ft (bgs)



6/15/99

Figure G-22. Location 21-11045 (5 ft west of pit center), run 8, 17.5 to 20.0 ft (bgs), sample number MD21-99-0071

6/15/99

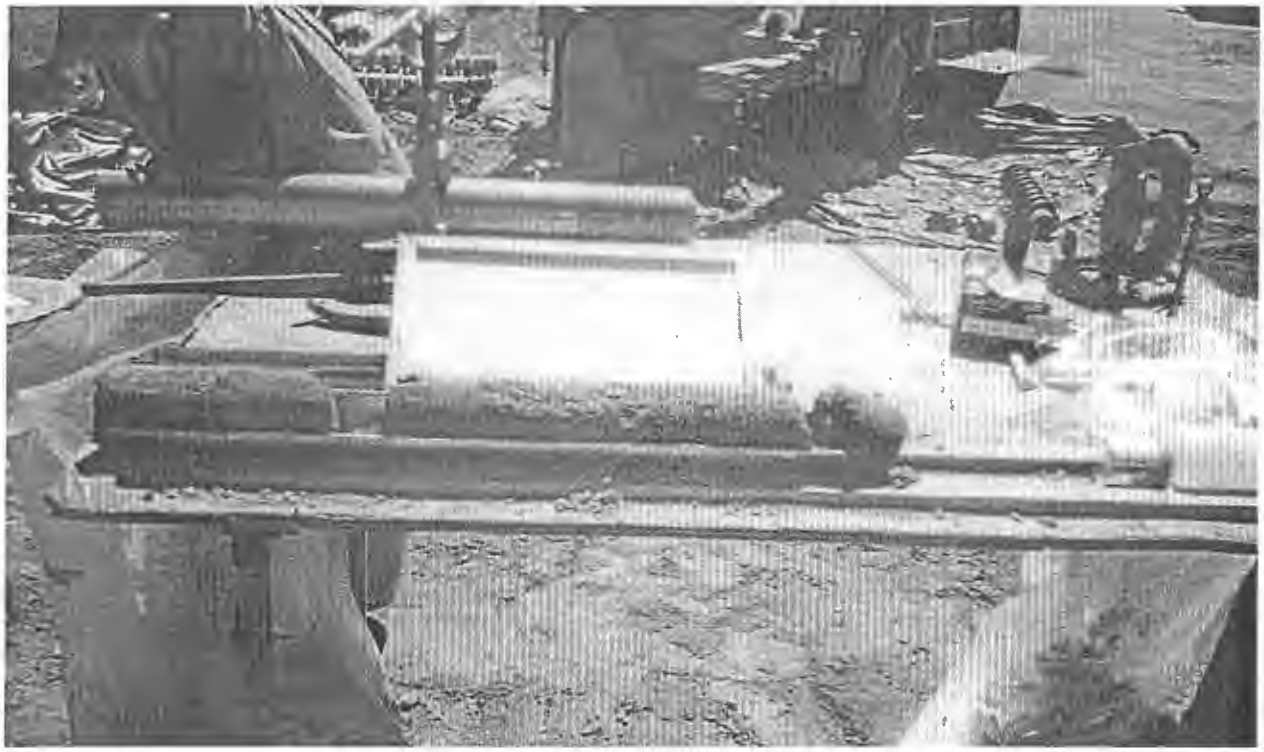
Figure G-23. Location 21-11046 (5 ft east of pit center), run 1, 0 to 2.5 ft (bgs)

6/15/99

Figure G-24. Location 21-11046 (5 ft east of pit center), run 2, 2.5 to 5.0 ft (bgs), sample number MD21-99-0059/MD21-99-0072

6/15/99

Figure G-25. Location 21-11046 (5 ft east of pit center), run 3, 5.0 to 7.5 ft (bgs)

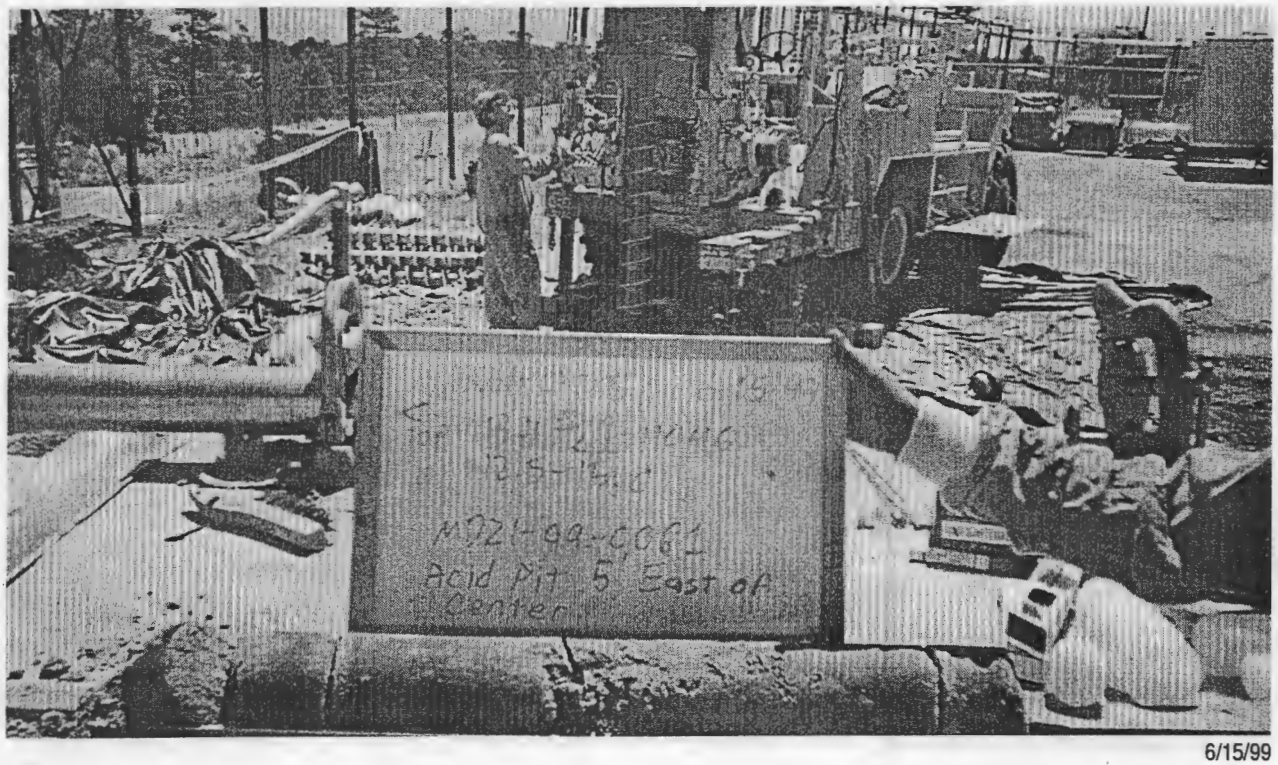


6/15/99

Figure G-26. Location 21-11046 (5 ft east of pit center), run 4, 7.5 to 10.0 ft (bgs), sample number MD21-99-0060

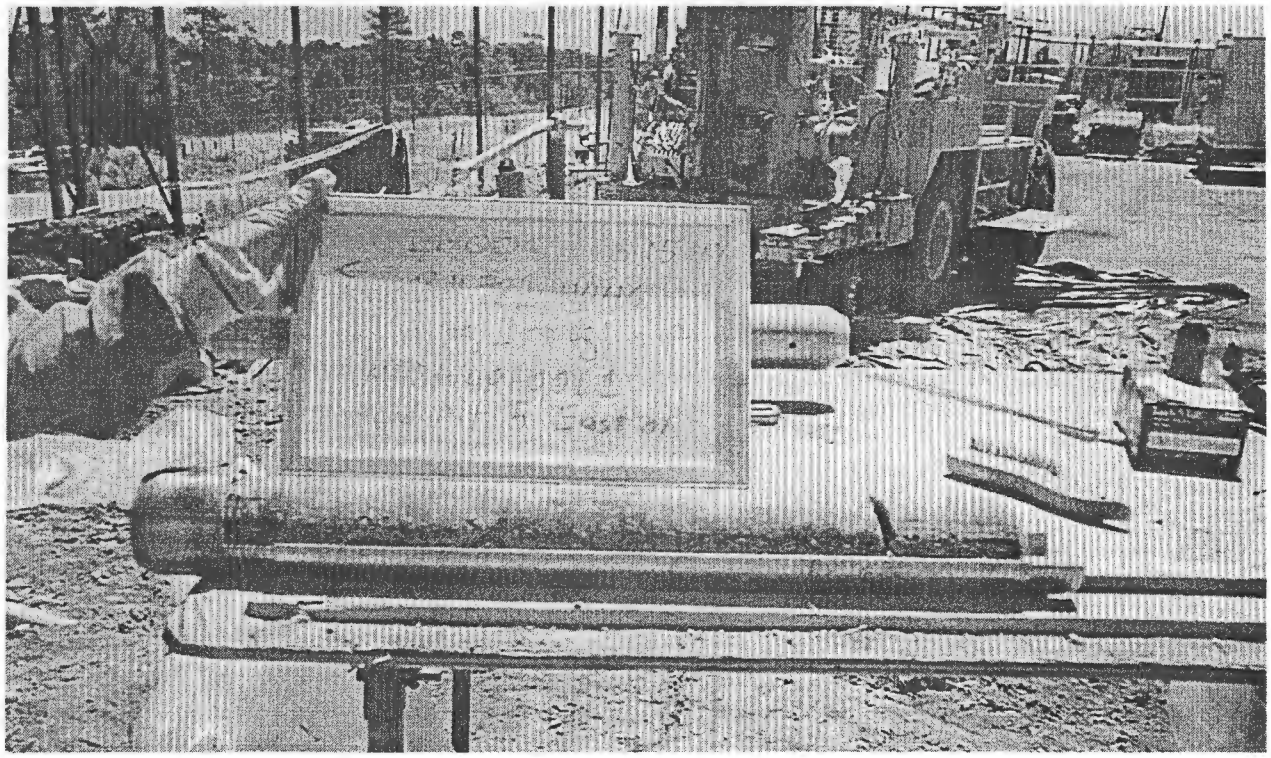
6/15/99

Figure G-27. Location 21-11046 (5 ft east of pit center), run 5, 10.0 to 12.5 ft (bgs)



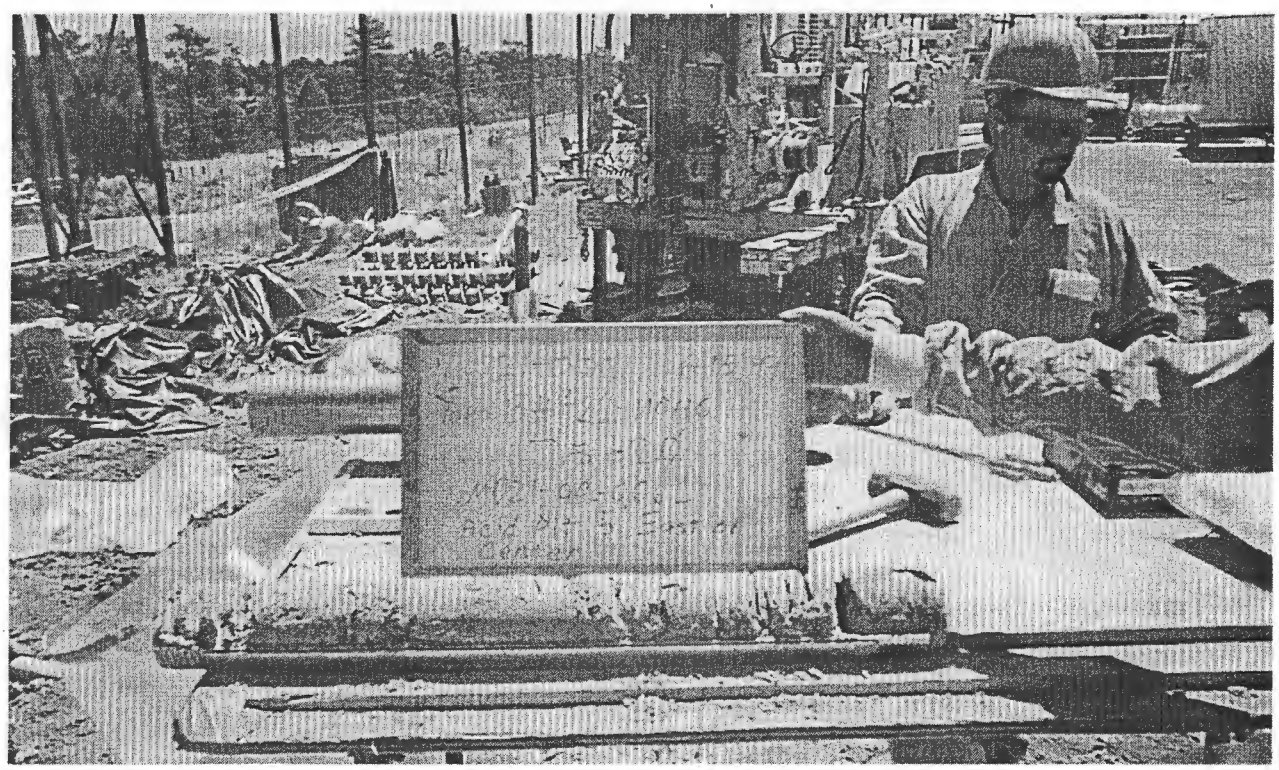
6/15/99

Figure G-28. Location 21-11046 (5 ft east of pit center), run 6, 12.5 to 15.0 ft (bgs), sample number MD21-99-0061



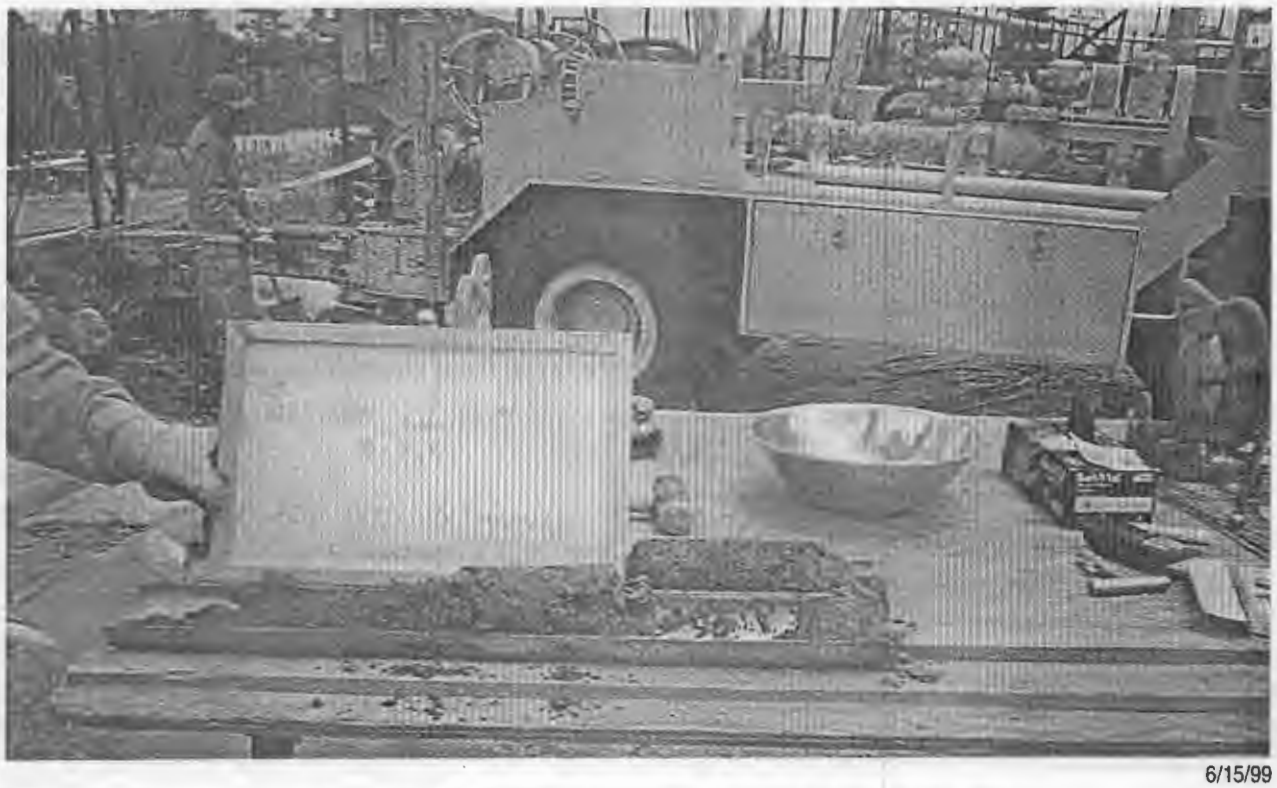
6/15/99

Figure G-29. Location 21-11046 (5 ft east of pit center), run 7, 15.0 to 17.5 ft (bgs)



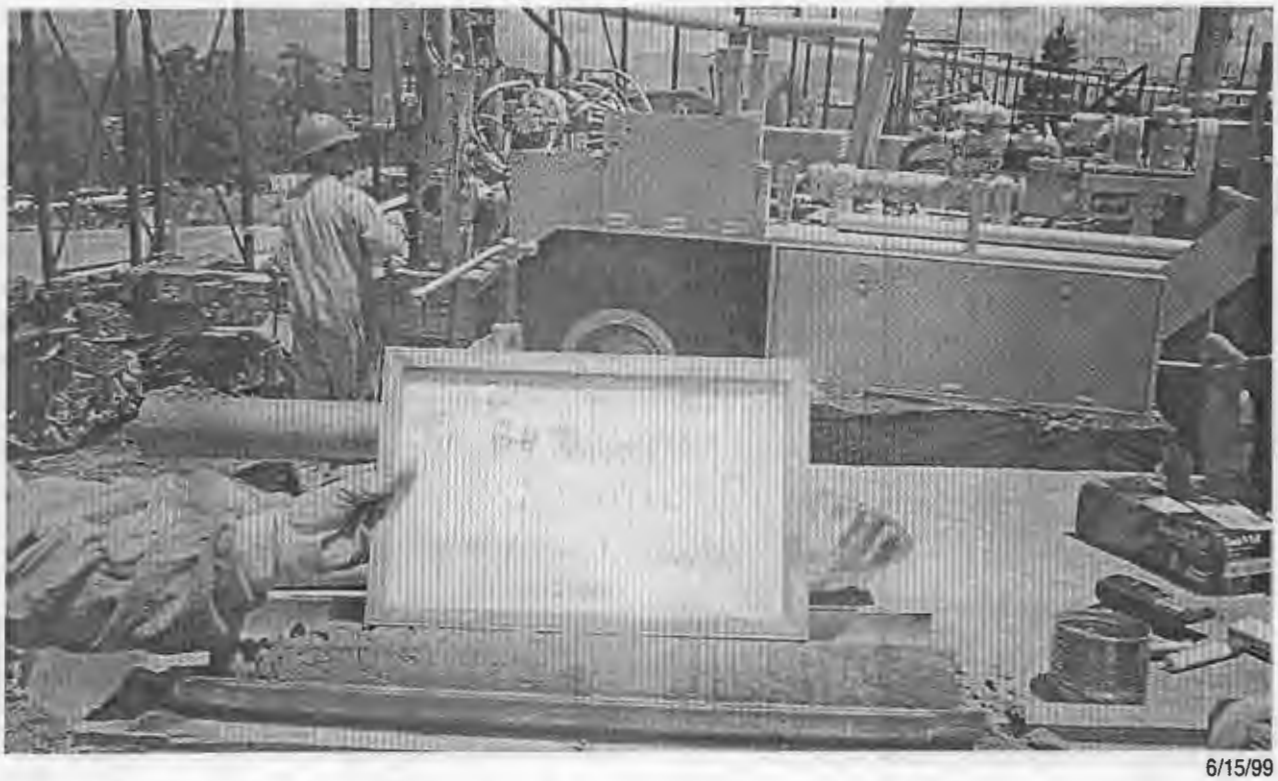
6/15/99

Figure G-30. Location 21-11046 (5 ft east of pit center), run 8, 17.5 to 20 ft (bgs), sample number MD21-99-0062



6/15/99

Figure G-31. Location 21-11047 (5 ft north of pit center), run 1, 0 to 2.5 ft (bgs)



6/15/99

Figure G-32. Location 21-11047 (5 ft north of pit center), run 2, 2.5 to 5.0 ft (bgs), sample number MD21-99-0063

6/15/99

Figure G-33. Location 21-11047 (5 ft north of pit center), run 3, 5.0 to 7.5 ft (bgs)

6/15/99

Figure G-34. Location 21-11047 (5 ft north of pit center), run 4, 7.5 to 10.0 ft (bgs), sample number MD21-99-0064

6/15/99

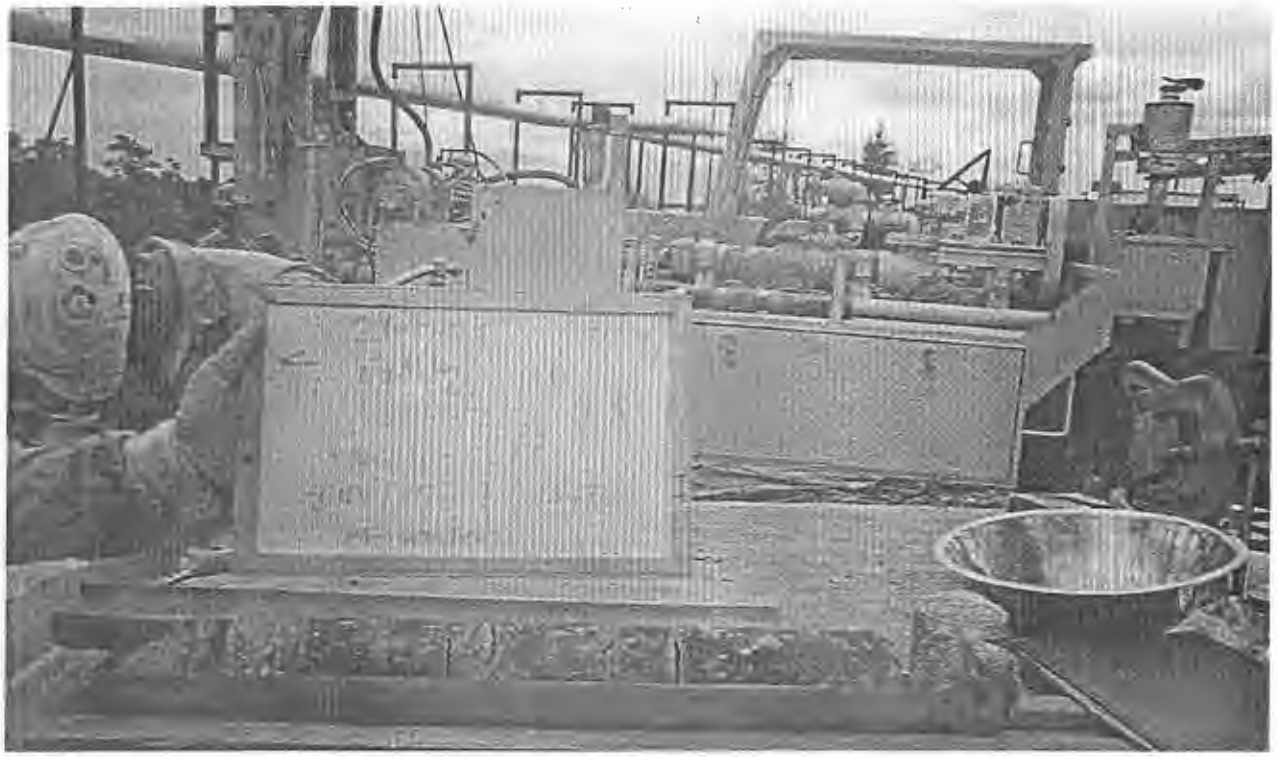
Figure G-35. Location 21-11047 (5 ft north of pit center), run 5, 10.0 to 12.5 ft (bgs)

6/15/99

Figure G-36. Location 21-11047 (5 ft north of pit center), run 6, 12.5 to 15.0 ft (bgs), sample number MD21-99-0065

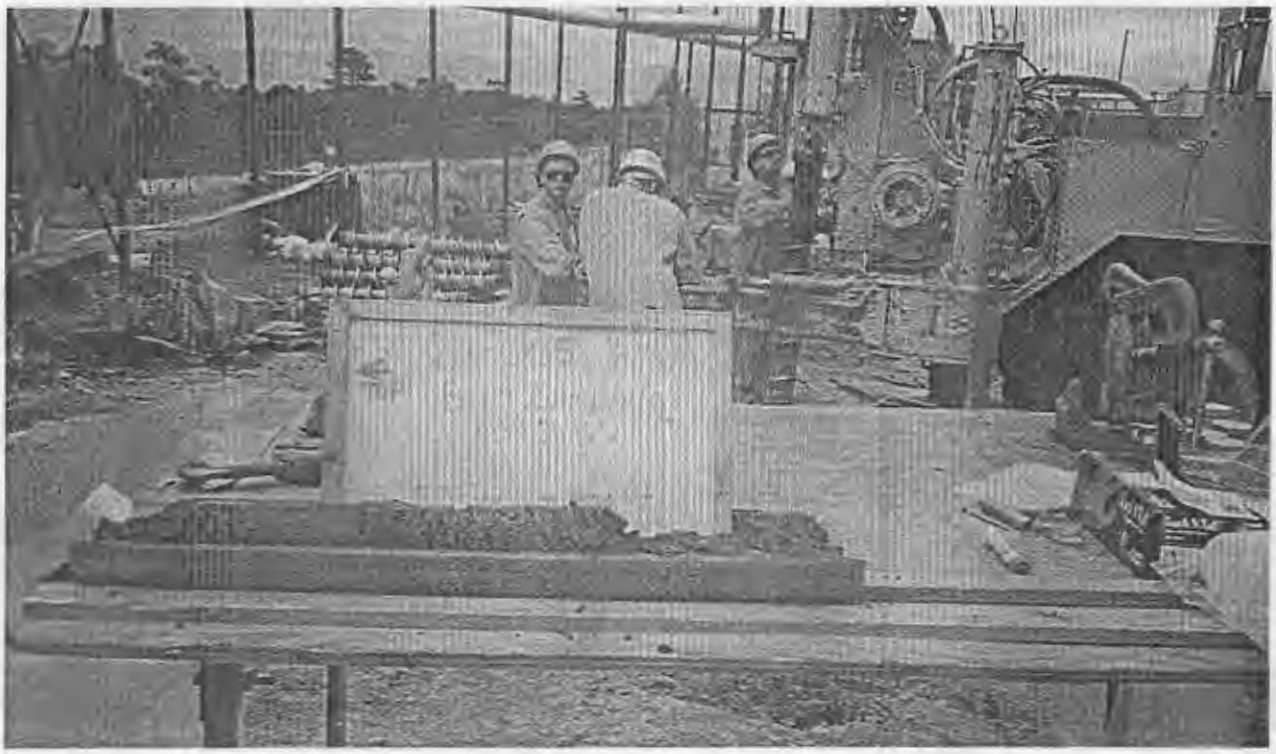
6/15/99

Figure G-37. Location 21-11047 (5 ft north of pit center), run 7, 15.0 to 17.5 ft (bgs)



6/15/99

Figure G-38. Location 21-11047 (5 ft north of pit center), run 8, 17.5 to 20.0 ft (bgs), sample number MD21-99-0066

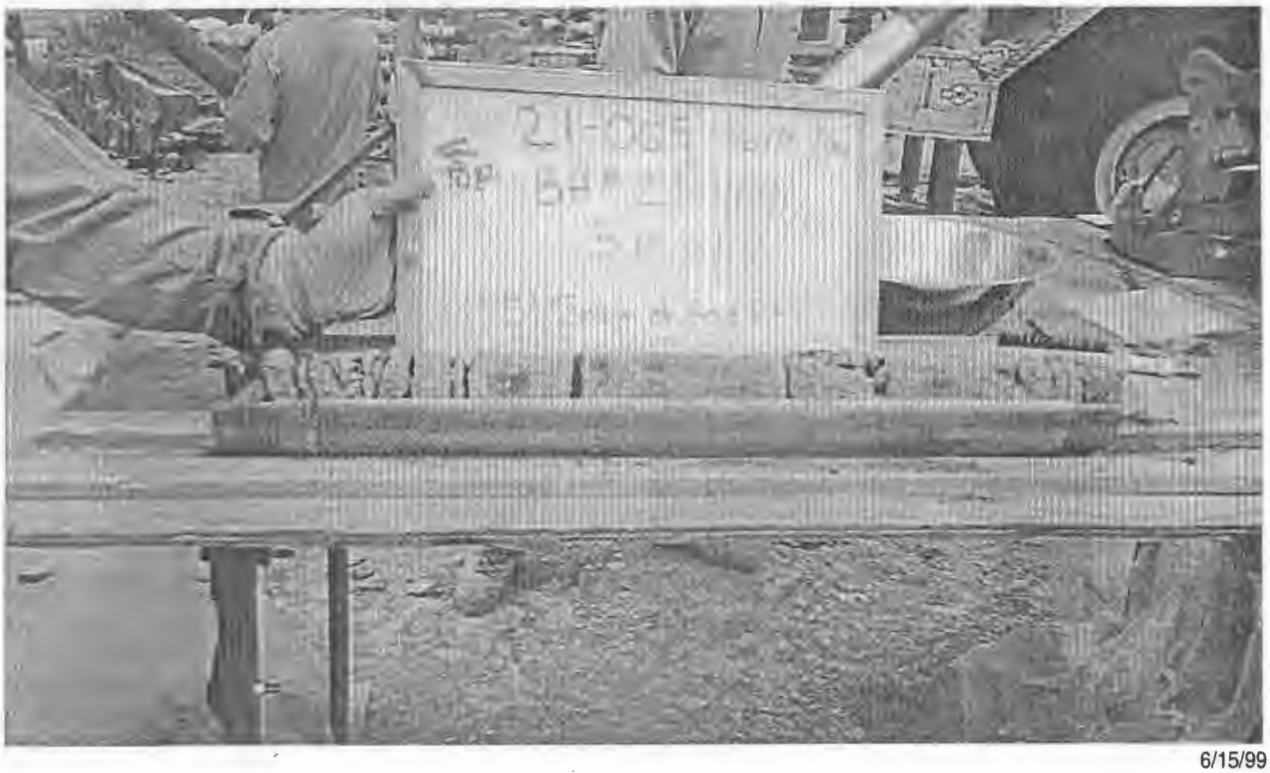


6/15/99

Figure G-39. Location 21-11048 (5 ft south of pit center), run 1, 0 to 2.5 ft (bgs)

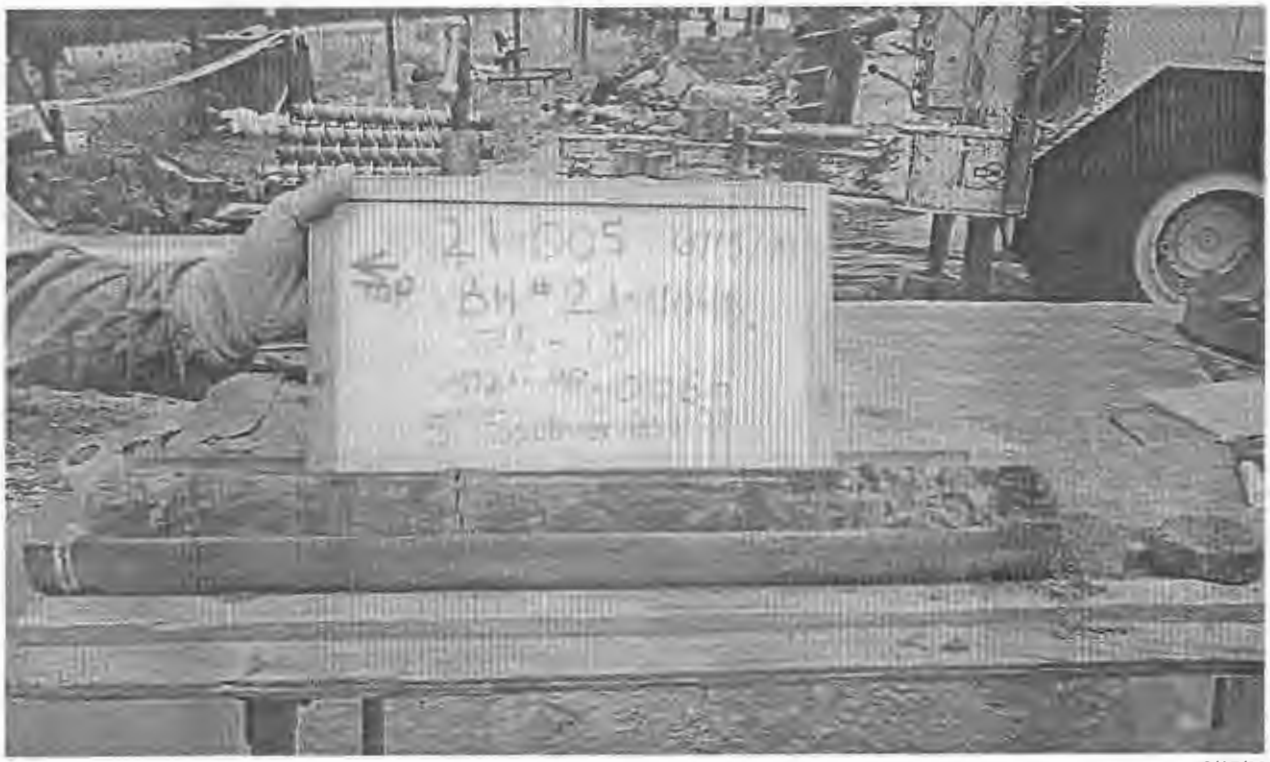
6/15/99

Figure G-40. Location 21-11048 (5 ft south of pit center), run 2, 2.5 to 5.0 ft (bgs), sample number MD21-99-0067



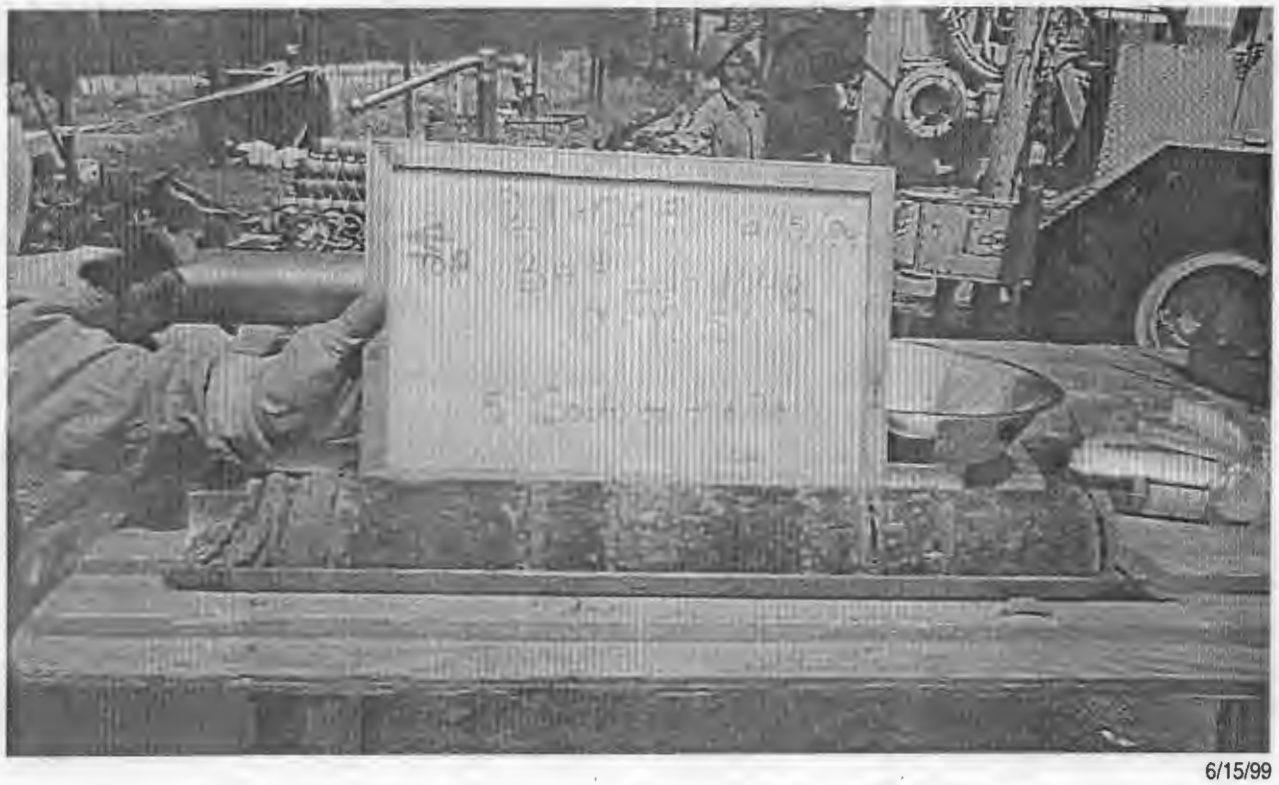
6/15/99

Figure G-41. Location 21-11048 (5 ft south of pit center), run 3, 5.0 to 7.5 ft (bgs)



6/15/99

Figure G-42. Location 21-11048 (5 ft south of pit center), run 4, 7.5 to 10.0 ft (bgs), sample number MD21-99-0064



6/15/99

Figure G-43. Location 21-11048 (5 ft south of pit center), run 5, 10.0 to 12.5 ft (bgs)

6/15/99

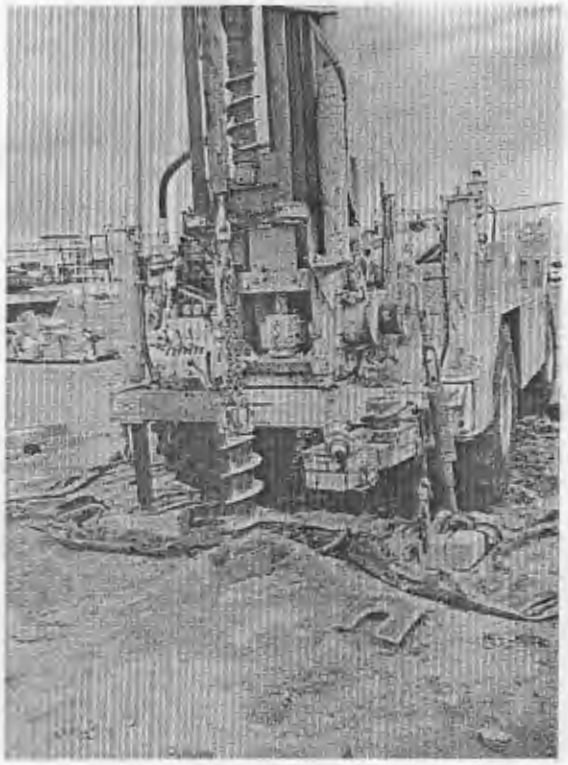
Figure G-44. Location 21-11048 (5 ft south of pit center), run 7, 15.0 to 17.5 ft (bgs)

6/15/99

Figure G-45. Location 21-11048 (5 ft south of pit center), run 8, 17.5 to 20.0 ft (bgs), sample number MD21-99-0066

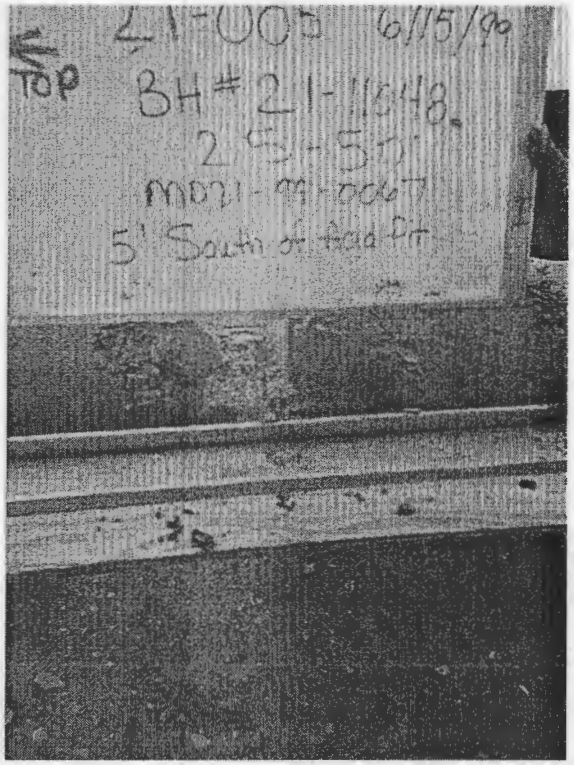
6/15/99

Figure G-46. Location 21-11048 (5 ft south of pit center), preparing to sample



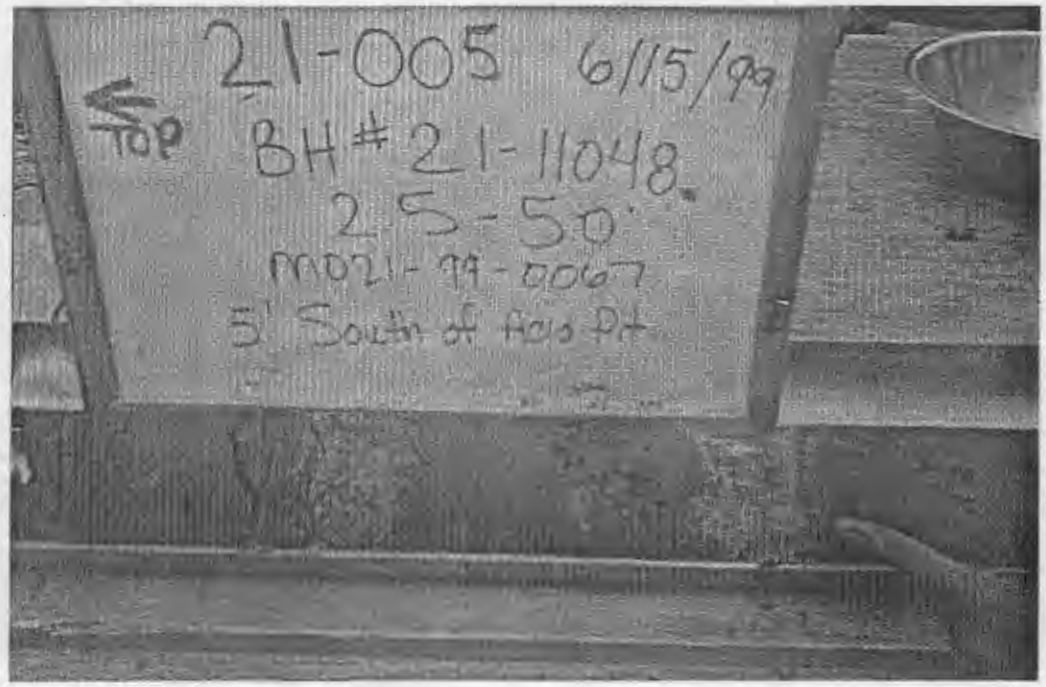
6/15/99

Figure G-47. Location 21-11048 (5 ft south of pit center), rig set up



6/15/99

Figure G-48. Location 21-11048 (5 ft south of pit center), run 5, 10.0 to 12.5 ft (bgs), detail of sandy fill containing cast iron pipe fragment



6/15/99

Figure G-49. Location 21-11048 (5 ft south of pit center), run 5, 10.0 to 12.5 ft (bgs), detail of sandy fill containing cast iron pipe fragment

Appendix H

Borehole Logs

LOS ALAMOS NATIONAL LABORATORY
PRS 21-005 ACID PIT RFI PROJECT
BOREHOLE LOG

BOREHOLE ID 21-11044	TA: 21	Page 1 of 1
TOTAL DEPTH: 20.0 FT	START DATE: 6/14/99, 1300	END DATE: 6/14/99, 1430
DRILLING EQ/METHOD: CME-750/HSA	SAMPLING EQ/METHOD: CORE BARREL/CONTINUOUS	
DRILLING COMPANY: STEWART BROTHERS DRILLER: S. JOHNSON	BOREHOLE ORIENTATION: VERTICAL SITE GEOLOGIST: J. CROCKER	

Depth (ft)	Recovery (ft / ft)	Analytical Sample Number	Field Screening Results	Lithology	Graphic Log	Notes
0	2.5/2.5		RAD = no detectable activity (NDA). Photoionization detector (PID) = 0.0 ppm.	Fill: Silty fine sand with 10% tuff fragments, reddish brown, moist and soft, loose to slightly plastic, no bedding features		Hole at center of former pit
	2.5/2.5	MD21-99-0051 (4.5–5.0 ft)	RAD = NDA. PID = 0.0 ppm.	Tuff: Reddish gray tuff, nonwelded, poorly indurated, core disaggregated, large quartz phenocrysts 1–2 mm in diameter, pumice to 3 cm gray to reddish brown and not flattened		
5	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5	MD21-99-0052 (9.5–10.0 ft)	RAD = NDA. PID = 0.0 ppm.	Tuff: Reddish gray tuff as above but moderately indurated and nonwelded, pumice not flattened, core not disaggregated as above		
10	2.5/2.5		RAD = NDA. PID = 0.0 ppm.	Tuff: Tuff as above but nonwelded and poorly indurated		10–11 ft: Trace of vertical fracture (2–3 mm), tuff very soft in this zone
				Tuff: Moderately indurated tuff, gray in color, nonwelded, dry, large quartz phenocrysts to 2 mm, pumice to 3 cm not flattened		
	2.5/2.5	MD21-99-0053 (14.5–15.0 ft)	RAD = NDA. PID = 0.0 ppm.			
15	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5	MD21-99-0054 (19.5–20.0 ft)	RAD = NDA. PID = 0.0 ppm.			
20						

Total depth = 20.0 ft

LOS ALAMOS NATIONAL LABORATORY
PRS 21-005 ACID PIT RFI PROJECT
BOREHOLE LOG

BOREHOLE ID 21-11045	TA: 21	Page 1 of 1
TOTAL DEPTH: 20.0 FT	START DATE: 6/14/99, 1530	END DATE: 6/15/99, 0900
DRILLING EQ/METHOD: CME-750/HSA	SAMPLING EQ/METHOD: CORE BARREL/CONTINUOUS	
DRILLING COMPANY: STEWART BROTHERS DRILLER: S. JOHNSON	BOREHOLE ORIENTATION: VERTICAL SITE GEOLOGIST: J. CROCKER	

Depth (ft)	Recovery (ft / ft)	Analytical Sample Number	Field Screening Results	Lithology	Graphic Log	Notes
0	2.5/2.5		RAD = no detectable activity (NDA). Photoionization detector (PID) = 0.0 ppm.	Fill: Clayey, silty, medium-grained sand; brown; moist; soft and slightly plastic; no bedding; tuff fragment in fill		5 ft WNW of center
	2.5/2.5	MD21-99-0055 (2.5–3.5 ft)	RAD = NDA. PID = 0.0 ppm.	Tuff: Brownish-pink tuff, nonwelded, prominant quartz phenocrysts to 2.0 mm, pumice not flattened and as large as 3.0 cm, pumice light gray to light reddish brown in color		2.5–3.5 ft: Clayey tan discolored area of core
5	2.5/2.5		RAD = NDA. PID = 0.0 ppm.	Tuff: Grey tuff, nonwelded, pumice grey and not flattened, quartz phenocrysts to 2.0 mm, poorly indurated and becomes moderately indurated at 12.5 ft to total depth		No staining 5.0–7.0 ft
		MD21-99-0056 (7.0–7.5 ft)				Fractures, tan discoloration (sample collected from 7.0–7.5 ft)
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
10		MD21-99-0057 (9.5–10.0 ft)				
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
						6/14/99, 1600 Off site for day
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			6/15/99, 0800 Begin drilling
15		MD21-99-0058 (14.5–15.0 ft)				
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
20		MD21-99-0071 (19.5–20.0 ft)				

Total depth = 20.0 ft

LOS ALAMOS NATIONAL LABORATORY
PRS 21-005 ACID PIT RFI PROJECT
BOREHOLE LOG

BOREHOLE ID 21-11046	TA: 21	Page 1 of 1
TOTAL DEPTH: 20.0 FT	START DATE: 6/15/99, 1010	END DATE: 6/15/99, 1130
DRILLING EQ/METHOD: CME-750/HSA	SAMPLING EQ/METHOD: CORE BARREL/CONTINUOUS	
DRILLING COMPANY: STEWART BROTHERS DRILLER: S. JOHNSON	BOREHOLE ORIENTATION: VERTICAL SITE GEOLOGIST: J. CROCKER	

Depth (ft)	Recovery (ft / ft)	Analytical Sample Number	Field Screening Results	Lithology	Graphic Log	Notes
0	2.5/2.5		RAD = no detectable activity (NDA). Photoionization detector (PID) = 0.0 ppm.	Fill: Sandy silt with crushed tuff, trace of clay, moist, soft and loose, no bedding		5 ft ESE of pit center
	2.5/2.5	MD21-99-0059 (4.0–5.0 ft)	RAD = NDA. PID = 0.0 ppm.	Tuff: Pinkish gray tuff, nonwelded, poorly indurated, moist, pumice pinkish gray and up to 2.0 cm, pumice not flattened, quartz phenocrysts to 2.0 mm		
5	2.5/2.5		RAD = NDA. PID = 0.0 ppm.	Tuff: Gray to light pinkish gray tuff, vertical fracture entire interval, tuff discolored (weathered) along fracture, nonwelded and poorly indurated as above		Vertical fracture 5.0–12.5 ft. Five-ft and ten-ft samples contain fracture, so no biased samples were collected. Fracture width is 2.0–3.0 mm.
	2.5/2.5	MD21-99-0060 (9.5–10.0 ft)	RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5	MD21-99-0061 (13.75–14.5 ft)	RAD = NDA. PID = 0.0 ppm.	Tuff: Light gray nonwelded, poorly indurated to moderately indurated tuff, large quartz phenocrysts, pumice to 3.0 cm not flattened		
15	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5	MD21-99-0062 (19.5–20.0 ft)	RAD = NDA. PID = 0.0 ppm.			
20						Total depth = 20.0 ft

LOS ALAMOS NATIONAL LABORATORY
PRS 21-005 ACID PIT RFI PROJECT
BOREHOLE LOG

BOREHOLE ID 21-11047	TA: 21	Page 1 of 1
TOTAL DEPTH: 20.0 FT	START DATE: 6/15/99, 1300	END DATE: 6/15/99, 1415
DRILLING EQ/METHOD: CME-750/HSA	SAMPLING EQ/METHOD: CORE BARREL/CONTINUOUS	
DRILLING COMPANY: STEWART BROTHERS DRILLER: S. JOHNSON	BOREHOLE ORIENTATION: VERTICAL SITE GEOLOGIST: J. CROCKER	

Depth (ft)	Recovery (ft / ft)	Analytical Sample Number	Field Screening Results	Lithology	Graphic Log	Notes
0	2.0/2.5		RAD = no detectable activity (NDA). Photoionization detector (PID) = 0.0 ppm.	Fill: Silt, sand, and crushed tuff; moist, reddish brown; soft, loose, and slightly plastic		5 ft NNE of pit center
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.	Tuff: Gray, nonwelded, moderately indurated tuff; pumice to 3.0 cm not flattened and range in color from light gray to light reddish brown; large quartz phenocrysts to 2.0 mm		
5		MD21-99-0063 (4.5–5.0 ft)				4 ft: Horizontal fracture with slight discoloration
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
10		MD21-99-0064 (9.5–10.0 ft)				
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
15		MD21-99-0065 (14.5–15.0 ft)		Tuff: Gray, well indurated, nonwelded tuff; pumice to 2.0 cm; rims of pumice light reddish brown with gray cores; pumice not flattened; quartz phenocrysts to 2.0 mm		
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
20		MD21-99-0066 (19.5–20.0 ft)				

Total depth = 20.0 ft

LOS ALAMOS NATIONAL LABORATORY
PRS 21-005 ACID PIT RFI PROJECT
BOREHOLE LOG

BOREHOLE ID 21-11048 | TA: 21 | Page 1 of 1

TOTAL DEPTH: 20.0 FT | START DATE: 6/15/99, 1300 | END DATE: 6/15/99, 1415

DRILLING EQ/METHOD: CME-750/HSA | SAMPLING EQ/METHOD: CORE BARREL/CONTINUOUS

DRILLING COMPANY: STEWART BROTHERS | BOREHOLE ORIENTATION: VERTICAL

DRILLER: S. JOHNSON | SITE GEOLOGIST: J. CROCKER

Depth (ft)	Recovery (ft / ft)	Analytical Sample Number	Field Screening Results	Lithology	Graphic Log	Notes
0	2.0/2.5		RAD = no detectable activity (NDA). Photoionization detector (PID) = 0.0 ppm.	Fill: Silty fine sand and crushed tuff; no bedding; soft, loose, and moist; pieces of crushed tuff to 5 cm; reddish brown in color		5 ft SSW of pit center
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.	Fill: Coarse sand fill, brown, soft and loose, less than 5% silt, moist, iron staining at 4.0 ft, no bedding		Piece of cast iron in sandy fill material
5		MD21-99-0067 (4.5–5.0 ft)		Tuff: Pinkish gray, nonwelded and poorly indurated, quartz phenocrysts to 2.0 mm, pumice reddish brown to 3.0 cm and not flattened, core disaggregated		
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.	Tuff: Light gray tuff, nonwelded, poorly to moderately indurated, phenocrysts of quartz to 2.0 mm, pumice not flattened and range in color from white to light reddish gray		
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
10		MD21-99-0068 (9.5–10.0 ft)				Induration improves with depth
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
15		MD21-99-0069 (14.5–15.0 ft)				
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
	2.5/2.5		RAD = NDA. PID = 0.0 ppm.			
20		MD21-99-0070 (19.5–20.0 ft)				

Total depth = 20.0 ft