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HIWALANL 4/1129/48

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Date: January 15, 1997
Refer to: EM/ER:97-009

ENTERED

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

SUBJECT: SAMPLING AND ANALYSIS PLAN FOR PRSs 48-001, 48-002(e), 48-003, 48-005, 48-007(a, b, c, d and f) and 48-010

Dear Mr. Garcia:

Enclosed please find a copy of the Sampling and Analysis Plan for Technical Area 48, Potential Release Sites 48-001, 48-002(e), 48-003, 48-005, 48-007(a, b, c, d and f) and 48-010. This plan has been approved by the Department of Energy-Los Alamos Area Office and is being submitted to your office for information purposes. Field activities to collect additional samples to obtain more complete radiological data and to address the previous notice of deficiency comments have commenced. After the analytical data have been received and analyzed, a final report will be written and submitted.

If you have any questions, please call Allyn Pratt at (505) 667-4308 or Everett Trollinger at (505) 667-5801.

Sincerely,

Jorg Jansen, Program Manager
LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager
for DOE/LAAO

JJ/TT/ss

2653

TC

Enclosure: Sampling And Analysis Plan for PRSs 48-001, 48-002(e), 48-003, 48-005, 48-007(a, b, c, d and f) and 48-010

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Sampling and Analysis Plan for TA-48

Field Unit 4

Environmental Restoration Project

January 1997

A Department of Energy Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-96-4839

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ACRONYMS AND ABBREVIATIONS

COC	chemical of concern
COPC	chemical of potential concern
CVAA	cold vapor atomic absorption
D&D	decontamination and decommissioning
DOE	Department of Energy
DOE/LAAO	Los Alamos Area Office of the Department of Energy
EDL	estimated detection limit
EPA	Environmental Protection Agency
EQL	estimated quantitation limit
ER	Environmental Restoration
FIMAD	Facility for Information Management, Analysis, and Display
FTL	field team leader
FU	field unit
GC/ECD	gas chromatography/electron capture detector
GC/MS	gas chromatography/mass spectrometry
GFAA	graphite furnace atomic absorption
H&S	health and safety
HSWA	Hazardous and Solid Waste Amendments
ICPES	inductively coupled plasma emission spectroscopy
ICPMS	inductively coupled plasma mass spectrometry
J	The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample.
J+	Reported value is an estimate and likely biased high.
J–	Reported value is an estimate and likely biased low.
LAS	large area swipe
NA	not analyzed
N/A	not applicable
N.A.	not available
ND	not detected
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFA	no further action
NM	New Mexico
NMED	New Mexico Environment Department
NOD	notice of deficiency
NPDES	National Pollutant Discharge Elimination System
NR	not requested

OVA	organic vapor analyzer
PCB	polychlorinated biphenyl
PID	photoionization detector
PRS	potential release site
QAPP	quality assurance project plan
Qbt3	cooling unit 3 of the Tshirege Member of the Bandelier Tuff
QC	quality control
R	The sample results are rejected because of serious deficiencies in the ability to analyze the sample and meet quality control criteria; presence or absence cannot be verified.
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RFI	RCRA facility investigation
RPF	Records-Processing Facility
SAL	screening action level
SAP	sampling and analysis plan
SMO	Sample Management Office
SOP	standard operating procedures
SSHASP	site-specific health and safety plan
SVOC	semivolatile organic compound
TA	Technical Area
TCLP	toxicity characteristic leaching procedure
UTL	upper tolerance limit
VOC	volatile organic compound
XRF	x-ray fluorescence

1.0 INTRODUCTION

This sampling and analysis plan (SAP) addresses supplemental sample collection to satisfy requirements given in the following documents:

- the regulator notice of deficiency (NOD) for the *RFI Report for Potential Release Sites 48-001, 48-002(e), 48-003, 48-005, 48-007(a), 48-007(b), 48-007(c), 48-007(d), 48-007(f), 48-010* (LANL 1995, 50295);
- the New Mexico Environment Department (NMED) request for additional information for the RFI report;
- the Los Alamos National Laboratory (the Laboratory) *Response to the Notice of Deficiency (NOD) for Technical Area (TA) 48 Resource Conservation and Recovery Act Facility Investigation (RFI) Report* (EM/ER:96-231); and
- the Laboratory *Response to Request for Additional Information for TA-48 RFI Report* (EM/ER:96-533).

The Laboratory responses are included as Attachment I of this SAP.

The purpose of this SAP is also to satisfy the original intent of the *RFI Work Plan for Operable Unit 1129* (LANL 1992, 7666) (hereafter referred to as "the work plan") and to provide additional data to support the recommendations for no further action (NFA) that were proposed in the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) report (LANL 1995, 50295) (hereafter referred to as "the RFI report"). A single SAP has been written for all potential release sites (PRSs) that were included in the RFI report, the response to the NOD (EM/ER:96-231), and the response to the request for additional information (EM/ER:96-533) for Technical Area (TA) -48 because the data collection requirements are similar.

A primary component of this SAP is the collection of additional gamma spectroscopy data at several of the PRSs. As described in the Laboratory response to NOD comment No. 16, mobile laboratory gamma spectroscopy data collected during the Phase I RFI are unusable for site decisions. Therefore, additional samples will be collected and analyzed for gamma-emitting radionuclides as necessary to fulfill the objectives of the Phase I SAPs submitted as part of the work plan and the addendum to the work plan (Pratt 1994, 43475). A description of sampling activities to collect radionuclide data is included in this sampling plan, although radiological contamination is not regulated by RCRA.

The goal of the Phase I SAPs was to confirm the presence or absence of laboratory-derived contamination at the PRSs in TA-48. At some PRSs, contaminants of potential concern (COPCs) were identified in the RFI report (LANL 1995, 50295). Therefore, this SAP also includes additional sampling to determine the extent of the contamination at some PRSs as recommended in the RFI report. Data for establishing the extent of contamination may be used to confirm assumptions regarding environmental transport and redistribution of contaminants and to provide data for developing summary statistics of contaminant concentration, as necessary.

The PRSs in this SAP are addressed individually in Section 2.0 with two exceptions. PRS Nos. 48-007(a and d) and 48-010, which compose part of Aggregate X as described in the RFI report, are addressed collectively because of their geographic proximity and similar sampling requirements. For the same reasons, PRS Nos. 48-007(b, c, and f), which compose Aggregate Y as described in the RFI report,

are addressed collectively. Figure 1-1 shows the location of TA-48; Figure 1-2 shows the locations of the PRSs addressed in this SAP.

1.1 Regulatory Drivers

Sampling is primarily driven by the Module VIII Hazardous and Solid Waste Amendments (HSWA) of the Laboratory's hazardous waste facility permit, which was issued on May 23, 1990 (EPA 1990, 1585) and modified on May 19, 1994. Other regulatory drivers may include the following.

- State of New Mexico's (NM) Water Quality Act and implementing regulations
- NM Solid Waste Act and implementing regulations
- NM Hazardous Waste Act and implementing regulations
- NM Radioactive and Hazardous Materials Act and implementing regulations

Federal regulatory drivers include the following.

- The Federal Facilities Compliance Act and implementing regulations
- The Toxic Substances Control Act and implementing regulations
- RCRA/HSWA implementing regulations

Federal regulatory drivers may also include the Clean Water Act and implementing regulations. However, the Environmental Restoration (ER) Project does not consider an outfall to be a PRS if the outfall is subject to regulation under Section 402 of the Clean Water Act as a point source discharge because the wastewater discharge is not a solid waste (40 CFR 261.4[a][2]). The Clean Water Act and RCRA cannot have duplicative authority over the same material. The ER Project does consider outfalls to be PRSs if they were active before the Clean Water Act was passed because at that time no regulations existed to govern wastewater discharges to the environment.

An additional standard for radiological contaminants is DOE Order 5400.5, "Radiation Protection of the Public and the Environment." In 1993 this DOE order was issued as a Proposed Rule in the Federal Register (58-FR-16268) and covers, among other topics, establishment of dose limits to the public from operations that are under DOE control. Radionuclides will be investigated as part of this RFI, although radiological contamination is not regulated by RCRA.

2.0 PROBLEM DEFINITION AND DESIGN OF SAMPLING AND ANALYSIS PLAN

2.1 PRS No. 48-001

To fulfill the Laboratory's commitments, as presented in its NOD response memorandum (see EM/ER:96-231 in Attachment I of this SAP), the adequacy of the existing data set for radionuclides at PRS No. 48-001 was evaluated to determine if additional sampling at this PRS is necessary. The following paragraphs contain a summary of the history of the PRS and the results of the evaluation.

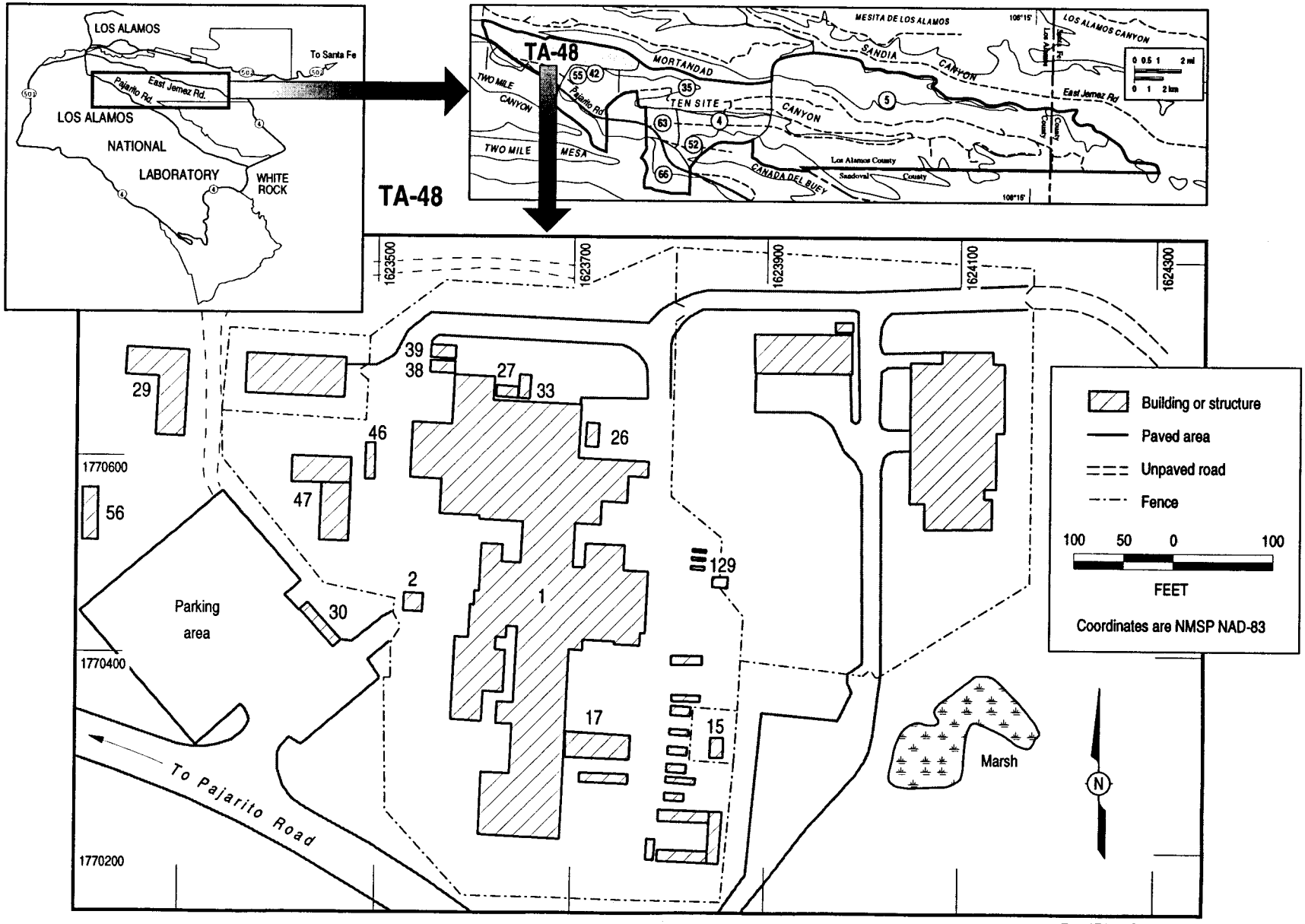
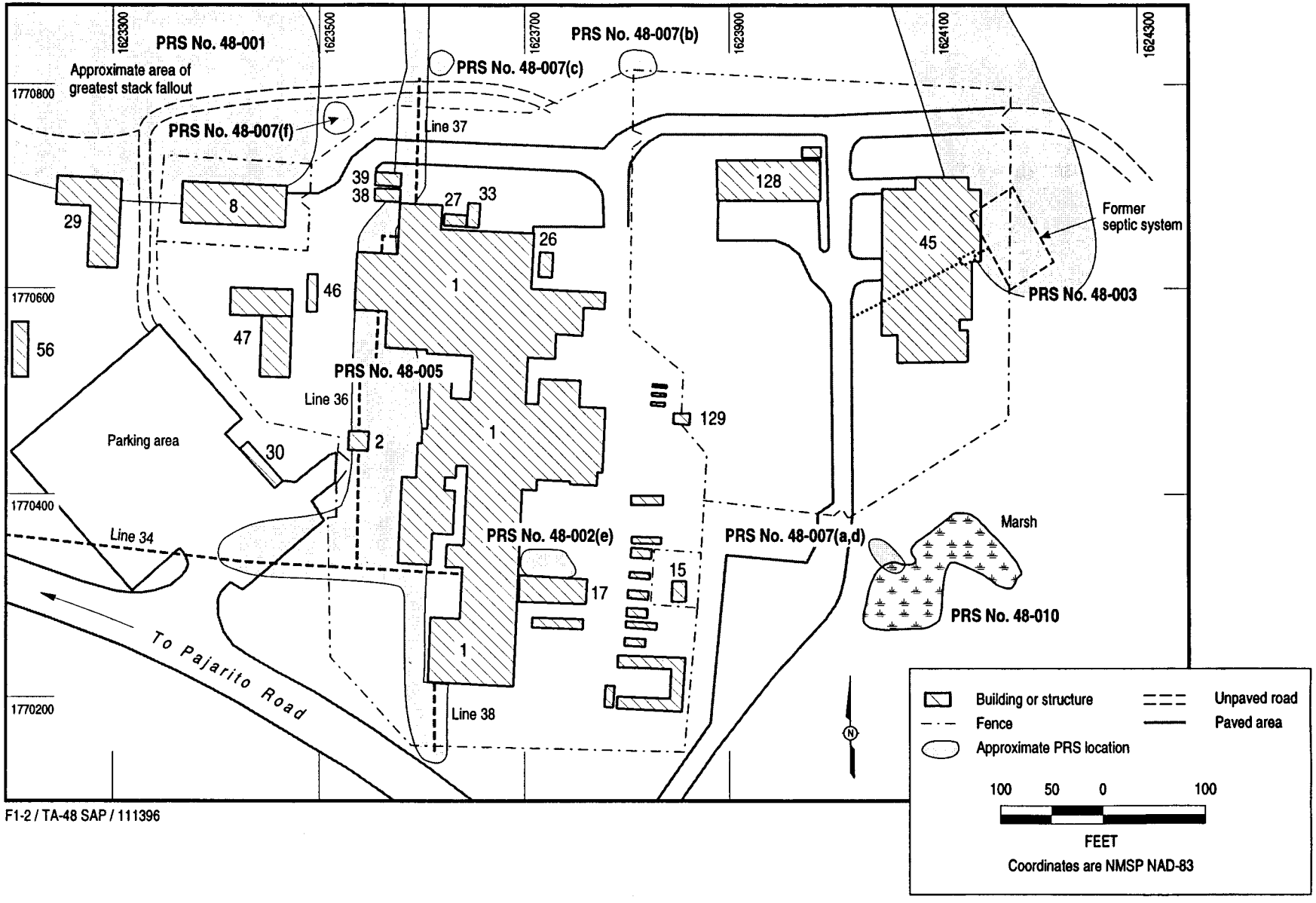


Figure 1-1. General location map for TA-48.

F1-1 / TA-48 SAP / 111496



F1-2 / TA-48 SAP / 111396

Figure 1-2. Approximate locations of potential release sites at TA-48.

Aggregate K at TA-48 consists of PRS No. 48-001, which is an air exhaust system composed of nine exhaust stacks associated with building TA-48-1 (the radiochemistry laboratory). One of the stacks exhausts individually filtered glove boxes, which are located in the Alpha Wing of TA-48-1. These glove boxes are used to handle high-level alpha-, beta-, and gamma-emitting radionuclides. Possible radioactive particles in the exhaust air include uranium, plutonium, and mixed fission products. The stack is currently permitted and monitored under National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations. Because this stack was operational before the promulgation of the NESHAP permit, the ER Project is responsible for the investigation of any releases that may have occurred before the permit was issued.

The other eight stacks exhaust unfiltered chemical fume hoods, combustion boilers, filtered air from the hot cell laboratory, and air from a welding and degreasing booth in the basement of the building. Particulate emissions from these stacks may include volatile organic compounds (VOCs) and acids.

2.1.1 Summary of Historical Data

PRS No. 48-001 and the existing sample locations are shown in Figure 2.1.1-1. Two historical data sets for radionuclides exist for this PRS. The first is composed of five surface and five subsurface samples that were collected near PRS No. 48-001 as part of the April 1991 ER reconnaissance survey (Fresquez 1991, 21358). The second consists of Phase I RFI sampling at five locations conducted in July 1993 (LANL 1995, 50295). A summary of the samples collected and the associated analyses is presented in Table 2.1.1-1. The data are presented in Table AII-1 in Attachment II of this SAP. The RFI report contains information on VOCs, semivolatile organic compounds (SVOCs), and inorganic chemicals for samples collected at PRS No. 48-001, and no COPCs were identified during the human health screening assessment for this PRS.

TABLE 2.1.1-1

SUMMARY OF RFI SAMPLES TAKEN AT PRS No. 48-001[a]

Location ID	Sample ID	Depth (ft)	Media	VOCs Fixed Lab	SVOCs Fixed Lab	XRF Mobile Lab	Inorganic Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-2001	AAA3445	0–0.5	Soil	15098	15098	15100	15106	15104	15102	15102
48-2001	AAA3475	0–0.5	Soil	NR[b]	15098	NR	NR	NR	NR	NR
48-2002	AAA3448	0–0.5	Soil	15098	15098	15100	NR	15104	15102	15102
48-2002	AAA3476	0–0.5	Soil	NR	NR	NR	NR	NR	NR	15102
48-2002	AAA3449	0.5–1	Soil	15098	15098	15100	NR	15104	15102	15102
48-2003	AAA3451	0–0.5	Soil	15098	15098	15100	NR	15104	15102	15102
48-2003	AAA3460	0–0.5	Soil	NR	NR	NR	NR	15104	NR	NR
48-2003	AAA3452	0.5–1	Soil	15098	15098	15100	NR	15104	15102	15102
48-2004	AAA3454	0–0.7	Soil	15098	15098	15100	15106	15104	15102	15102
48-2005	AAA3457	0–0.2	Soil	15098	15098	15100	NR	15104	15102	15102
48-2005	AAA3474	0–0.2	Soil	NR	NR	15100	NR	NR	NR	NR

a. The numbers in the analytical suite columns are analytical request numbers.
b. Not requested

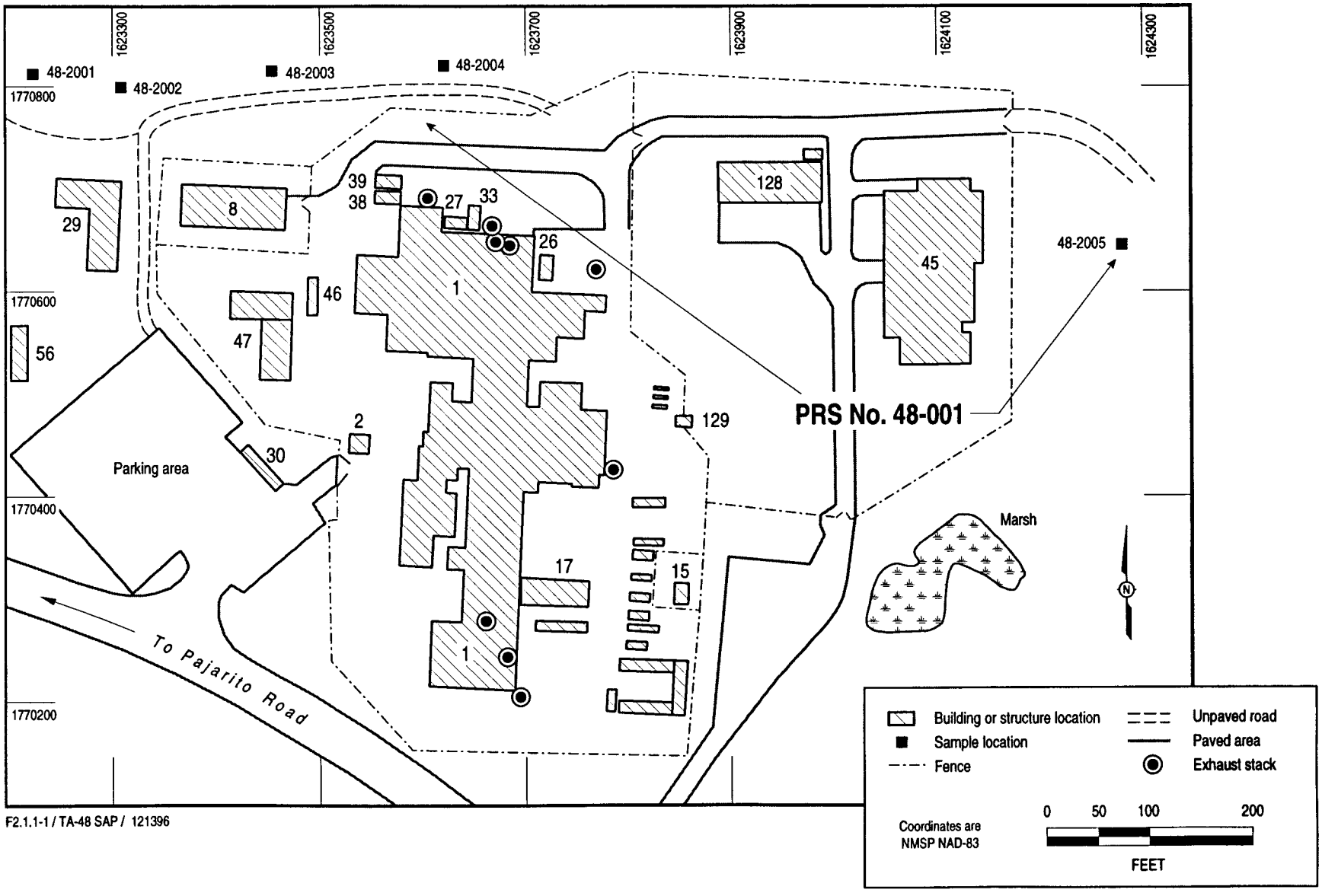


Figure 2.1.1-1. Existing sample locations for PRS No. 48-001.

The work plan indicates that five locations would be sampled for the characterization of radionuclides at PRS No. 48-001: four locations with high probability of radiological contamination and one location with low probability of such contamination. The AIRDOS-EPA modeling software was used to predict locations of particle deposition of ^{90}Sr, ^{144}Ce, ^{137}Cs, ^{241}Am, and ^{238}Pu based on site-specific parameters including wind velocity, stack height, and particle size. Further discussion of the model can be found in Section 7.15.1 of the work plan.

Sampling from the five locations was to include three depth intervals: 0 to 1 ft, 1 to 2 ft, and 2 to 3 ft. However, as noted in the RFI report, the soil/tuff interface never exceeded 12 in. Therefore, samples were collected at the surface for all five locations and at depth at two locations. These seven samples were sent for fixed-site laboratory radiological analysis (gamma spectroscopy and alpha spectrometry) and were also analyzed in the mobile laboratory by gamma spectroscopy. One field duplicate sample was analyzed in the mobile laboratory, and one field duplicate sample was analyzed at a fixed-site laboratory by alpha spectrometry. No radionuclide COPCs were identified in the screening assessment. Conclusions and recommendations presented in the RFI report for this site were based not on the mobile laboratory radionuclide results but on the fixed-site laboratory data instead.

2.1.2 Problem Statement

To fulfill the Laboratory's commitments, as presented in its NOD response memorandum (see EM/ER:96-231 in Attachment I of this SAP), the adequacy of the existing data set for radionuclides at PRS No. 48-001 was evaluated. Specifically, the Laboratory stated in the NOD response No. 16 that conclusions based on mobile laboratory radiological analysis should be disregarded. The Laboratory had determined that mobile laboratory radionuclide results from the Phase I RFI were unusable for determining the nature of gamma-emitting radionuclide contamination. However, a review of the existing data and the sampling requirements set forth in the work plan indicates that the collection of additional gamma spectroscopy data is not required for PRS No. 48-001.

2.1.3 Sampling and Analysis Plan Design

No additional samples will be collected. The locations and numbers of samples follow the SAP in the work plan, except for the depth interval sampling. The deviations from the work plan are noted in the RFI report and were determined not to affect the conclusions and the recommendation of NFA for PRS No. 48-001. Because samples from each location and depth were analyzed for gamma-emitting radionuclides at a fixed-site laboratory, the data quality is adequate to support the recommendation of NFA.

2.2 PRS No. 48-002(e)

PRS No. 48-002(e) is a small container storage area located on the east side of TA-48-1. Most of the PRS is covered with asphalt except a small piece of exposed ground. This area was listed in the 1988 Laboratory active container storage database and was used for many years to store solvents and oils. All containers and other material were removed from the area in 1989 or 1990 (LANL 1992, 7666). Since June 1992, the area has been used to store a liquid nitrogen tank and several compressed-gas cylinders.

2.2.1 Summary of Historical Data

PRS No. 48-002(e) and the existing sample locations are shown in Figure 2.2.1-1. Phase I RFI soil data were collected in 1993 (LANL 1995, 50295). A summary of these samples and the associated analyses is presented in Table 2.2.1-1. The RFI report contains information on organic and inorganic chemicals in samples collected during the Phase I RFI.

TABLE 2.2.1-1

SUMMARY OF RFI SAMPLES TAKEN AT PRS No. 48-002(e)[a]

Part 1							
Location ID	Sample ID	Depth (ft)	Media	VOCs Fixed Lab	SVOCs Fixed Lab	PCBs Fixed Lab	XRF Mobile Lab
48-2037	AAA3545	0–0.5	Soil	15292	15292	15292	15331
48-2037	AAA4431	0–0.5	Soil	15292	NR[b]	NR	NR
48-2037	AAA3546	0.5–1.5	Soil	15292	15292	15292	15331
48-2037	AAA4434	0.5–1.5	Soil	NR	15292	15292	NR
48-2037	AAA3547	1.5–3	Soil	15292	15292	15292	15331
48-2037	AAA4432	1.5–3	Soil	NR	15292	NR	NR
48-2037	AAA4433	1.5–3	Soil	15292	NR	NR	NR
48-2057	AAA3782	0–0.5	Soil	15292	15292	15292	15331
Part 2							
Location ID	Sample ID	Depth (ft)	Media	Inorganic Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-2037	AAA3545	0–0.5	Soil	NR	15334	15333	15333
48-2037	AAA4431	0–0.5	Soil	NR	NR	NR	NR
48-2037	AAA3546	0.5–1.5	Soil	NR	15334	NR	15333
48-2037	AAA4434	0.5–1.5	Soil	NR	NR	NR	NR
48-2037	AAA3547	1.5–3	Soil	15332	15334	NR	15333
48-2037	AAA4432	1.5–3	Soil	NR	NR	NR	NR
48-2037	AAA4433	1.5–3	Soil	NR	NR	NR	NR
48-2057	AAA3782	0–0.5	Soil	NR	15334	NR	15333

a. The numbers in the analytical suite columns are analytical request numbers.
b. Not requested

As described in the RFI report, three intervals were sampled from a 3-ft hand-auger hole, and a surface sample was collected from a separate location.

- Four samples were analyzed for alpha-emitting radionuclides. Only one surface sample was analyzed by gamma spectroscopy at a fixed-site laboratory. Table AII-2 in Attachment II of this SAP contains the fixed-site laboratory results for radionuclides. All four samples were analyzed by gamma spectroscopy at the mobile laboratory.

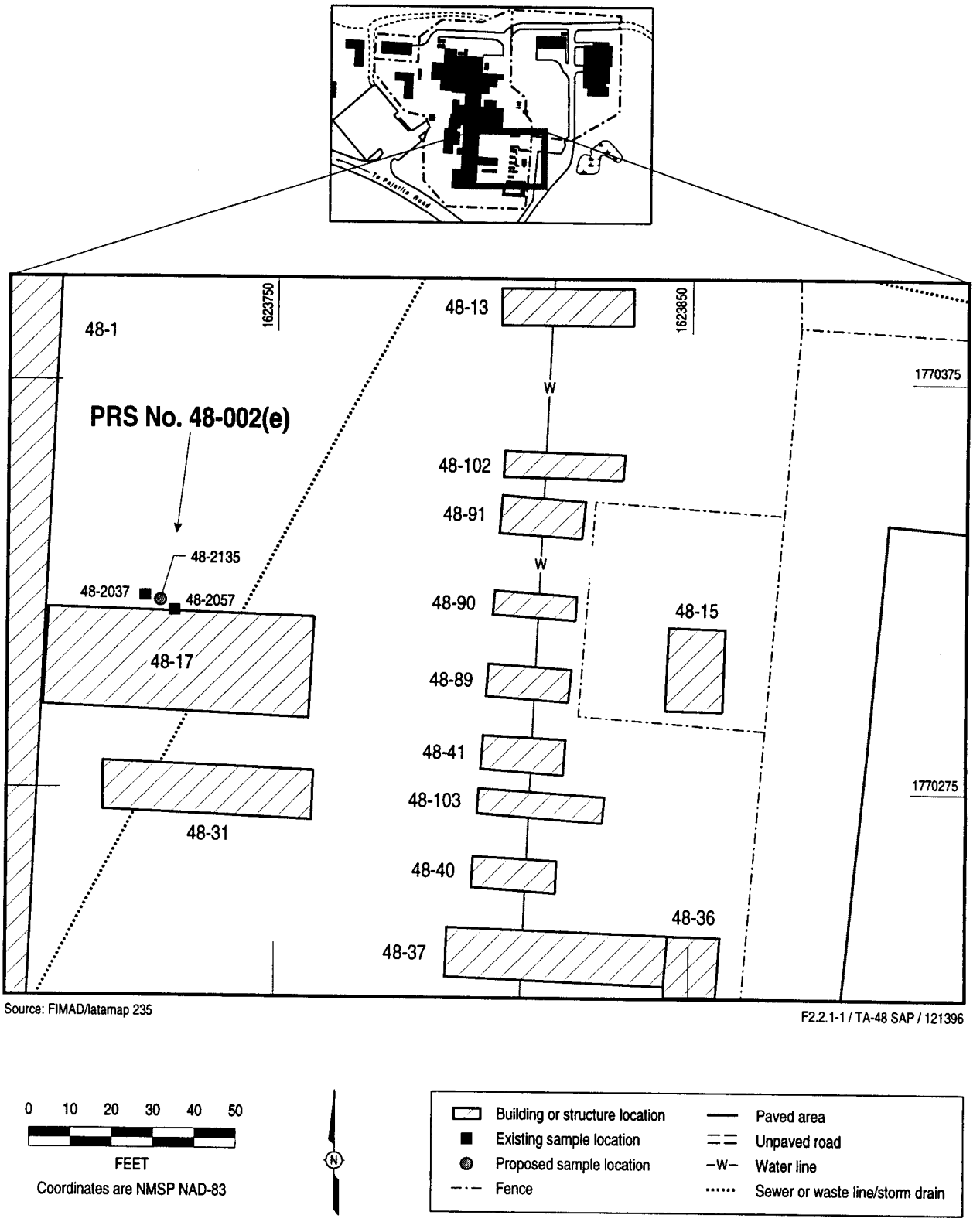


Figure 2.2.1-1. Existing and proposed sample locations for PRS No. 48-002(e).

- Energy dispersive x-ray fluorescence (XRF) analyses and analyses for VOCs, SVOCs, and polychlorinated biphenyls (PCBs) were performed for all samples from this PRS. Environmental Protection Agency (EPA) SW-846 metals analysis was performed at a fixed-site laboratory for the sample collected in the 1.5- to 3-ft interval at Location ID No. 48-2037.

Although COPCs were identified at this site, a recommendation for NFA, with supporting rationale, is made in the RFI report.

2.2.2 Problem Statement

To fulfill the Laboratory's commitments, as presented in its NOD response memorandum (see EM/ER:96-231 in Attachment I of this SAP), the adequacy of the existing data set for radionuclides at PRS No. 48-002(e) must be evaluated. Specifically, the Laboratory stated in the NOD response No. 16 that conclusions based on mobile laboratory radiological analysis should be disregarded. The Laboratory had determined that mobile laboratory radionuclide results from the Phase I RFI were unusable for determining the nature of gamma-emitting radionuclide contamination. Because insufficient fixed-site laboratory gamma spectroscopy data are available to determine the presence or absence of gamma-emitting radionuclide contamination at PRS No. 48-002(e), additional gamma spectroscopy data will be collected as part of this RFI, although radiological contamination is not regulated by RCRA.

The following question will be addressed by collecting supplemental data.

- Are gamma-emitting radionuclides present above background levels at PRS No. 48-002(e) and could they represent a potential threat to human health or the environment?

2.2.3 Sampling and Analysis Plan Design

The locations of proposed samples to be collected under this SAP are shown in Figure 2.2.1-1. One hand-auger hole is proposed to be drilled to approximately 3 ft from existing Location ID No. 48-2037 to collect supplemental gamma spectroscopy data. Three samples will be collected, one at each of the following depth intervals: 0 to 1 ft, 1 to 2 ft, and at the soil/tuff interface. If the depth to tuff is between 2 and 3 ft, one interval may be eliminated and, if the soil depth is less than 2 ft, the two sampling intervals may be reduced to less than 1 ft. A summary of the proposed samples and the associated analyses is presented in Table 2.2.3-1.

TABLE 2.2.3-1

SUMMARY OF PROPOSED SAMPLING FOR PRS No. 48-002(e)

Location ID	Planned Depth	Media	Gamma Spectroscopy
48-2135	0–1 ft	Soil	1
48-2135	1–2 ft	Soil	1
48-2135	Soil/tuff interface	Soil/tuff	1

These gamma spectroscopy data will be used to determine if gamma-emitting radionuclides are present at this PRS and to fulfill the Phase I RFI data objectives as described in the work plan and the addendum to the work plan (LANL 1992, 7666; Pratt 1994, 43475).

2.3 PRS No. 48-003

PRS No. 48-003 is an inactive septic system that served TA-48-1 from 1957 until January 1986 when it was decommissioned (LANL 1992, 7666). This system consisted of a septic tank (TA-48-5), a filter bed (TA-48-6), and an outfall into Mortandad Canyon north of TA-48. The filter bed consisted of a sand and gravel bed that contained polyvinyl chloride piping with open joints to allow seepage of wastes. The bed was lined above and below with an impervious membrane to prevent leakage in the proximate location of the septic system. The septic system is thought to have received mostly sanitary wastes; however, it is suspected that it accidentally received hazardous chemicals and radionuclides during its operation (LANL 1992, 7666).

Building TA-48-45 now covers the former location of the septic tank and a portion of the filter bed. A review of archival aerial photographs and engineering drawings during preparation of this SAP revealed the likely location of the outfall into Mortandad Canyon (see Figure 2.3.1-1).

Engineering drawings of the septic system indicate that the filter bed was drained by a 6-in.-diameter vitrified clay pipe that extended approximately 40 ft toward the edge of Mortandad Canyon. Site surveys have revealed that the actual distance to the mesa edge is approximately 80 ft; however, aerial photographs from 1972 and 1986 do not show an open drainage channel for the remaining distance, and mesa-top discharge of sewage is unlikely for sanitary reasons. Therefore, it is concluded that the pipe extended to the edge of Mortandad Canyon. A drainage channel on the side of the mesa is located where a straight line in the direction shown in the engineering drawing would have intersected the edge of the mesa. It is evident that the outfall from the filter bed was a pipe that extended to the edge of the mesa.

2.3.1 Summary of Historical Data

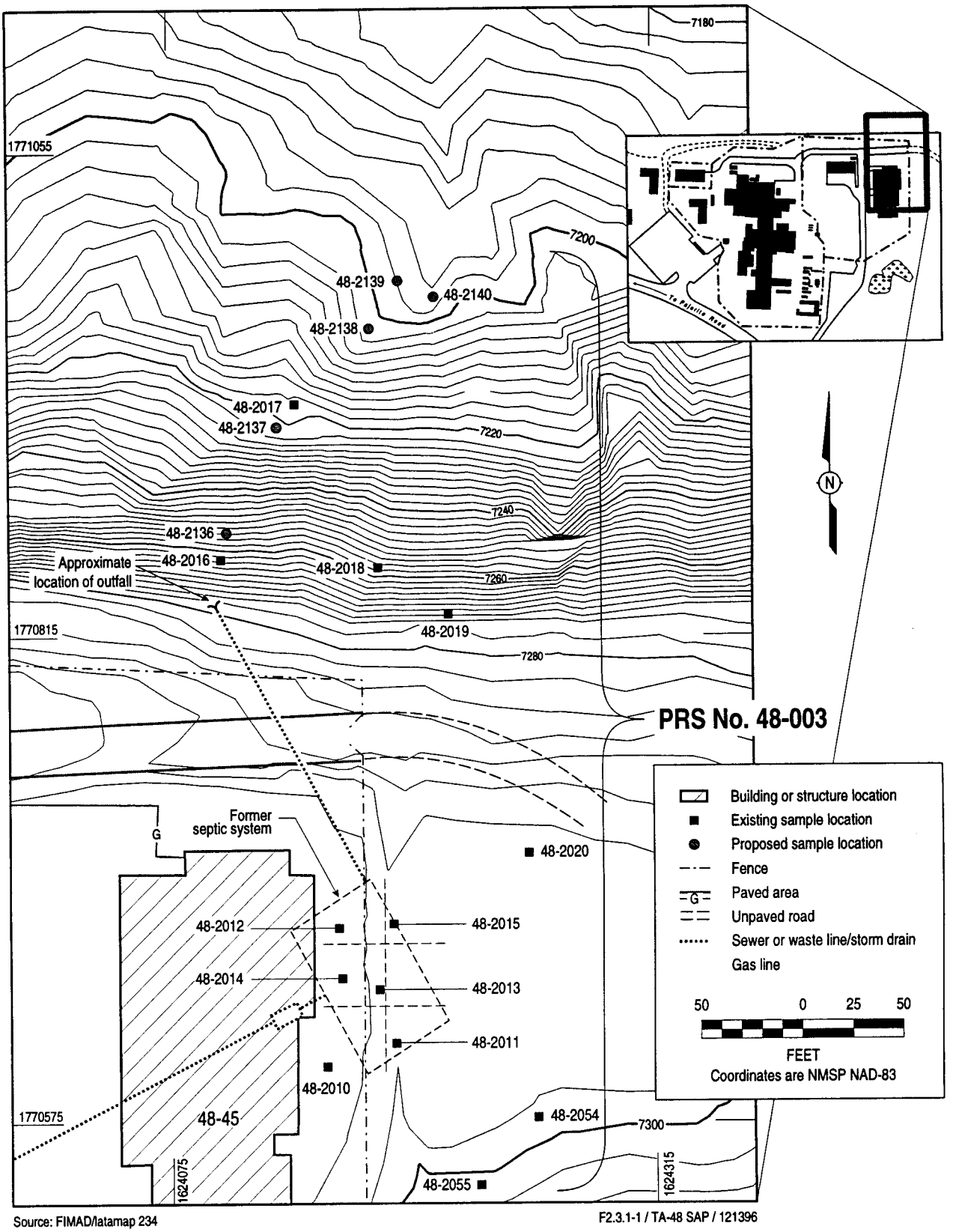
PRS No. 48-003 and the existing sample locations are shown in Figure 2.3.1-1. Historical data associated with PRS No. 48-003 include information from field screening surveys that were conducted before field sampling activities in July 1993, field screening results accumulated during field sampling activities, and fixed-site laboratory results for those samples.

A radiation site walkover was conducted before field sampling activities; no radioactivity above background was detected. The actual range of radioactivity levels is not known. All samples collected during the RFI were scanned for gross-alpha, -beta, and -gamma radioactivity with a Bicron pancake probe 2000. The resulting readings were all within background activity levels (120 to 160 parts per million).

During the RFI, 55 samples (including 22 field duplicate samples) were collected at 13 locations. Table 2.3.1-1 is a summary of the Phase I RFI samples that were collected and the associated analyses. Table AII-3 in Attachment II of this SAP contains the results of inorganic analyses. Table AII-4 in Attachment II of this SAP contains the fixed-site laboratory radionuclide results.

- Six locations (Location ID Nos. 48-2010 through 48-2015) within and around the former filter bed were sampled at approximately 5-ft intervals at depths from 0 to 15 ft. Of the 36 samples collected (including 15 field duplicate samples), 6 (including 2 field duplicate samples) were submitted for fixed-site laboratory gamma spectroscopy analysis.

- Surface samples were collected at five locations (Location ID Nos. 48-2016 through 48-2020) down slope from the location of the former outfall from the septic system. The sample locations were chosen at points near the edge of the mesa along three drainage channels and along the canyon slope near the area where the outfall was thought to have been located. Surface samples from all five locations were submitted for fixed-site laboratory gamma spectroscopy analysis.



Source: FIMAD/latamap 234

F2.3.1-1 / TA-48 SAP / 121396

Figure 2.3.1-1. Existing and proposed sample locations for PRS No. 48-003.

TABLE 2.3.1-1

SUMMARY OF RFI SAMPLES TAKEN AT PRS No. 48-003[a]

Location ID	Sample ID	Depth (ft)	Media	VOCs Fixed Lab	SVOCs Fixed Lab	XRF Mobile Lab	Inorganic Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-2010	AAA3401	4–5	Qbt3	15150	15150	15154	15157	15165	NR[b]	15162
48-2010	AAA3415	4–5	Qbt3	15150	NR	NR	NR	15165	NR	NR
48-2010	AAA3416	4–5	Qbt3	NR	NR	NR	15157	15165	NR	NR
48-2010	AAA3402	8.5–9.5	Qbt3	15150	15150	15154	NR	15165	NR	15162
48-2010	AAA3403	14–15	Qbt3	15150	15150	15154	NR	15165	15162	15162
48-2010	AAA3410	14–15	Qbt3	NR	NR	NR	NR	15165	15162	15162
48-2011	AAA4449	1.7–3.7	Soil	15176	15176	15182	NR	15183	15185	15185
48-2011	AAA4458	1.7–3.7	Soil	15176	NR	NR	NR	NR	NR	NR
48-2011	AAA4459	1.7–3.7	Soil	NR	NR	NR	NR	NR	15185	15185
48-2011	AAA4450	7–8	Qbt3	15176	15176	15182	15179	15183	NR	15185
48-2011	AAA4460	7–8	Qbt3	NR	15176	NR	NR	NR	NR	NR
48-2011	AAA4461	7–8	Qbt3	NR	NR	NR	15179	NR	NR	NR
48-2011	AAA4451	11–12	Qbt3	15176	15176	15182	NR	15183	NR	15185
48-2011	AAA3542	14–15	Qbt3	15176	15176	15182	NR	15183	NR	15185
48-2012	AAA3404	4–5	Qbt3	15150	15150	15154	NR	15165	15162	15162
48-2012	AAA3405	9–10	Qbt3	15150	15150	15154	NR	15165	NR	15162
48-2012	AAA3411	9–10	Qbt3	NR	15150	NR	NR	15165	NR	NR
48-2012	AAA3406	14–15	Qbt3	15150	15150	15154	NR	15165	NR	15162
48-2012	AAA3412	14–15	Qbt3	NR	NR	15154	NR	15165	NR	NR
48-2012	AAA3413	14–15	Qbt3	15150	NR	NR	NR	15165	NR	NR
48-2013	AAA4452	2.5–3.8	Soil	15176	15176	15182	NR	15183	NR	15185
48-2013	AAA4465	2.5–3.8	Soil	NR	NR	15182	NR	NR	NR	NR
48-2013	AAA4453	9–10	Qbt3	15176	15176	15182	NR	15183	15185	15185
48-2013	AAA4454	14–15	Qbt3	15176	15176	15182	15179	15183	NR	15185
48-2013	AAA4462	14–15	Qbt3	NR	15176	NR	NR	NR	NR	NR
48-2014	AAA3407	4–5	Qbt3	15150	15150	15154	NR	15165	NR	15162
48-2014	AAA3414	4–5	Qbt3	NR	NR	NR	NR	15165	NR	NR
48-2014	AAA3408	7–7.2	Qbt3	15150	15150	15154	15157	15165	NR	15162
48-2014	AAA3409	9–10	Qbt3	15150	15150	15154	NR	15165	NR	15162
48-2014	AAA4473	14–15	Qbt3	15150	15150	15154	NR	NR	NR	15162
48-2015	AAA4455	0.5–1.5	Soil	15176	15176	15182	NR	15183	NR	15185
48-2015	AAA4456	4–5	Qbt3	15176	15176	15182	NR	15183	NR	15185

a. The numbers in the analytical suite columns are analytical request numbers.
b. Not requested

TABLE 2.3.1-1 (continued)

SUMMARY OF RFI SAMPLES TAKEN AT PRS No. 48-003[a]

Location ID	Sample ID	Depth (ft)	Media	VOCs Fixed Lab	SVOCs Fixed Lab	XRF Mobile Lab	Inorganic Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-2015	AAA4457	9–10	Qbt3	15176	15176	15182	NR	15183	NR	15185
48-2015	AAA4463	9–10	Qbt3	NR	NR	NR	NR	15183	NR	NR
48-2015	AAA4464	9–10	Qbt3	15176	NR	NR	NR	15183	NR	NR
48-2015	AAA3543	14–15	Qbt3	15176	15176	15182	NR	15183	NR	15185
48-2016	AAA3493	0–0.5	Soil	NR	15118	NR	NR	15126	15128	15128
48-2017	AAA3494	0–0.5	Soil	NR[b]	NR	15125	NR	15126	15128	15128
48-2017	AAA3498	0–0.5	Soil	NR	NR	NR	NR	15126	NR	NR
48-2017	AAA3502	0–0.5	Soil	NR	NR	15125	NR	15126	NR	NR
48-2017	AAA3511	0–0.5	Soil	NR	15118	NR	NR	15126	NR	NR
48-2018	AAA3495	0–0.5	Soil	NR	15118	NR	NR	15126	15128	15128
48-2018	AAA3500	0–0.5	Soil	NR	15118	NR	NR	15126	NR	NR
48-2018	AAA3501	0–0.5	Soil	NR	NR	NR	NR	15126	15128	15128
48-2019	AAA3496	0–0.5	Soil	NR	15118	NR	NR	15126	15128	15128
48-2020	AAA3497	0–0.5	Soil	NR	15118	15122	NR	15126	15128	15128
48-2020	AAA3499	0–0.5	Soil	NR	NR	15122	NR	15126	NR	NR
48-2054	AAA3512	0–0.5	Soil	NR	15118	15122	NR	15126	15128	15128
48-2054	AAA3514	0.5–1.5	Soil	NR	15118	15122	NR	15126	NR	15128
48-2054	AAA3515	1.5–2.5	Soil	NR	15118	15122	NR	15126	NR	15128
48-2055	AAA3469	0–0.5	Soil	NR	15118	NR	NR	15126	NR	NR
48-2055	AAA3513	0–0.5	Soil	NR	15118	15122	NR	15126	15128	15128
48-2055	AAA3516	0.5–1.5	Soil	NR	15118	15122	NR	15126	NR	15128
48-2055	AAA3470	1.5–2.5	Soil	NR	15118	NR	NR	15126	NR	15128
48-2055	AAA3471	2.5–3.5	Soil	NR	15118	NR	NR	15126	NR	15128

a. The numbers in the analytical suite columns are analytical request numbers.
b. Not requested

- Two additional locations (Location ID Nos. 48-2054 and 48-2055) were sampled on the mesa top southeast of the former filter bed in an area identified from 1988 archival photographs as sandy areas that are assumed to be the excavated material from the filter bed. Eight samples (including one field duplicate sample) were collected from depths ranging from 0 to 3.5 ft. Two samples were submitted for fixed-site laboratory gamma spectroscopy analysis.

Table AII-4 in Attachment II of this SAP also contains the fixed-site laboratory results for radionuclides.

The RFI report (LANL 1995, 50295) indicates that neither inorganic nor organic chemicals are present in Phase I RFI samples at concentrations that pose an unacceptable risk to human health. However in the

area of the outfall from the sand filter bed, samples from the two locations that were sampled (Location ID Nos. 35-2016 and 35-2017) were not analyzed for inorganic chemicals, and only two surface samples (and no subsurface samples) were analyzed for SVOCs. The RFI report identifies radionuclides as potential chemicals of concern (COCs).

2.3.2 Problem Statement

To fulfill the Laboratory's commitments, as presented in its NOD response memorandum (see EM/ER:96-231 in Attachment I of this SAP), the adequacy of the existing data set for radionuclides at PRS No. 48-003 was evaluated. Specifically, the Laboratory stated in the NOD response No. 16 that conclusions based on mobile laboratory radiological analysis should be disregarded. The Laboratory had determined that mobile laboratory radionuclide results from the Phase I RFI were unusable for determining the nature of gamma-emitting radionuclide contamination.

An assumption in the design of this SAP is that the septic tank and filter bed were designed not to leak and that the major part of a release, if any, was through the outfall. The area of the outfall will be the focus of additional sampling at this PRS. There were sufficient fixed-site laboratory gamma spectroscopy data to evaluate potential releases in the area of the filter bed. However, because insufficient fixed-site laboratory gamma spectroscopy data are available to determine the presence or absence of gamma-emitting radionuclide contamination, additional gamma spectroscopy data will be collected. An inadequate number of samples were collected in the area below the outfall, and those samples were not analyzed for inorganic chemicals; only two surface samples were analyzed for organic chemicals. Therefore, additional samples for inorganic and organic chemical analysis will be collected in the area below the outfall from PRS No. 48-003.

The following question will be addressed by collecting supplemental data.

- Are inorganic chemicals, organic chemicals, or radionuclides present above background levels in soils and sediments of the septic system drainage channel at PRS No. 48-003 and could they represent a potential threat to human health or the environment?

The RFI report identifies ^{137}Cs, ^{230}Th, and ^{238}U as potential COCs after the Phase I RFI and requires additional sampling to determine the extent of these contaminants, although radiological contamination is not regulated by RCRA. Therefore, establishing the extent of contamination associated with these potential COCs will also be addressed in this SAP to respond to this problem statement.

2.3.3 Sampling and Analysis Plan Design

Because gamma spectroscopy data from the mobile laboratory facility have been discarded, as stated in Section 2.3.2, data for gamma-emitting radionuclides are available for only four samples in the area of the former filter bed. Three of these samples were collected in native tuff, and one was collected in backfill material at the interface with bedrock tuff. Because these data do not indicate contamination in either the backfill or the underlying tuff and because the filter bed was designed with impermeable membranes to isolate the underlying tuff from the waste stream, no additional samples are proposed for the filter bed area to satisfy NOD comment No. 16.

In the RFI report (LANL 1995, 50295) three COPCs (^{137}Cs, ^{230}Th, and ^{238}U) were identified in a single surface sample collected at Location ID No. 48-2019 on the mesa edge. Two of the other three surface samples on the slope below PRS No. 48-003 (Location ID Nos. 48-2016 and 48-2017) were collected in the drainage channel where the outfall is suspected to have been located and on the bench below this

drainage channel. Plutonium and uranium isotopes were identified above background levels in these samples. However, these surface samples are not sufficient to evaluate the nature of a release, if any, because sedimentary processes in the ten years since the outfall was active may have deposited new soil on the slope or may have remobilized contaminants deposited on the slope in either continuous or periodic erosional events.

The locations of proposed samples to be collected under this SAP are shown in Figure 2.3.1-1. A summary of the proposed samples and the associated analyses is presented in Table 2.3.3-1. Hand-auger samples are proposed for two locations of sediment accumulation in the drainage channel on the mesa slope where the outfall is believed to have been located. Data from these locations will be used to evaluate whether residual contamination may have accumulated in soil or tuff in the drainage channel. The drainage channel will be surveyed either visually or (preferably) with a depth probe to identify the two areas with deepest accumulation of sediment. Three samples will be collected, one at each of the following depth intervals: 0 to 1 ft, 1 to 2 ft, and at the soil/tuff interface. If the depth to tuff is between 2 and 3 ft, one interval may be eliminated and, if the soil depth is less than 2 ft, the two sampling intervals may be reduced to less than 1 ft. Each sample will be analyzed for alpha-, beta-, and gamma-emitting radionuclides; inorganic chemicals; and SVOCs.

TABLE 2.3.3-1

SUMMARY OF PROPOSED SAMPLING FOR PRS No. 48-003

Location ID	Planned Depth (ft)	Media	SVOCs	SW-846 Metals	Gamma Spectroscopy	Isotopic Pu	Isotopic Th	Isotopic U	Sr-90
48-2136	Surface	Soil	1	1	1	1	1	1	1
48-2136	Intermediate*	Soil	1	1	1	1	1	1	1
48-2136	Tuff interface	Soil/tuff	1	1	1	1	1	1	1
48-2137	Surface	Soil	1	1	1	1	1	1	1
48-2137	Intermediate*	Soil	1	1	1	1	1	1	1
48-2137	Tuff interface	Soil/tuff	1	1	1	1	1	1	1
48-2138	Surface	Soil	1	1	1	1	1	1	1
48-2138	Intermediate*	Soil	1	1	1	1	1	1	1
48-2138	Tuff interface	Soil/tuff	1	1	1	1	1	1	1
48-2139	Surface	Soil	1	1	1	1	1	1	1
48-2139	Intermediate*	Soil	1	1	1	1	1	1	1
48-2139	Tuff interface	Soil/tuff	1	1	1	1	1	1	1
48-2140	Surface	Soil	1	1	1	1	1	1	1
48-2140	Intermediate*	Soil	1	1	1	1	1	1	1
48-2140	Tuff interface	Soil/tuff	1	1	1	1	1	1	1

*Collect intermediate interval if depth allows.

Three additional hand-auger holes are proposed for locations on the bench directly below the drainage channel. Data from these locations will be used to evaluate whether contaminants have accumulated at the base of the drainage channel, either due to mobilization from the drainage on soil particles to which they are bound or directly due to infiltration of septic liquids when the outfall was active. The presence of an alluvial fan at the base of the drainage channel and its configuration will ideally determine sample

locations. If the locations of the hand-auger holes cannot be field biased in this manner, one hand-auger hole will be located directly below the drainage channel where sediments are located, and the remaining two will be located approximately 50 or 60 ft farther from the slope and spaced 50 ft apart, forming a triangular pattern. Depth intervals will be determined in the same manner as the hand-auger holes located in the drainage channel.

In summary, five locations with up to three sampling intervals per location will be sampled. The location of these samples will allow not only identification of a release but also a preliminary evaluation of the extent of the release and will provide information on the type of sedimentary processes that have been active on the slope during the period of releases. Whether contaminants are present in the drainage channel or on the bench below the drainage channel, the depths where they are present and the relative concentrations among depths and locations will allow the technical team to infer (1) if any significant release has occurred and (2) if the highest environmental concentrations are likely to have been spatially bound. Based on the interpretation of these data, recommendations for additional action, if any, will be made.

2.4 PRS No. 48-005, Line 34

PRS No. 48-005 includes abandoned radioactive waste Lines 34, 36, 37, and 38 and an outfall into Mortandad Canyon that originated from Line 37.

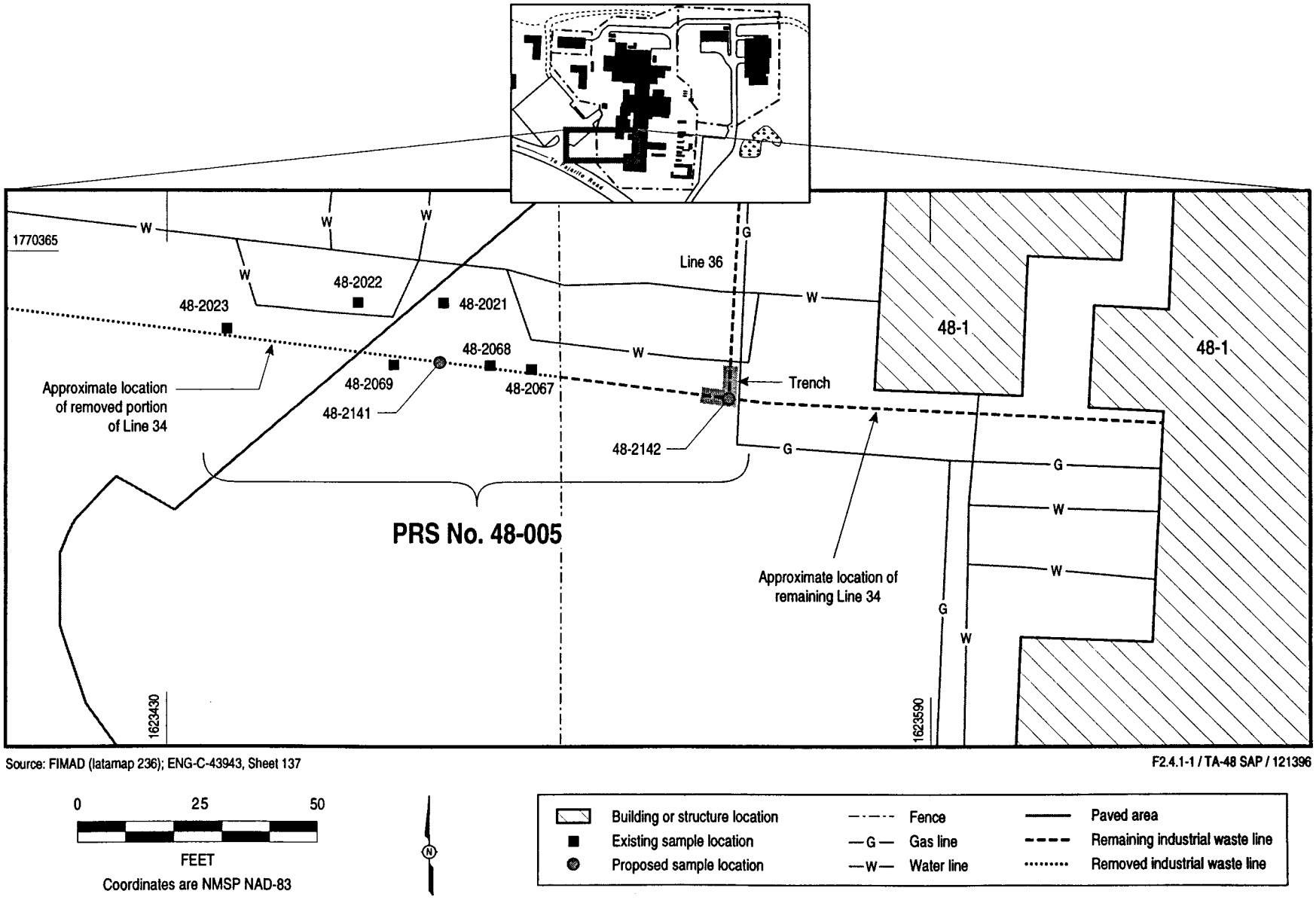
From 1957 to 1965 underground industrial waste lines were used to transport liquid wastes containing radionuclides and chemicals from TA-48 to a chemical waste treatment plant at TA-45. Beginning in 1963, liquid wastes from TA-48 were diverted through new underground waste lines to the new liquid waste treatment facility at TA-50. Portions of the abandoned waste lines that were located outside the security fence at TA-48 were removed during decontamination and decommissioning (D&D) operations in 1981 and 1984. However, portions of the waste lines that are located inside the security fence were not removed (LANL 1992, 7666).

Line 34 was a 3-in.-diameter cast-iron pipe that ran westward from TA-48-1 and carried industrial wastes to TA-45 before 1963. The line contained up to 1,000 disintegrations per minute per 50 cm^2 of alpha activity when it was decommissioned (LANL 1992, 7666). In 1984 a 200-ft section of Line 34 located outside the security fence was removed. A 100-ft section remains inside the security fence at a depth of approximately 11 ft.

2.4.1 Summary of Historical Data

Line 34 and the existing sample locations are shown in Figure 2.4.1-1. Phase I RFI soil data were collected in 1993 (LANL 1995, 50295). A summary of the samples collected and the associated analyses is presented in Table 2.4.1-1. Location ID Nos. 48-2021, 48-2022, and 48-2023 were situated outside the Line 34 trench. Boreholes drilled in the Line 34 trench include Location ID Nos. 48-2067, 48-2068, and 48-2069. Table AII-5 in Attachment II of this SAP contains the results of inorganic and organic chemical analysis for Line 34.

XRF, SVOC, and alpha spectrometry data are available for two samples collected in backfill material and three samples collected at the backfill/tuff interface from boreholes at Location ID Nos. 48-2067, 48-2068, and 48-2069. Fixed-site laboratory gamma spectroscopy data were obtained for the 2.5- to 3-ft sample of backfill material at Location ID No. 48-2069. Table AII-6 in Attachment II of this SAP contains the fixed-site laboratory results for radionuclides.



Source: FIMAD (latamap 236); ENG-C-43943, Sheet 137

F2.4.1-1 / TA-48 SAP / 121396

Figure 2.4.1-1. Existing and proposed sample locations for PRS No. 48-005, Line 34.

TABLE 2.4.1-1

SUMMARY OF RFI SAMPLES TAKEN AT PRS No. 48-005, LINE 34[a]

Location ID	Sample ID	Depth (ft)	Media	VOCs Fixed Lab	SVOCs Fixed Lab	XRF Mobile Lab	Inorganic Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-2021	AAA3693	2.5–3.7	Soil	15188	15188	15194	NR[b]	15191	15195	15195
48-2021	AAA3702	2.5–3.7	Soil	NR	NR	NR	NR	15191	NR	NR
48-2021	AAA3708	2.5–3.7	Soil	15188	NR	NR	NR	15191	NR	NR
48-2021	AAA3712	2.5–3.7	Qbt3	NR	NR	NR	NR	15191	15195	15195
48-2021	AAA3694	9–10	Qbt3	15188	15188	15194	NR	15191	NR	15195
48-2021	AAA3709	9–10	Qbt3	NR	NR	15194	NR	15191	NR	NR
48-2021	AAA3695	14–15	Qbt3	15188	15188	15194	15196	15191	NR	15195
48-2022	AAA3696	4–5	Qbt3	15188	15188	15194	NR	15191	NR	15195
48-2022	AAA3697	9–10	Qbt3	15188	15188	15194	NR	15191	NR	15195
48-2022	AAA3703	9–10	Qbt3	15188	NR	NR	NR	15191	NR	NR
48-2022	AAA3698	14–15	Qbt3	15188	15188	15194	NR	15191	NR	15195
48-2022	AAA3710	14–15	Qbt3	NR	15188	NR	NR	15191	NR	NR
48-2023	AAA3699	4–5	Qbt3	15188	15188	15194	15196	15191	NR	15195
48-2023	AAA3711	4–5	Qbt3	NR	NR	NR	15196	15191	NR	NR
48-2023	AAA3700	9–10	Qbt3	15188	15188	15194	NR	15191	15195	15195
48-2023	AAA3701	14–15	Qbt3	15188	15188	15194	NR	15191	NR	15195
48-2023	AAA3713	14–15	Qbt3	NR	15188	NR	NR	15191	NR	NR
48-2067	AAA3803	4.47–5	Soil	NR	16178	16191	NR	16180	NR	16193
48-2067	AAA3804	6.4–7	Soil	NR	16178	16191	NR	16180	NR	16193
48-2068	AAA3806	7.0–8	Soil	NR	16178	16191	NR	16180	NR	16193
48-2069	AAA3810	2.5–3	Soil	NR	16178	16191	NR	16180	16193	16193
48-2069	AAA3811	5.5–7	Soil	NR	16178	16191	NR	16180	NR	16193

a. The numbers in the analytical suite columns are analytical request numbers.
b. Not requested

No inorganic chemicals or radionuclides were identified as COPCs, and no SVOCs were detected. Trace levels of acetone were detected in three samples (LANL 1995, 50295).

2.4.2 Problem Statement

Data will be collected to supplement chemical and gamma spectroscopy data to satisfy NOD response Nos. 16 and 26 (see EM/ER:96-231 in Attachment I of this SAP).

In NOD response No. 16, the Laboratory stated that conclusions based on mobile laboratory radiological analysis should be disregarded. The Laboratory had determined that mobile laboratory radionuclide results from the Phase I RFI were unusable for determining the nature of gamma-emitting radionuclide

contamination. Because insufficient fixed-site laboratory gamma spectroscopy data are available to determine the presence or absence of gamma-emitting radionuclide contamination as described in the work plan, additional gamma spectroscopy data will be collected as part of this RFI, although radiological contamination is not regulated by RCRA.

In NOD response No. 26, the Laboratory has agreed to collect additional data for waste lines associated with PRS No. 48-005 both inside and outside the security fence. Because no data are available for Line 34 inside the security fence, full-suite analyses will be performed for samples collected in this area to complete Phase I sampling objectives as described in the work plan. The following question will be addressed by collecting supplemental data.

- Are contaminants present above background concentrations in soils at Line 34 and could they represent a potential threat to human health or the environment?

The work plan specifies that Phase I subsurface samples will be analyzed for inorganic chemicals, VOCs, and SVOCs following EPA SW-846 protocols. Radionuclides will be analyzed using Laboratory-approved methods.

2.4.3 Sampling and Analysis Plan Design

The locations of proposed samples to be collected are shown in Figure 2.4.1-1. A single borehole will be drilled in the Line 34 trench outside the security fence near Location ID No. 48-2069. A trench will also be dug at the intersection of Lines 34 and 36 inside the security fence. A trench was chosen rather than a borehole because qualitative information on the integrity of the remaining pipe, staining, and type and location of fill material can be used to support the analytical data in making recommendations for future action. The proposed location of the trench was established by inspecting engineering drawings. A summary of the proposed samples and the associated analyses is presented in Table 2.4.3-1.

TABLE 2.4.3-1

SUMMARY OF PROPOSED SAMPLING FOR PRS No. 48-005, LINE 34

Location ID	Planned Depth (ft)	Media	VOCs	SVOCs	SW-846 Metals	Gamma Spectroscopy	Isotopic Pu	Isotopic Th	Isotopic U	Sr-90
48-2141	Line[a]	Soil	0	0	0	1	0	0	0	0
48-2141	Tuff[b]	Tuff	0	0	0	1	0	0	0	0
48-2142	Line[a]	Soil	1	1	1	1	1	1	1	1
48-2142	Tuff[b]	Tuff	1	1	1	1	1	1	1	1

a. At depth of former line
b. In tuff at bottom of trench below level of line

Samples from the trench will be analyzed for alpha-, beta-, and gamma-emitting radionuclides; inorganic chemicals; VOCs; and SVOCs. Two samples will be collected in the trench, biased by gross-gamma screening, organic vapor analyzer (OVA) screening, or visual observation of staining, if possible. If this field screening provides no guidance for biasing samples, one sample will be collected from soil immediately above or adjacent to Line 34, and one sample will be collected from the tuff below the Line 34 trench.

Two samples will be collected from the borehole near Location ID No. 48-2069. One sample will be collected in tuff from below the depth of the removed waste line, and another sample will be collected in the soil at or immediately above the Line 34 trench. Borehole samples will be analyzed for gamma-emitting radionuclides by gamma spectroscopy. If radiation field screening indicates contamination in backfill material above the tuff, at least one additional sample will be collected from the backfill material at the depth of the highest field instrument reading.

Data from trench and borehole samples are intended to provide information on whether historical releases associated with Line 34 may have occurred. The borehole (Location ID No. 48-2141) outside the fence is placed essentially at random at a point along the former location of the line because no data exists on the presence or location of possible subsurface leaks. The trench inside the fence is located at the intersection of Line 36 because (1) fittings or welds at a T connector may be more likely to fail than other points along a line and (2) data may be used to evaluate both Lines 34 and 36 and thereby conserve resources.

Only gamma spectroscopy is requested for the borehole samples because existing Phase I RFI soil data from Location ID Nos. 48-2067, 48-2068, and 48-2069 do not reveal the presence of alpha-emitting radionuclides or inorganic or organic COPCs. Full-suite analyses are requested from the trench because these data also support the investigation of Line 36, and no data are available yet from this area.

2.5 PRS No. 48-005, Line 36

PRS No. 48-005 includes abandoned radioactive waste Lines 34, 36, 37, and 38 and an outfall into Mortandad Canyon that originated from Line 37.

From 1957 to 1965 underground industrial waste lines were used to transport liquid wastes containing radionuclides and chemicals from TA-48 to a chemical waste treatment plant at TA-45. Beginning in 1963, liquid wastes from TA-48 were diverted through new underground waste lines to the new liquid waste treatment facility at TA-50. Portions of the abandoned waste lines that were located outside the security fence at TA-48 were removed during D&D operations in 1981 and 1984 (LANL 1992, 7666). However, portions of the waste lines that are located inside the security fence were not removed.

Line 36 is a 3-in.-diameter cast-iron pipe that runs southward from the north wing of TA-48-1 to Line 34. No activity was detected in Line 36 (LANL 1992, 7666). A 300-ft section of Line 36 remains inside the security fence at a depth of approximately 11 ft.

2.5.1 Summary of Historical Data

No samples for RFI characterization were collected from Line 36 (as described in the work plan).

Five surface samples and five subsurface samples were collected north of TA-48 near PRS No. 48-001 by the Laboratory environmental protection group during a reconnaissance survey in April 1991 (Fresquez 1991, 21358). Some of these samples were reported in Section 4.3.1 of the RFI report as being near Lines 36 and 37. Gross-alpha, -beta, and -gamma-emitting radionuclides were at background levels, and no SVOCs or PCBs were detected. Metals were analyzed by the toxicity characteristic leaching procedure (TCLP).

On March 19, 1982, a broken radioactive waste line was identified as the source of surface ponding at the northwest corner of TA-48-1 (Emelity 1982, 797). Contaminated soil was reportedly removed. Based on schematic drawings, the waste line in question is Line 36.

2.5.2 Problem Statement

Data will be collected to satisfy NOD response No. 26 and NMED's Request for Additional Information (No. 2) (see EM/ER:96-231 and EM/ER:96-533 in Attachment I of this SAP).

No samples have been collected at Line 36. The work plan stated that the Phase I RFI would be limited to sampling around the former waste lines outside the security fence, the former waste lines at the west and south perimeter of TA-48-1, the former waste lines north of TA-48-1 inside the security fence, and the outfall area. The work plan also stated that if contamination was detected above background concentrations during the Phase I RFI, additional sampling would be conducted to investigate the remaining sections of Lines 34, 36, and 38. Therefore, no samples were collected during the Phase I RFI at Line 36.

In NOD response No. 26, the Laboratory agreed to collect data for waste lines associated with PRS No. 48-005 both inside and outside the security fence. Additionally, in the response to NMED's Request for Additional Information (No. 2), the Laboratory has agreed to include sampling of Line 36 in this SAP. The Laboratory noted in the response that a release associated with Line 36 was reported at the northwest corner of TA-48-1 (Emelity 1982, 797) and has agreed to investigate this area to confirm whether the Emelity memorandum (1982, 797) is accurate and pertains to Line 36 and, if so, whether residual contamination remains in the area.

The following question will be addressed by collecting supplemental data.

- Are contaminants present above background concentrations in soils at Line 36 and could they represent a potential threat to human health or the environment?

The samples will be analyzed for inorganic chemicals, VOCs, and SVOCs following EPA SW-846 protocols. Samples will be analyzed for radionuclides using Laboratory-approved methods.

2.5.3 Sampling and Analysis Plan Design

The locations of proposed samples are shown in Figures 2.5.3-1 and 2.5.3-2. Two trenches will be excavated to below the depth of the waste line inside the security fence. One trench will be located at the intersection of Lines 34 and 36, as described in Section 2.4.3, and another trench will be located at the approximate location of the leak reported by Emelity (1982, 797). It is possible that a trench will not be feasible near the reported leak because of the presence of underground utilities and current site use. If a trench cannot be excavated, subsurface data may be collected via a borehole if this process will mitigate safety concerns. All samples will be analyzed for alpha-, beta-, and gamma-emitting radionuclides; inorganic chemicals; VOCs; and SVOCs.

Two samples will be collected in the trench at the intersection of Lines 34 and 36 as described in Section 2.4.3.

In the location of the 1982 release described by Emelity (1982, 797), the field team will attempt to identify the area of backfill material where soil was removed in 1982. Surface or subsurface occurrence of newer backfill material, field survey instrument response, visual or olfactory evidence of a release, and information provided by TA-48 personnel may be used to confirm the location of the release. The sampling design for this location will vary depending on whether the area of the leak is identified and whether a trench or a borehole is used to collect subsurface samples. Table 2.5.3-1 contains a summary of the proposed samples and the associated analyses for each scenario. The different approaches for these scenarios are described below.

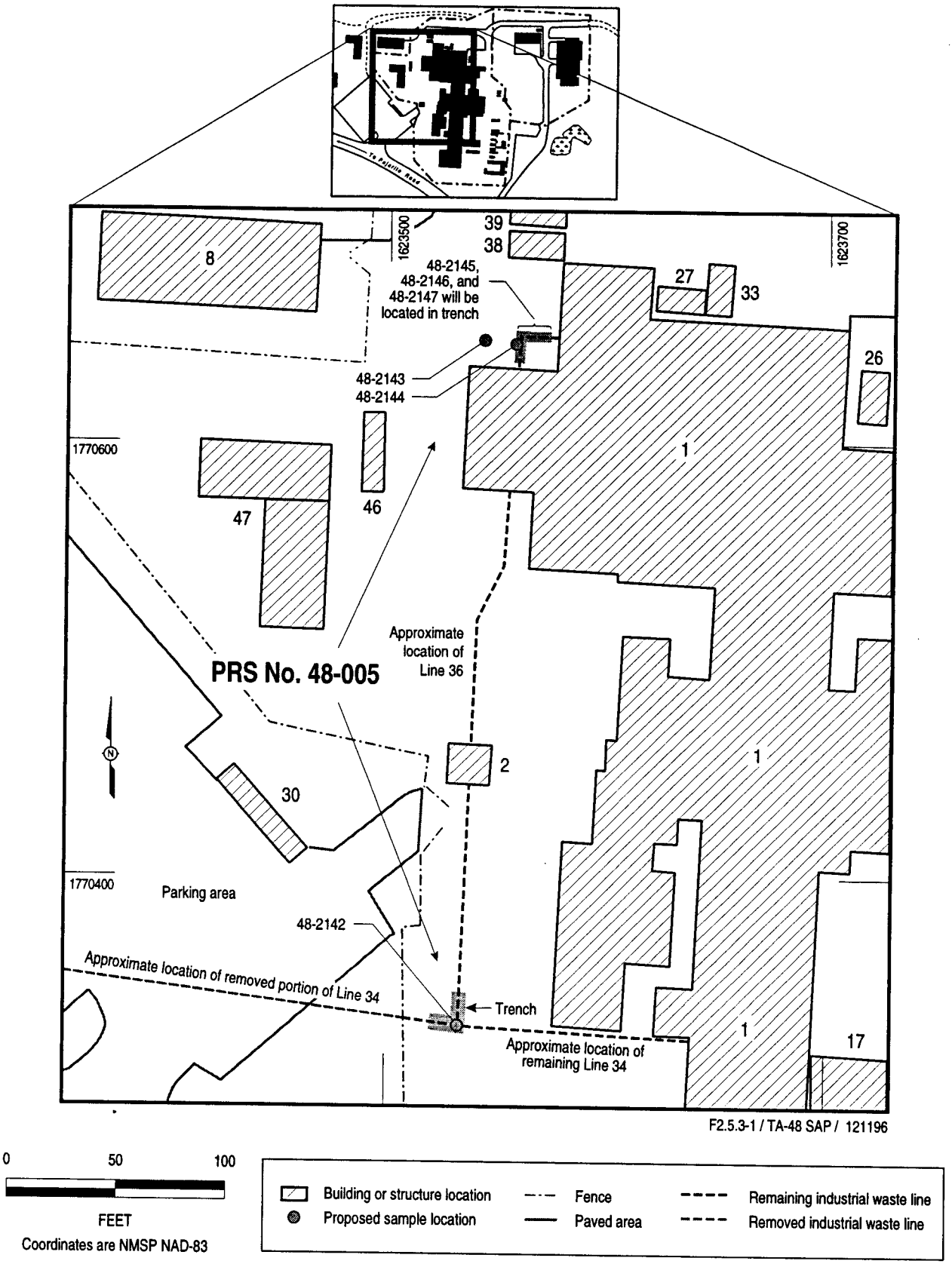


Figure 2.5.3-1. Scenarios 1 and 3 for proposed samples at PRS No. 48-005, Line 36.

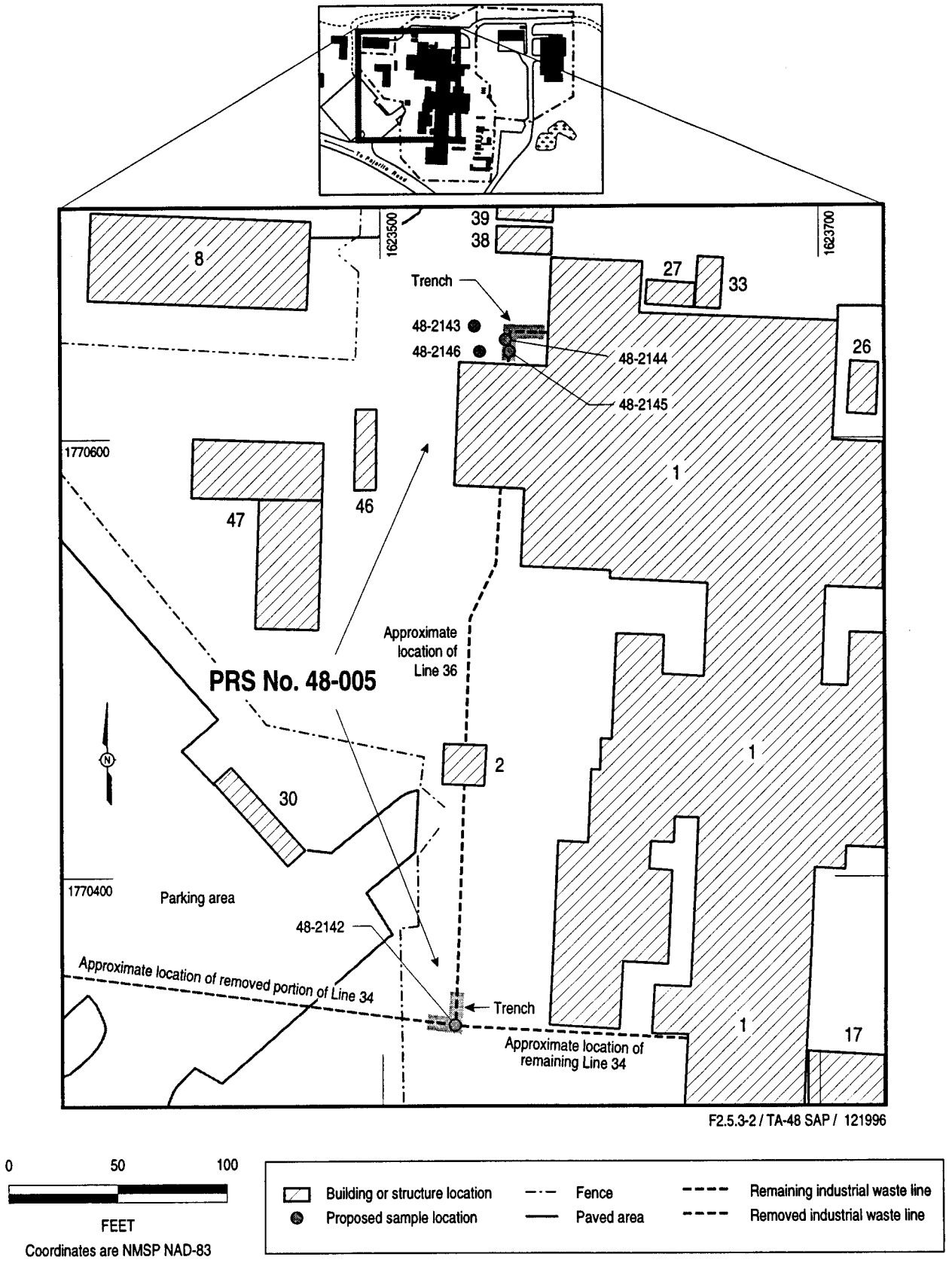


Figure 2.5.3-2. Scenarios 2 and 4 for proposed samples at PRS No. 48-005, Line 36.

TABLE 2.5.3-1

SUMMARY OF PROPOSED SAMPLING FOR PRS No. 48-005, LINE 36

Location ID	Planned Depth (ft)	Media	VOCs	SVOCs	SW-846 Metals	Gamma Spectroscopy	Isotopic Pu	Isotopic Th	Isotopic U	Sr-90
48-2142	Line[a]	Soil	1	1	1	1	1	1	1	1
48-2142	Tuff[a]	Tuff	1	1	1	1	1	1	1	1
Scenario 1										
48-2143	Surface	Soil	1	1	1	1	1	1	1	1
48-2144	Surface	Soil	1	1	1	1	1	1	1	1
48-2145	Line[a]	Soil	1	1	1	1	1	1	1	1
48-2146	Line[a]	Backfill	1	1	1	1	1	1	1	1
48-2147	Tuff[b]	Tuff	1	1	1	1	1	1	1	1
Scenario 2										
48-2143	Surface	Soil	1	1	1	1	1	1	1	1
48-2144	Surface	Backfill	1	1	1	1	1	1	1	1
48-2145	Line[a]	Backfill	1	1	1	1	1	1	1	1
48-2145	Tuff[b]	Tuff	1	1	1	1	1	1	1	1
48-2146	Line[a]	Soil	1	1	1	1	1	1	1	1
48-2146	Tuff[b]	Tuff	1	1	1	1	1	1	1	1
Scenario 3										
48-2145	Surface	Backfill	1	1	1	1	1	1	1	1
48-2146	Line[a]	Backfill	1	1	1	1	1	1	1	1
48-2147	Tuff[b]	Tuff	1	1	1	1	1	1	1	1
Scenario 4										
48-2143	Above line[c]	Soil	1	1	1	1	1	1	1	1
48-2143	Line[a]	Backfill	1	1	1	1	1	1	1	1
48-2143	Tuff[b]	Tuff	1	1	1	1	1	1	1	1
48-2144	Above line[c]	Backfill	1	1	1	1	1	1	1	1
48-2144	Line[a]	Backfill	1	1	1	1	1	1	1	1
48-2144	Tuff[b]	Tuff	1	1	1	1	1	1	1	1

a. At depth of former line
b. In tuff at bottom of trench below level of line
c. Depth just above former line

1. Release area is identified; trench can be excavated.

   In this scenario, evidence of a release is identified either before or during excavation of the trench. It is assumed that the hole created when contaminated soil was removed (Emelity 1982, 797) was backfilled to grade. Two surface samples (Location ID Nos. 48-2143 and 48-2144) will be collected in the 0 to 1-ft interval; one from this new backfill material and one from original backfill material immediately adjacent to the excavation. Three subsurface grab samples (Location ID Nos. 48-2145, 48-2146, and 48-2147) will be collected from the trench: one from the backfill material, one from adjacent original backfill material, and one from the tuff that underlies the new backfill material. If field screening (gross-gamma, OVA, or visual observation of staining) indicates contamination during

excavation of the trench, the desirability of shifting the investigation to a remedial effort will be evaluated before proceeding. If field screening provides no guidance for sample collection, the subsurface backfill sample will be collected at the approximate center of the backfill material, the original backfill sample will be collected from soil immediately adjacent to the new backfill material at the depth of the line, and the tuff sample will be collected in the center of the new backfilled area from the tuff at the backfill/tuff interface (see Figure 2.5.3-1).

2. Release area is identified; boreholes must be drilled to collect subsurface samples.

   In this scenario, evidence of a release is identified. Surface samples will be collected as described in scenario No. 1. Two boreholes will be drilled approximately 2 to 3 ft into the tuff: one in the center of the backfilled area (Location ID No. 48-2145) and another in native soil immediately adjacent to the backfill material (Location ID No. 48-2146). Subsurface samples will be collected from 1-ft intervals. For Location ID No. 48-2145, one sample will be collected from the backfill material and another from the tuff that underlies the backfill material. These samples will be biased by gross-gamma screening, OVA screening, or visual observation of staining of core segments, if possible. If this field screening provides no guidance for sample collection, the backfill sample will be collected at the approximate center of the backfill material, and the tuff sample will be collected from the tuff at the backfill/tuff interface. For Location ID No. 48-2146, one sample will be collected in soil and another in tuff. If these samples cannot be biased as described for Location ID No. 48-2145, the soil sample will be collected from the approximate depth of the line, and the tuff sample will be collected from the tuff at the soil/tuff interface (see Figure 2.5.3-2).

3. Release area is not identified; trench can be excavated.

   In this scenario, no evidence of a release is identified either before or during excavation of the trench. (As described above, if field screening indicates contamination during excavation of the trench, the desirability of shifting the investigation to a remedial effort should be evaluated before proceeding.) Three samples will be collected from the trench (Location ID Nos. 48-2145, 48-2146, and 48-2147): a surface sample from the 0 to 1-ft interval, a grab sample from (line trench) backfill at the approximate depth of the line trench, and a grab sample from the tuff at the backfill/tuff interface (see Figure 2.5.3-1).

4. Release area is not identified; borehole must be drilled to collect subsurface samples.

   In this scenario, no evidence of a release is identified. Two boreholes (Location ID Nos. 48-2143 and 48-2144) will be drilled, spaced approximately 10 ft apart and oriented over the waste line in the area of the reported release. Three samples will be collected in 1-ft intervals: one from the (line trench) backfill material above the line, one from the backfill material at the level of the line, and one from the underlying tuff. Subsurface samples will be biased by gross-gamma screening, OVA screening, or visual observation of staining of core segments, if possible. If these samples cannot be biased, the soil sample will be collected from the approximate depth of the line, and the tuff sample will be collected from tuff at the backfill/tuff interface (see Figure 2.5.3-2).

Data from samples collected at the northwest corner of TA-48-1 are intended to confirm whether the Emelity memorandum (1982, 797) is accurate and pertains to Line 36 and, if so, whether residual contamination remains in the area. If concentrations of target analytes are identified above risk-based screening levels in soil or tuff, additional sampling may be proposed to evaluate the extent of residual contamination.

A trench is located at the intersection of Line 34 because (1) fittings or welds at a T connector may be more likely to fail than other points along a line and (2) data may be used to evaluate both Lines 34 and 36 and thereby conserve resources. A trench is chosen rather than a borehole because qualitative information on the integrity of the remaining pipe, staining, and type and location of fill can be used to support the analytical data in making recommendations for future action.

2.6 PRS No. 48-005, Line 37

PRS No. 48-005 includes abandoned radioactive waste Lines 34, 36, 37, and 38 and an outfall into Mortandad Canyon that originated from Line 37.

From 1957 to 1965 underground industrial waste lines were used to transport liquid wastes containing radionuclides and chemicals from TA-48 to a chemical waste treatment plant at TA-45. Beginning in 1963, liquid wastes from TA-48 were diverted through new underground waste lines to the new liquid waste treatment facility at TA-50. Portions of the abandoned waste lines that were located outside the security fence at TA-48 were removed during D&D operations in 1981 and 1984 (LANL 1992, 7666). However, portions of the waste lines located inside the security fence were not removed.

Line 37 was a 2-in.-diameter cast-iron pipe, 56 ft long, that ran from sumps in the north basement of TA-48-1 northward to the canyon outfall. This line was completely removed in 1981.

2.6.1 Summary of Historical Data

Five surface samples and five subsurface samples were collected north of TA-48 near PRS No. 48-001 by the Laboratory environmental protection group during a reconnaissance survey in April 1991 (Fresquez 1991, 21358). Some of these samples were reported in Section 4.3.1 of the RFI report as near Lines 36 and 37. Gross-alpha, -beta, and -gamma radiation were at background levels, and no SVOCs or PCBs were detected. Metal analysis was by TCLP.

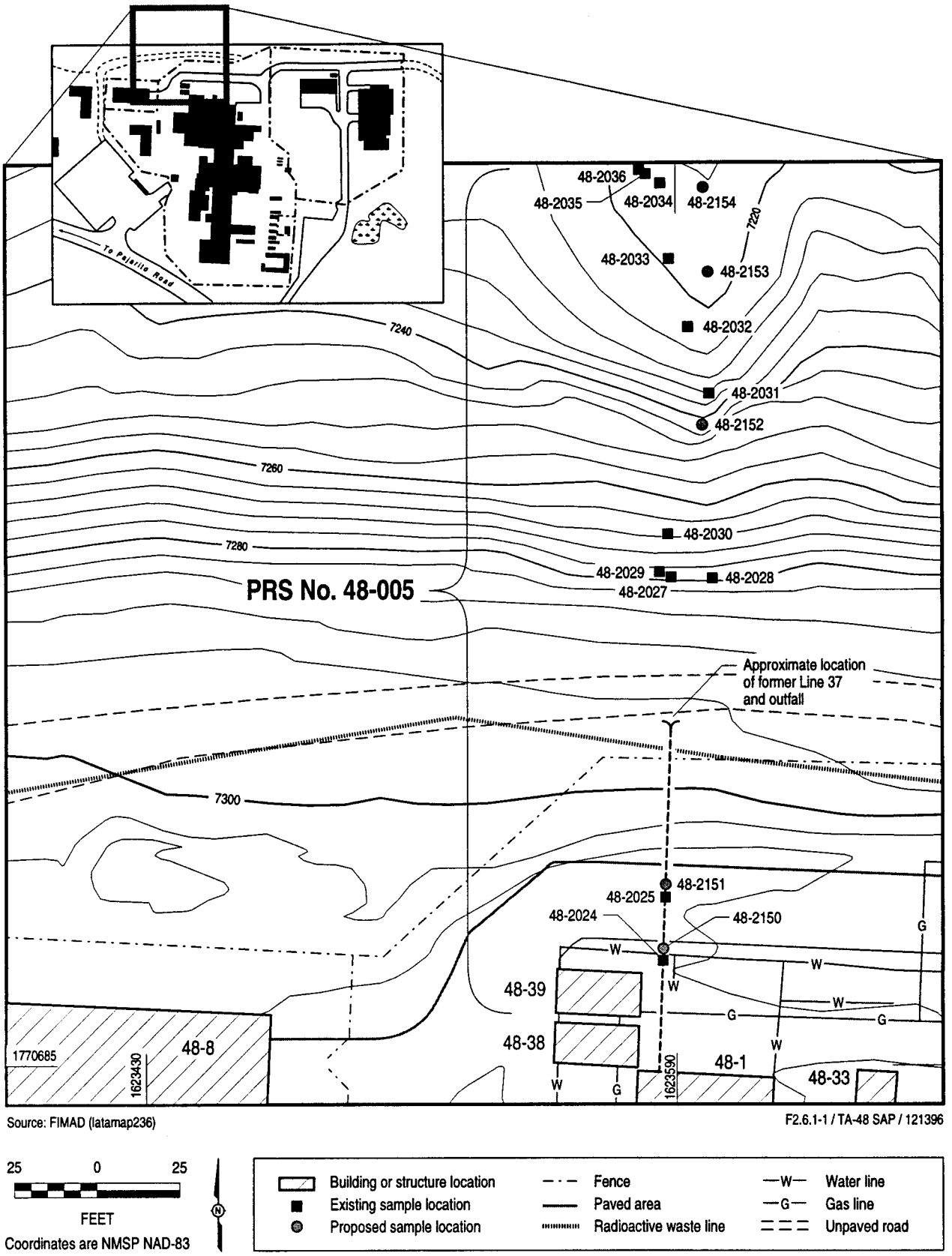
Phase I RFI soil data were collected in 1993 (LANL 1995, 50295). Line 37 and the samples locations are shown in Figure 2.6.1-1. Thirteen samples (including five field duplicate samples) were collected from two boreholes at Location ID Nos. 48-2024 and 48-2025. Fifteen surface samples (including five field duplicate samples) were collected at ten locations (Location ID Nos. 48-2027 through 48-2036) in the drainage channel of the former outfall. A summary of the samples that were collected and the associated analyses is presented in Table 2.6.1-1.

- Data include ten surface samples collected in the drainage channel and three samples collected in both boreholes, which were analyzed by XRF. EPA SW-846 analysis was performed for the 5- to 10-ft interval at Location ID No. 48-2025 and for two surface drainage channel samples.

- Gamma spectroscopy data are available for Location ID Nos. 48-2028 and 48-2031 and at 8 to 9 and 5.5 to 6.5 ft in the boreholes at Location ID Nos. 48-2024 and 48-2025, respectively. Alpha spectrometry data are available for all locations.

- VOC and SVOC data are available for all borehole samples, and SVOC data are available for all the surface drainage channel samples.

Table AII-7 in Attachment II of this SAP contains the results for inorganic and organic chemical analysis, and Table AII-8 contains the fixed-site laboratory results for radionuclides.



Source: FIMAD (latamap236)

F2.6.1-1 / TA-48 SAP / 121396

Figure 2.6.1-1. Existing and proposed sample locations for PRS No. 48-005, Line 37.

TABLE 2.6.1-1

SUMMARY OF RFI SAMPLES TAKEN AT PRS No. 48-005, LINE 37[a]

Location ID	Sample ID	Depth (ft)	Media	VOCs Fixed Lab	SVOCs Fixed Lab	XRF Mobile Lab	Inorganic Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-2024	AAA3717	4–5	Soil	15206	15206	15209	NR[b]	15210	NR	15213
48-2024	AAA3718	8–9	Soil	15206	15206	15209	NR	15210	15213	15213
48-2024	AAA4471	8–9	Soil	NR	NR	NR	NR	15210	15213	15213
48-2024	AAA3719	14–15	Qbt3	15206	15206	15209	NR	15210	NR	15213
48-2024	AAA4470	14–15	Qbt3	NR	15206	NR	NR	15210	NR	NR
48-2025	AAA3720	4–5	Soil	15206	15206	15209	NR	15210	NR	15213
48-2025	AAA4472	4–5	Soil	15206	NR	NR	NR	15210	NR	NR
48-2025	AAA3721	5.5–6.5	Soil	15206	15206	15209	15216	15210	15213	15213
48-2025	AAA4481	5.5–6.5	Soil	15206	NR	NR	NR	15210	NR	NR
48-2025	AAA4482	5.5–6.5	Soil	NR	NR	NR	15216	15210	NR	NR
48-2025	AAA3722	7.5–8.5	Soil	15206	15206	15209	NR	15210	NR	15213
48-2025	AAA4475	9–10	Soil	15206	15206	15209	NR	15210	NR	15213
48-2025	AAA4476	13–14	Qbt3	15206	15206	15209	NR	15210	NR	15213
48-2027	AAA3429	0–0.5	Soil	NR	15101	15103	15111	15120	NR	15120
48-2028	AAA3430	0–0.5	Soil	NR	15101	15103	NR	15120	15120	15120
48-2028	AAA3442	0–0.5	Soil	NR	NR	NR	NR	15120	15120	15120
48-2029	AAA3431	0–0.5	Soil	NR	15101	15103	NR	15120	NR	15120
48-2030	AAA3432	0–0.5	Soil	NR	15101	15103	NR	15120	NR	15120
48-2030	AAA3440	0–0.5	Soil	NR	NR	15103	NR	NR	NR	NR
48-2031	AAA3433	0–0.5	Soil	NR	15101	15103	NR	15120	15120	15120
48-2032	AAA3434	0–0.5	Soil	NR	15101	15103	NR	15120	NR	15120
48-2033	AAA3435	0–0.5	Soil	NR	15101	15103	NR	15120	NR	15120
48-2034	AAA3436	0–0.5	Soil	NR	15101	15103	NR	15120	NR	15120
48-2034	AAA3443	0–0.5	Soil	NR	15101	NR	NR	NR	NR	NR
48-2035	AAA3437	0–0.5	Soil	NR	15101	15103	NR	15120	NR	15120
48-2035	AAA3439	0–0.5	Soil	NR	NR	NR	NR	15120	NR	NR
48-2036	AAA3438	0–0.5	Soil	NR	15101	15103	15111	15120	NR	15120
48-2036	AAA3444	0–0.5	Soil	NR	NR	NR	15111	NR	NR	NR

a. The numbers in the analytical suite columns are analytical request numbers.
b. Not requested

No inorganic chemicals were reported as COPCs in the RFI report. The radionuclides ^{228}Th and ^{230}Th exceed upper tolerance limit (UTL) values in some samples in the boreholes at Location ID Nos. 48-2024 and 48-2025. Although there was method blank contamination for the isotopic analyses, total thorium (measured by XRF) was also elevated in these samples. Uranium isotopes were elevated above UTL values at Location ID Nos. 48-2024, 48-2025, 48-2031, and 48-2034.

2.6.2 Problem Statement

To fulfill the Laboratory's commitments, as presented in its NOD response memorandum (see EM/ER:96-231 in Attachment I of this SAP), the adequacy of the existing data set for radionuclides must be evaluated. Specifically, the Laboratory stated in the NOD response No. 16 that conclusions based on mobile laboratory radiological analysis should be disregarded. The Laboratory had determined that mobile laboratory radionuclide results from the Phase I RFI were unusable for determining the nature of gamma-emitting radionuclide contamination. Because insufficient fixed-site laboratory gamma spectroscopy data are available to determine the presence or absence of gamma-emitting radionuclide contamination at PRS No. 48-005, Line 37, supplemental gamma spectroscopy data will be collected as part of this RFI to satisfy NOD response Nos. 16 and 23, although radiological contamination is not regulated by RCRA.

In NOD response No. 23, the Laboratory has agreed to collect additional data for Line 37 to replace radionuclide data affected by quality control (QC) problems.

The following question will be addressed by collecting supplemental data.

- Are radionuclides present above background levels in soils at Line 37 and could they represent a potential threat to human health or the environment?

The samples will be analyzed for alpha-, beta-, and gamma-emitting radionuclides. Samples will be analyzed for radionuclides using Laboratory-approved methods.

2.6.3 Sampling and Analysis Plan Design

The locations of proposed samples to be collected for Line 37 under this SAP are shown in Figure 2.6.1-1. Two boreholes (Location ID Nos. 48-2150 and 48-2151) will be drilled near Location ID Nos. 48-2024 and 48-2025 to collect supplemental gamma spectroscopy data and to replace the alpha spectrometry data that had QC problems. Three samples will be collected from 1-ft intervals in each borehole and biased by gross-gamma field screening, if possible. If field screening provides no guidance for sample collection, samples from Location ID No. 48-2150 will be collected at the same depths as in the borehole at Location ID No. 48-2024 (4 to 5, 8 to 9, and 14 to 15 ft). Similarly, in Location ID No. 48-2151, samples will be collected at the same depths as in the borehole at Location ID No. 48-2025 (6 to 7, 9 to 10, and 13 to 14 ft) if they cannot be biased.

Three hand-auger holes (Location ID Nos. 48-2152, 48-2153, and 48-2154) will be drilled to approximately 3 ft in the drainage channel and on the bench below the drainage channel for the Line 37 outfall. Samples will be analyzed for alpha-, beta-, and gamma-emitting radionuclides. Two subsurface samples will be collected from each hand-auger hole at 1-ft intervals. If the depth to tuff is less than 2 ft, the two sampling intervals may be reduced to less than 1 ft. If the depth to tuff is deeper than 3 ft, the two intervals will be chosen by gross-gamma field screening, if possible. Otherwise, samples will be collected from the 1- to 2-ft interval and from the soil interval directly above the underlying tuff. A summary of the proposed samples and the associated analyses is presented in Table 2.6.3-1.

One hand-auger hole (Location ID No. 48-2152) will be drilled approximately 5 to 10 ft south of Location ID No. 48-2031, or as determined by identifying an area of sediment accumulation in the drainage channel in this location. The two hand-auger holes on the bench below the drainage channel (Location ID Nos. 48-2153 and 48-2154) will be located in areas of sediment accumulation near the existing Location ID Nos. 48-2032 through 48-2036.

TABLE 2.6.3-1

SUMMARY OF PROPOSED SAMPLING FOR PRS No. 48-005, LINE 37

Location ID	Planned Depth (ft)[a]	Media	Gamma Spectroscopy	Isotopic Th	Isotopic U	Sr-90
48-2150	4–5	Backfill	1	1	1	1
48-2150	8–9	Tuff	1	1	1	1
48-2150	14–15	Tuff	1	1	1	1
48-2151	6–7	Backfill	1	1	1	1
48-2151	9–10	Tuff	1	1	1	1
48-2151	13–14	Tuff	1	1	1	1
48-2152	1–2	Soil	1	1	1	1
48-2152	2–3	Soil[b]	1	1	1	1
48-2153	1–2	Soil	1	1	1	1
48-2153	2–3	Soil[b]	1	1	1	1
48-2154	1–2	Soil	1	1	1	1
48-2154	2–3	Soil[b]	1	1	1	1

a. Biased by field screening or at stated depth
b. Possibly soil/tuff interface

Gamma spectroscopy, alpha spectrometry, and ^{90}Sr data from borehole samples are intended to provide information on whether historical releases have occurred along Line 37 on the mesa edge. Data from the hand-auger samples in the drainage channel and bench are intended to determine if historical contamination has been released from the outfall of Line 37. Data from the drainage channel and bench will be used to evaluate the existence of a release and to provide some information on the extent of a release, if any, in a manner similar to that described for PRS No. 48-003 in Section 2.3.3.

The SAP design is based on the assumption that the location of the outfall has not changed since TA-48 has been active.

2.7 PRS No. 48-005, Line 38

PRS No. 48-005 includes abandoned radioactive waste Lines 34, 36, 37, and 38 and an outfall into Mortandad Canyon that originated from Line 37.

From 1957 to 1965 underground industrial waste lines were used to transport liquid wastes containing radionuclides and chemicals from TA-48 to a chemical waste treatment plant at TA-45. Beginning in 1963, liquid wastes from TA-48 were diverted through new underground waste lines to the new liquid waste treatment facility at TA-50. Portions of the abandoned waste lines that were located outside the security fence at TA-48 were removed during D&D operations in 1981 and 1984 (LANL 1992, 7666). However, portions of the waste lines located inside the security fence were not removed.

Line 38 was a 3-in.-diameter cast-iron pipe that ran southward from TA-48-1 to Line 33, which carried waste to TA-50 for treatment. A 50-ft section of Line 38 remains inside the security fence at a depth of approximately 10 ft.

2.7.1 Summary of Historical Data

Phase I RFI soil data were collected in 1993 (LANL 1995, 50295). Line 38 and the existing sample locations are shown in Figure 2.7.1-1. A summary of the samples collected and the associated analyses is presented in Table 2.7.1-1. Available data include XRF metals and alpha spectrometry for three samples (1.5 to 2.5, 6 to 7.4, and 14 to 15 ft) in a single borehole at Location ID No. 48-2026. Only one sample (collected at the 6- to 7.4-ft interval) was analyzed in a fixed-based laboratory for inorganic chemicals. No fixed-site laboratory gamma spectroscopy data are available. VOC and SVOC data are available for all three depth intervals. Table AII-9 in Attachment II of this SAP contains the results of inorganic and organic chemical analysis, and Table AII-10 contains the fixed-site laboratory results for radionuclides.

TABLE 2.7.1-1

SUMMARY OF RFI SAMPLES TAKEN AT PRS No. 48-005, LINE 38[a]

Location ID	Sample ID	Depth (ft)	Media	VOCs Fixed Lab	SVOCs Fixed Lab	XRF Mobile Lab	Inorganic Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-2026	AAA3723	1.5–2.5	Soil	15206	15206	15209	NR[b]	15210	NR	15213
48-2026	AAA3724	6–7.4	Soil	15206	15206	15209	15216	15210	NR	15213
48-2026	AAA4483	6–7.4	Soil	NR	NR	NR	NR	15210	NR	NR
48-2026	AAA4469	14–15	Qbt3	15206	15206	NR	NR	15210	NR	15213
48-2026	AAA4484	14–15	Qbt3	NR	NR	15209	NR	15210	NR	NR
48-2026	AAA4485	14–15	Qbt3	NR	15206	NR	NR	NR	NR	NR

a. The numbers in the analytical suite columns are analytical request numbers.
b. Not requested

The radionuclide ^{238}Pu was measured at 223 pCi/g in the 6- to 7.4-ft interval but was not detected in the deepest interval. The radionuclides ^{239,240}Pu, ^{241}Am, ^{228}Th, and ^{230}Th contributed to the exceedance of unity in the multiple chemical evaluation. Trace concentrations of acetone and di-n-butyl phthalate were detected in several samples.

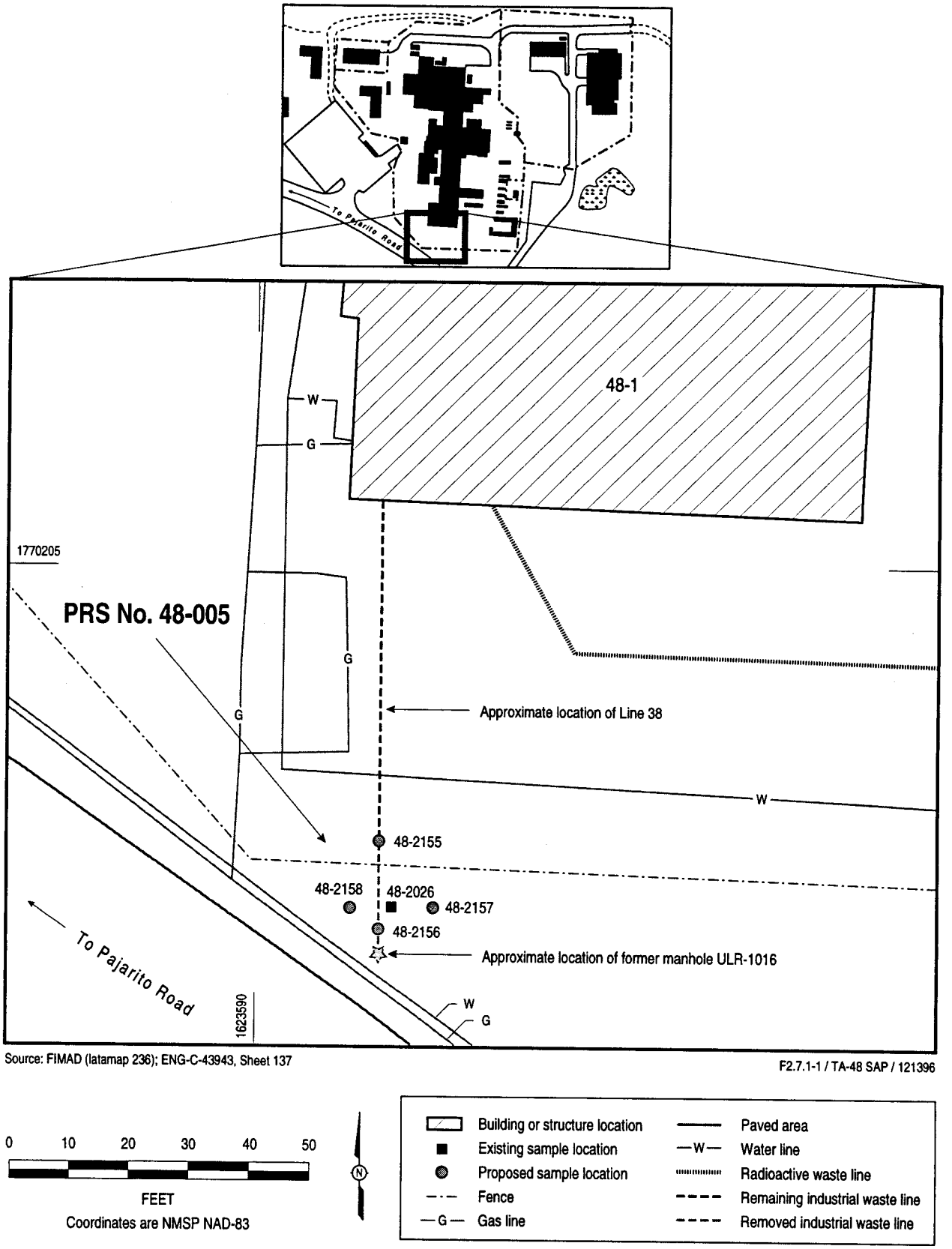
2.7.2 Problem Statement

To fulfill the Laboratory's commitments, as presented in its NOD response memorandum (see EM/ER:96-231 in Attachment I of this SAP), data will be collected to supplement chemical and gamma spectroscopy data to satisfy NOD response Nos. 16, 24, and 26. Sampling for radionuclides will be included as part of this RFI, although radiological contamination is not regulated by RCRA.

The following questions will be addressed by collecting supplemental data.

- Are inorganic chemicals, organic chemicals, or beta- and gamma-emitting radionuclides present above background levels in soils at Line 38 and could they represent a potential threat to human health or the environment?

- What is the extent of contamination identified in the alpha spectrometry data from Location ID No. 48-2026?



Source: FIMAD (latamap 236); ENG-C-43943, Sheet 137

F2.7.1-1 / TA-48 SAP / 121396

Figure 2.7.1-1. Existing and proposed sample locations for PRS No. 48-005, Line 38.

The Laboratory stated in the NOD response No. 16 that conclusions based on mobile laboratory radiological analysis should be disregarded. The adequacy of the existing data set for radionuclides must be evaluated. The Laboratory had determined that mobile laboratory radionuclide results from the Phase I RFI were unusable for determining the nature of gamma-emitting radionuclide contamination.

In NOD response No. 24, the Laboratory has agreed to collect additional data to determine the extent of contamination identified in the 6- to 7.4-ft interval at Location ID No. 48-2026.

In NOD response No. 26, the Laboratory has agreed to collect data for waste lines associated with PRS No. 48-005 both inside and outside the security fence. Because no data are available for Line 38 inside the security fence, full-suite analyses will be performed for samples collected in this area to complete Phase I sampling objectives as described in the work plan.

2.7.3 Sampling and Analysis Plan Design

The locations of proposed samples to be collected for Line 38 under this SAP are shown in Figure 2.7.1-1. Additional boreholes are included to determine the extent of contamination near Location ID No. 48-2026 and to determine if contamination may exist inside the security fence. Specific locations may be constrained by the presence of underground utilities. A summary of the proposed samples and the associated analyses is presented in Table 2.7.3-1.

TABLE 2.7.3-1

SUMMARY OF PROPOSED SAMPLING FOR PRS No. 48-005, LINE 38

Location ID	Planned Depth (ft)	Media	VOCs	SVOCs	SW-846 Metals	Gamma Spectroscopy	Isotopic Pu	Isotopic Th	Isotopic U	Sr-90
48-2155	Above line[a]	Backfill	1	1	1	1	1	1	1	1
48-2155	Line	Backfill	1	1	1	1	1	1	1	1
48-2155	Below line	Tuff	1	1	1	1	1	1	1	1
48-2156	Above line[a]	Backfill	0[b]	0[b]	0[b]	1	1	1	1	1
48-2156	Line[c]	Backfill	0[b]	0[b]	0[b]	1	1	1	1	1
48-2156	Below line[d]	Tuff	0[b]	0[b]	0[b]	1	1	1	1	1
48-2157	Above line[a]	Backfill	0[b]	0[b]	0[b]	1	1	1	1	1
48-2157	Line[c]	Backfill	0[b]	0[b]	0[b]	1	1	1	1	1
48-2157	Below line[d]	Tuff	0[b]	0[b]	0[b]	1	1	1	1	1
48-2158	Above line[a]	Backfill	0[b]	0[b]	0[b]	1	1	1	1	1
48-2158	Line[c]	Backfill	0[b]	0[b]	0[b]	1	1	1	1	1
48-2158	Below line[d]	Tuff	0[b]	0[b]	0[b]	1	1	1	1	1

a. Depth just above former line
b. Contingent on field screening
c. At depth of former line
d. Below level of line

One borehole (Location ID No. 48-2155) will be drilled inside the security fence along the Line 38 trench, as close to the fence as underground utilities allow. Samples from three depths will be collected at 1-ft intervals. A sample will be collected from an interval above the line. Gross-alpha field screening will be

performed to bias subsurface sample collection intervals. Subsurface sample intervals may also be biased by gross-gamma screening, OVA screening, or visual observation of staining of core sections. Otherwise, two samples will be collected at intervals at the level of the line and below the existing line. Samples will and analyzed for alpha-, beta-, and gamma-emitting radionuclides; metals; VOCs; and SVOCs.

Three new boreholes (Location ID Nos. 48-2156, 48-2157, and 48-2158) will be drilled south, east, and west of Location ID No. 48-2026 approximately 5 ft from the existing borehole. Selection of sample intervals will be the same as that described for the new borehole inside the security fence. Because the line outside the fence has been removed, subsurface samples will be at and below the depth of the line trench where the line existed.

All samples collected from the three boreholes will be analyzed for alpha-, beta-, and gamma-emitting radionuclides. Any samples that are identified as potentially contaminated using any field screening technique will also be analyzed for inorganic chemicals, VOCs, and SVOCs. Samples collected from the borehole inside the fence at Location ID No. 48-2155 will also be analyzed for inorganic chemicals, VOCs, and SVOCs.

Data from the borehole inside the security fence will be used to determine if a release has occurred inside the fence at Line 38. Data from this location will also be used in conjunction with data from the three boreholes to determine the extent of the release at Location ID No. 48-2026, which is described in the RFI report. The location and depths of any contamination in these boreholes will also be used to assess whether the source of the release may be associated with manhole ULR-1016 (located at the junction of Line 38 and former Line 33) instead of a leak in Line 38.

It is anticipated that these boreholes will be drilled early during implementation of this SAP to allow additional boreholes to be drilled to establish the extent of contamination, if any, while the field team is mobilized. Specific soil criteria for establishing extent will be documented when the nature of the release and the depths of contamination have been better described by the data collected according to this SAP.

2.8 PRS Nos. 48-007(a and d) and 48-010

PRS Nos. 48-007(a and d) are the discharge areas for active outfalls included under the Laboratory's National Pollutant Discharge Elimination System (NPDES) Permit No. NM002835 (LANL 1985, 853). PRS No. 48-007(a) is the discharge area for treated cooling water that is located in the northwest part of an unlined surface impoundment area (PRS No. 48-010, which is discussed below) east of the parking area for building TA-48-45. PRS No. 48-007(d) is the discharge area for noncontact cooling water that is located at the southwestern edge of the unlined surface impoundment area. Both outfalls were active before the Clean Water Act was passed.

PRS No. 48-010, the unlined surface impoundment area, is located east of the parking area for TA-48-45 and lies on the western edge of the rim of Mortandad Canyon. This impoundment area receives storm water runoff from the parking area as well as outfall effluent as described above. A marsh-like environment with cattails and other plants has developed in the impoundment area.

A steep drop-off into a small feeder canyon of Mortandad Canyon is located at the mesa edge east of the marsh. The location of the drainage channel to the mesa edge was altered when the parking lot for TA-48-45 was constructed, although the primary marsh area remains unchanged. Before construction the drainage channel was located approximately 50 ft south of the current location at the northeast corner of the marsh area.

2.8.1 Summary of Historical Data

In January 1991 five surface samples and five subsurface samples were collected during a reconnaissance survey at the site of the proposed parking lot for TA-48-45 (Fresquez 1991, 819). Gross-beta and -gamma radioactivity were at background levels, but gross-alpha radioactivity ranged between background and 45 to 65 pCi/g for surface and subsurface samples, respectively. The higher readings are above ER Project *de minimus* alpha activity levels for surface soils (Pratt 1994, 43475).

PRS Nos. 48-007(a and d) and 48-010 and the existing soil sample locations are shown in Figure 2.8.1-1. A summary of the samples that were collected and the associated analyses is presented in Table 2.8.1-1. Phase I RFI soil data were collected in 1993 (LANL 1995, 50295).The following data are available for PRS Nos. 48-007(a and d) and 48-010: surface samples from four locations analyzed for inorganic chemicals by XRF, surface samples from two locations analyzed by gamma spectroscopy, and surface samples from three locations analyzed by alpha spectrometry. No Inorganic chemicals were identified as COPCs. No analyses for organic chemicals were performed. Table AII-11 in Attachment II of this SAP contains the results of inorganic chemical analysis, and Table AII-12 contains the fixed-site laboratory results for radionuclides.

TABLE 2.8.1-1

SUMMARY OF RFI SAMPLES TAKEN AT PRS Nos. 48-007(a and d) AND 48-010[a]

PRS	Location ID	Sample ID	Depth (ft)	Media	XRF Mobile Lab	Inorganic Fixed Lab	Mercury Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-007(a,d)	48-2038	AAA3548	0–0.5	Soil	15226	NR[b]	NR	15228	15230	15230
48-007(a,d)	48-2038	AAA4430	0–0.5	Soil	15226	NR	NR	15228	NR	NR
48-007(a,d)	48-2080	0448-95-0001	0–0.5	Soil	NR	NR	224	NR	NR	225
48-007(a,d)	48-2080	0448-95-0002	0–0.5	Soil	NR	NR	224	NR	NR	225
48-010	48-2040	AAA3550	0–0.5	Soil	15226	NR	NR	NR	NR	15230
48-010	48-2041	AAA3551	0–0.5	Soil	15226	NR	NR	NR	15230	15230
48-010	48-2041	AAA4429	0–0.5	Soil	NR	NR	NR	NR	NR	NR
48-010	48-2041	AAA4435	0–0.5	Soil	NR	NR	NR	15228	15230	15230
48-010	48-2052	AAA4442	0–0.5	Soil	15226	NR	NR	NR	NR	NR
48-010	48-2082	0448-95-0005	0–0.5	Soil	NR	NR	224	NR	NR	NR

a. The numbers in the analytical suite columns are analytical request numbers.
b. Not requested

In addition to the outfalls, two other potential contaminant sources may have impacted PRS No. 48-010. Runoff from the area of PRS No. 48-002(e), where solvents and oils are known to have been stored, could have contributed organic contamination to PRS No. 48-010 because surface water would drain to the marsh. It is also possible that the area where the parking lot for TA-48-45 was built, which is up-gradient from PRS No. 48-010, may have contributed alpha-emitting radionuclides to the marsh by surface water runoff.

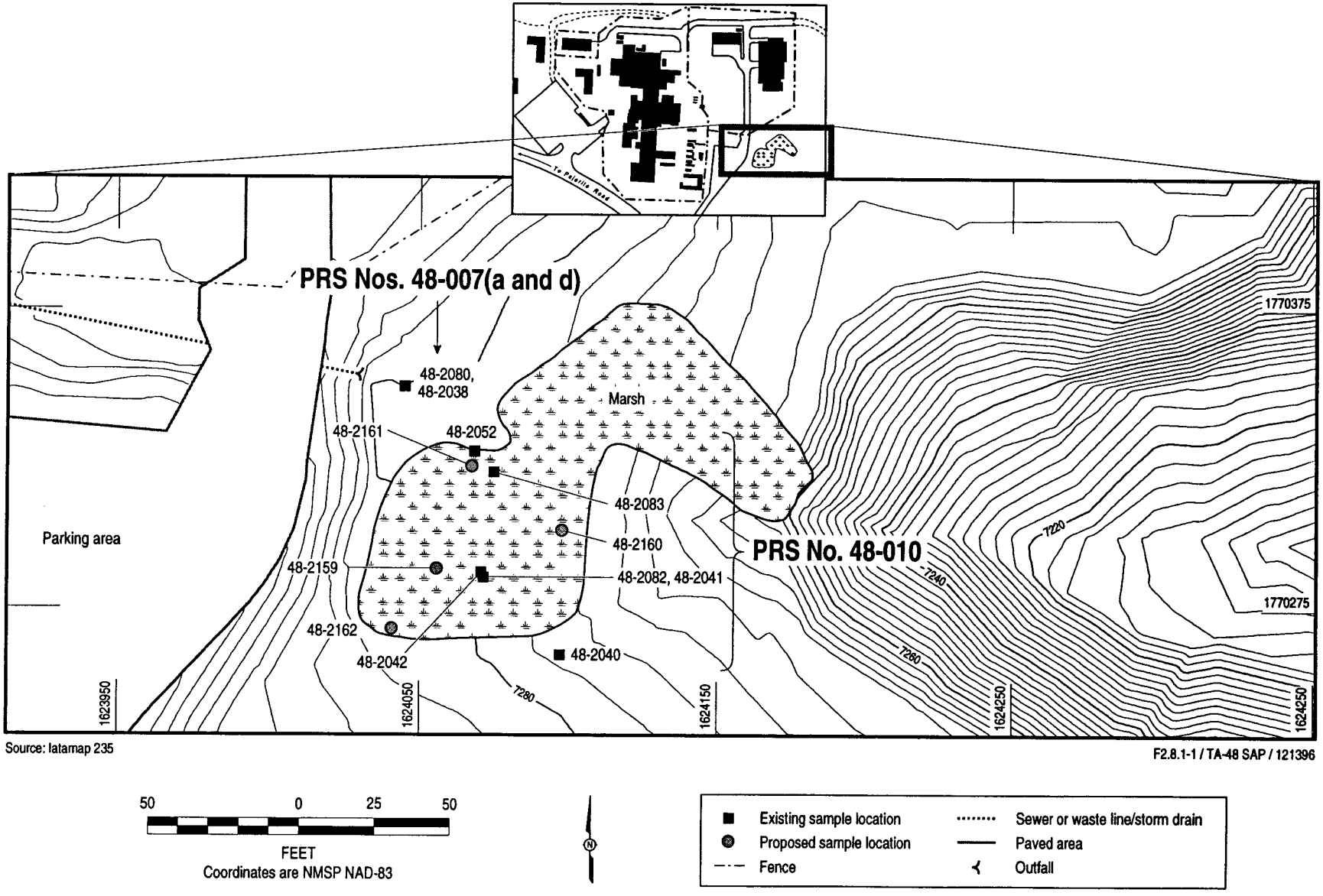


Figure 2.8.1-1. Existing and proposed sample locations for PRS Nos. 48-007(a and d) and 48-010.

2.8.2 Problem Statement

To fulfill the Laboratory's commitments, as presented in its NOD response memorandum (see EM/ER:96-231 in Attachment I of this SAP), data will be collected to supplement chemical and gamma spectroscopy data to satisfy NOD response No. 16.

Data collection at PRS Nos. 48-007(a and d) and 48-010 is also required by the Laboratory's response to NMED's Request for Additional Information (No. 3) (see EM/ER:96-533 in Attachment I of this SAP). The Laboratory has agreed to collect additional data for inorganic chemicals, organic chemicals, and radionuclides at these PRSs. Sampling for radionuclides will be included as part of this RFI, although radiological contamination is not regulated by RCRA.

The following question will be addressed by collecting supplemental data.

- Are inorganic chemicals, organic chemicals, or radionuclides present above background levels in soils or sediments of PRS Nos. 48-007(a and d) and 48-010 and could they represent a potential threat to human health or the environment?

The supplemental gamma spectroscopy data at PRS Nos. 48-007(a and d) and 48-010 will be collected in part to satisfy NOD response No. 16. The Laboratory had determined that mobile laboratory radionuclide results from the Phase I RFI were unusable to identify the presence of gamma-emitting radionuclide contamination. Because insufficient fixed-site laboratory gamma spectroscopy data are available to determine the presence or absence of gamma-emitting radionuclide contamination as described in the work plan, additional gamma spectroscopy data will be collected.

The ER Project investigation will be limited to soil and sediment contamination that indicates historical releases, as discussed in Section 1.1. The water data that were collected during the Phase I RFI will be supplied to Laboratory group ESH-18.

2.8.3 Sampling and Analysis Plan Design

The locations of proposed samples to be collected under this SAP are shown in Figure 2.8.1-1. A summary of the proposed samples and the associated analyses is presented in Table 2.8.3-1.

TABLE 2.8.3-1

SUMMARY OF PROPOSED SAMPLING FOR PRS Nos. 48-007(a and d) AND 48-010

Location ID	Planned Depth	Media	VOCs	SVOCs	SW-846 Metals	Gamma Spectroscopy	Isotopic Pu	Isotopic Th	Isotopic U	Sr-90
48-2159	0.5–1.5 ft	Soil	1	1	1	1	1	1	1	1
48-2159	Interface	Soil/tuff	1	1	1	1	1	1	1	1
48-2160	0.5–1.5 ft	Soil	1	1	1	1	1	1	1	1
48-2160	Interface	Soil/tuff	1	1	1	1	1	1	1	1
48-2161	0.5–1.5 ft	Soil	1	1	1	1	1	1	1	1
48-2161	Interface	Soil/tuff	1	1	1	1	1	1	1	1
48-2162	0.5–1.5 ft	Soil	1	1	1	1	1	1	1	1
48-2162	Interface	Soil/tuff	1	1	1	1	1	1	1	1

Two hand-auger holes (Location ID Nos. 48-2159 and 48-2160) will be drilled to a depth of approximately 3 to 4 ft in the existing marsh (PRS No. 48-010). Two samples will be collected from each hand-auger hole at 1-ft intervals. If the depth to tuff is less than 2 ft, the two sampling intervals may be reduced to less than 1 ft. If the depth to tuff is deeper than 3 ft, the two intervals will be chosen by field gross-gamma or OVA screening, if possible. Otherwise, samples will be collected from the 0.5- to 1.5-ft interval and from the soil/tuff interface. Analyses for alpha-, beta-, and gamma-emitting radionuclides; inorganic chemicals; VOCs; and SVOCs will be performed for these samples.

Two hand-auger holes (Location ID Nos. 48-2161 and 48-2162) will be drilled at the location of the outfall (before construction of the parking lot) associated with PRS No. 48-007(a) and the outfall for PRS No. 48-007(d). Depth intervals and analytical suites for these locations will follow the guidance described for the hand-auger holes for PRS No. 48-010.

If one or more COPCs are identified in the four hand-auger samples, the current drainage channel, the drainage channel before construction of the parking lot, and the canyon floor directly below the mesa edge may be sampled to determine the extent of contamination.

The decision to establish extent will also be guided by the spatial distribution of any contamination observed in the four hand-auger hole locations. If necessary, extent will be established with two additional hand-auger holes in each drainage channel and two hand-auger holes on the canyon floor. Three soil samples will be collected from each hand-auger hole at 1-ft intervals (0 to 1, 1 to 2, and 2 to 3 ft). If the depth to tuff is between 2 and 3 ft, one interval may be eliminated, and if the sediment depth is less than 2 ft the two sampling intervals may be reduced to less than 1 ft. If the depth to tuff is deeper than 3 ft, the middle interval will be sampled at the midpoint between the top and bottom intervals, and samples will still be collected at the surface and at the soil/tuff interface.

Data from marsh subsurface samples are intended to provide information on whether historical releases to PRS No. 48-010 have occurred. Data from the discharge channel (and canyon floor samples, if they are collected) will establish whether migration has occurred beyond PRS No. 48-010.

2.9 PRS Nos. 48-007(b, c, and f)

PRS Nos. 48-007(b, c, and f) are outfalls located north of TA-48-1 that discharge northward into Mortandad Canyon.

PRS Nos. 48-007(b and c) discharge noncontact cooling water that cools vacuum pumps housed in TA-48-1. PRS No. 48-007(b) discharges up to 420 gal. per day into Mortandad Canyon and was "grandfathered" into the NPDES permit (LANL 1985, 853). It has NPDES Permit No. 016 EPA 04A. PRS No. 48-007(c) discharges up to 110 gal. per day and was submitted for inclusion under the NPDES permit in 1987 (LANL 1991, 21557). It has NPDES Permit No. 131 EPA 04A.

PRS No. 48-007(f) was submitted to the EPA in November 1987 for inclusion under the NPDES permit to discharge up to 100 gal. per day of noncontact cooling water from x-ray equipment located in building TA-48-46 (LANL 1990, 7511). It has NPDES Permit No. 137 EPA 04A.

2.9.1 Summary of Historical Data

Five surface samples and five subsurface samples were collected north of TA-48 near PRS No. 48-001 during a reconnaissance survey in April 1991 (Fresquez 1991, 21358). Some of these samples were

reported in Section 4.3.1 of the RFI report (LANL 1995, 50295) as being near Lines 36 and 37. This information may also be applicable to PRS Nos. 48-007(b, c, and f) outfalls. Gross-alpha, -beta, and -gamma-emitting radioactivity were at background levels, and no SVOCs or PCBs were detected. Metals were analyzed by TCLP.

Phase I RFI soil data were collected in 1993 (LANL 1995, 50295). PRS Nos. 48-007(b, c, and f) and the existing sample locations are shown in Figure 2.9.1-1. A summary of the samples that were collected and the associated analyses is presented in Table 2.9.1-1. One surface sample and one or two hand-auger samples were collected at each outfall. No fixed-site laboratory gamma spectroscopy data are available. EPA SW-846 metals were analyzed for in three hand-auger samples at PRS No. 48-007(f). At least one soil sample from each hand-auger hole at each PRS was analyzed for VOCs and SVOCs.

Table AII-13 in Attachment II of this SAP contains the fixed-site laboratory results for radionuclides. The RFI report (LANL 1995, 50295) contains information on organic and inorganic chemicals in samples that were collected during the Phase I RFI.

2.9.2 Problem Statement

The following question will be addressed by collecting supplemental data.

- Are gamma-emitting radionuclides present above background levels at PRS Nos. 48-007(b, c, and f) and could they represent a potential threat to human health or the environment?

Data will be collected to supplement gamma spectroscopy data to satisfy NOD response No. 16 (see EM/ER:96-231 in Attachment I of this SAP). The Laboratory had determined that mobile laboratory radionuclide results from the Phase I RFI were unusable to identify the presence of gamma-emitting radionuclide contamination. Because insufficient fixed-site laboratory gamma spectroscopy data are available to determine the presence or absence of gamma-emitting radionuclide contamination as described in the work plan, additional gamma spectroscopy data will be collected as part of this RFI, although radiological contamination is not regulated by RCRA.

The ER Project investigation will be limited to soil and sediment contamination that indicates historical releases, as discussed in Section 1.1. The water data that were collected during the Phase I RFI will be supplied to ESH-18.

2.9.3 Sampling and Analysis Plan Design

The locations of proposed samples to be collected under this SAP are shown in Figure 2.9.1-1. A summary of the proposed samples and the associated analyses is presented in Table 2.9.3-1. Two hand-auger holes, one near the location of the existing hand-auger holes and one on the first bench below the outfall, will be drilled within the drainage channel for each PRS. Three soil samples will be collected from each hand-auger hole at 1-ft intervals. If the depth to tuff is between 2 and 3 ft, one interval may be eliminated and, if the sediment depth is less than 2 ft, the two sampling intervals may be reduced to less than 1 ft. If the depth to tuff is deeper than 3 ft, the middle interval will be sampled at the midpoint between the top and bottom intervals, and samples will still be collected at the surface and at the soil/tuff interface. Each sample will be analyzed for gamma-emitting radionuclides to complete the Phase I RFI data collection, as described in the work plan and the addendum to the work plan (LANL 1992, 7666; Pratt 1994, 43475).

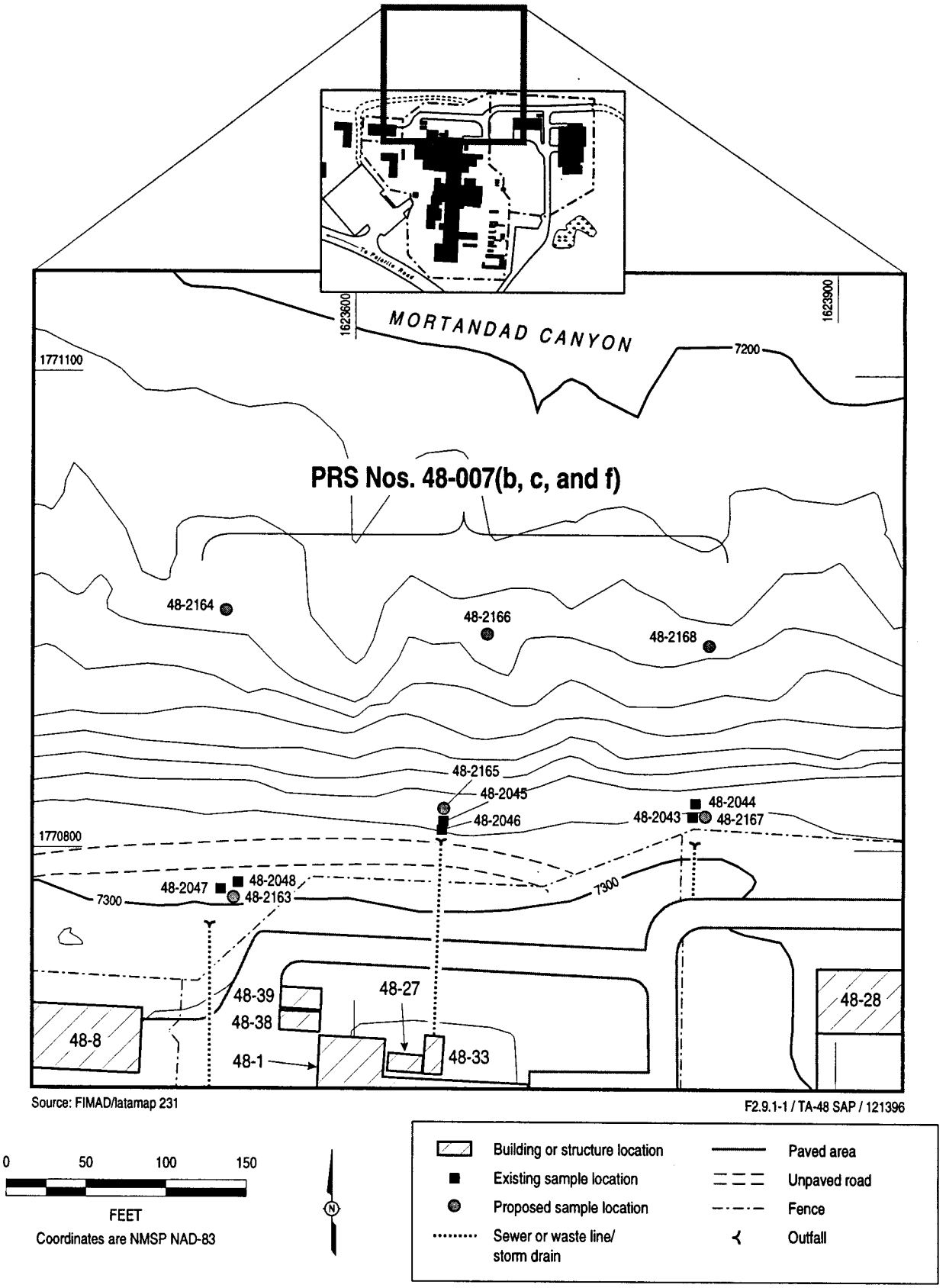


Figure 2.9.1-1. Existing and proposed sample locations for PRS Nos. 48-007(b, c, and f).

TABLE 2.9.1-1

SUMMARY OF RFI SAMPLES TAKEN AT PRS Nos. 48-007(b, c, and f)[a]

Part 1

PRS	Location ID	Sample ID	Depth (ft)	Media	VOCs Fixed Lab	SVOCs Fixed Lab	PCBs Fixed Lab	XRF Mobile Lab
48-007(b)	48-2043	AAA3517	0–0.5	Soil	NR[b]	NR	NR	15142
48-007(b)	48-2044	AAA3489	0–0.5	Soil	NR	NR	NR	NR
48-007(b)	48-2044	AAA3518	0–0.5	Soil	NR	NR	NR	15142
48-007(b)	48-2044	AAA3490	0.5–1.5	Soil	15136	NR	NR	NR
48-007(b)	48-2044	AAA3491	0.5–1.5	Soil	NR	15136	15136	NR
48-007(b)	48-2044	AAA3492	0.5–1.5	Soil	15136	NR	NR	NR
48-007(b)	48-2044	AAA3519	0.5–1.5	Soil	15136	15136	15136	15142
48-007(b)	48-2044	AAA3520	1.5–2.5	Soil	NR	NR	NR	15142
48-007(c)	48-2045	AAA3521	0–0.5	Soil	NR	NR	NR	15142
48-007(c)	48-2046	AAA3522	0–0.5	Soil	NR	NR	NR	15142
48-007(c)	48-2046	AAA3523	0.5–1.5	Soil	15136	15136	15136	15142
48-007(c)	48-2046	AAA3533	0.5–1.5	Soil	NR	15136	15136	NR
48-007(c)	48-2046	AAA3524	1.5–2	Soil	NR	NR	NR	15142
48-007(f)	48-2047	AAA3525	0–0.5	Soil	NR	NR	NR	15142
48-007(f)	48-2047	AAA3534	0–0.5	Soil	NR	NR	NR	15142
48-007(f)	48-2048	AAA3526	0–0.5	Soil	NR	NR	NR	15142
48-007(f)	48-2048	AAA3535	0–0.5	Soil	NR	NR	NR	NR
48-007(f)	48-2048	AAA3536	0–0.5	Soil	NR	NR	NR	NR
48-007(f)	48-2048	AAA3527	0.5–1.5	Soil	15136	15136	15136	15142
48-007(f)	48-2048	AAA3537	0.5–1.5	Soil	NR	15136	15136	NR

Part 2

PRS	Location ID	Sample ID	Depth (ft)	Media	Inorganic Fixed Lab	Gamma Spec Mobile Lab	Gamma Spec Fixed Lab	Alpha Spec Fixed Lab
48-007(b)	48-2043	AAA3517	0–0.5	Soil	NR	15149	NR	15146
48-007(b)	48-2044	AAA3489	0–0.5	Soil	NR	15149	NR	NR
48-007(b)	48-2044	AAA3518	0–0.5	Soil	NR	15149	NR	15146
48-007(b)	48-2044	AAA3490	0.5–1.5	Soil	NR	15149	NR	NR
48-007(b)	48-2044	AAA3491	0.5–1.5	Soil	NR	15149	NR	NR
48-007(b)	48-2044	AAA3492	0.5–1.5	Soil	NR	15149	NR	NR
48-007(b)	48-2044	AAA3519	0.5–1.5	Soil	NR	15149	NR	15146
48-007(b)	48-2044	AAA3520	1.5–2.5	Soil	NR	15149	NR	15146
48-007(c)	48-2045	AAA3521	0–0.5	Soil	NR	15149	NR	15146
48-007(c)	48-2046	AAA3522	0–0.5	Soil	NR	15149	NR	15146
48-007(c)	48-2046	AAA3523	0.5–1.5	Soil	NR	15149	NR	15146
48-007(c)	48-2046	AAA3533	0.5–1.5	Soil	NR	15149	NR	NR
48-007(c)	48-2046	AAA3524	1.5–2	Soil	NR	15149	NR	15146
48-007(f)	48-2047	AAA3525	0–0.5	Soil	NR	15149	NR	15146
48-007(f)	48-2047	AAA3534	0–0.5	Soil	NR	15149	NR	NR
48-007(f)	48-2048	AAA3526	0–0.5	Soil	15140	15149	NR	15146
48-007(f)	48-2048	AAA3535	0–0.5	Soil	NR	15149	NR	15146
48-007(f)	48-2048	AAA3536	0–0.5	Soil	15140	15149	NR	NR
48-007(f)	48-2048	AAA3527	0.5–1.5	Soil	15140	15149	NR	15146
48-007(f)	48-2048	AAA3537	0.5–1.5	Soil	NR	15149	NR	NR

a. The numbers in the analytical suite columns are analytical request numbers.

b. Not requested

TABLE 2.9.3-1

SUMMARY OF PROPOSED SAMPLING FOR PRS Nos. 48-007(b, c, and f)

Location ID	Planned Depth (ft)	Media	Gamma Spectroscopy
48-2163	0–1	Soil	1
48-2163	1–2	Soil	1
48-2163	2–3	Soil/tuff	1
48-2164	0–1	Soil	1
48-2164	1–2	Soil	1
48-2164	2–3	Soil/tuff	1
48-2165	0–1	Soil	1
48-2165	1–2	Soil	1
48-2165	2–3	Soil/tuff	1
48-2166	0–1	Soil	1
48-2166	1–2	Soil	1
48-2166	2–3	Soil/tuff	1
48-2167	0–1	Soil	1
48-2167	1–2	Soil	1
48-2167	2–3	Soil/tuff	1
48-2168	0–1	Soil	1
48-2168	1–2	Soil	1
48-2168	2–3	Soil/tuff	1

Gamma spectroscopy data from these hand-auger samples are intended to provide information on whether historical releases from the PRS outfalls have occurred. The placement of a second borehole on the first bench below each outfall is intended to verify that the placement of initial Phase I RFI sample locations directly below each outfall represents a positively biased sample. Historical contamination that predates the NPDES outfalls may have been scoured from the upper drainages because of continuous cooling water discharge and/or storm water runoff and may have accumulated lower in the drainage channel where particulates settle and water infiltrates.

3.0 DATA USE AND DATA QUALITY REQUIREMENTS

3.1 Use of Data to Meet SAP Objectives

Analytical data for inorganic and organic chemicals and/or radionuclides will be evaluated according to the methodology outlined in *Risk-Based Corrective Action Process* (Environmental Restoration Decision Support Council 1996, 53751). Levels of inorganic chemicals and radionuclides will be compared with Laboratory-specific background 95th percentile (95% confidence) UTL values or maximum values for the appropriate geological background unit (Longmire et al. 1995, 48818; Longmire et al. 1995, 52227). If a UTL value is not available for a radionuclide, the maximum reported value for radionuclides associated with global fallout from regional sites published in Laboratory environmental surveillance reports will be used only for surface samples collected from undisturbed sites. Assumptions of secular equilibrium among specific radionuclides (for example, decay products of ^{238}U such as ^{226}Ra) may be used to extend the applicability of the Laboratory background data set for radionuclides.

Levels of inorganic chemicals and radionuclides that exceed background UTL values and all detected organic chemicals will be compared with risk-based screening action level (SAL) values. The maximum observed level will be compared with SAL values to identify COPCs. Distributional shift tests may also be employed to determine if a chemical is present at a PRS at levels greater than background. The SAL values for organic and inorganic chemicals are based on EPA Region IX preliminary remediation goals for residential soil and tap water (EPA 1995, 53970). The SAL values for radionuclides are based on an annual effective dose of 10 mrem/yr and are calculated with RESRAD. The potential for additive toxic effects will be evaluated by conducting multiple chemical evaluations for carcinogens, noncarcinogens, and radionuclides.

3.2 Requirements for Data Quality

In accordance with the ER Project risk-based corrective action process as well as guidance given in *Risk Assessment Guidance for Superfund, Volume I* (EPA 1989, 8021), appropriate analytical chemistry methods must be chosen to maximize the ability to detect chemicals present in soil samples at or below background concentrations and risk-based screening concentrations. Field measurement and analytical techniques may be used where appropriate. In accordance with the ER Project risk-based corrective action process, if field analytical techniques are not sufficient to detect chemicals at SAL concentrations, EPA-approved fixed-site laboratory methods or equivalent must be employed. Field measurements of gross radioactivity and organic vapors are appropriate for biasing sample locations and depth intervals but are not equivalent to a fixed-site laboratory analyses.

For example, if VOCs are suspected contaminants at a site but specific chemicals have not yet been identified, an analytical method that allows low-level detection, identification, and reliable quantitation must be employed. Field screening instruments for organic vapors (for example, flame ionization detectors or photoionization detectors [PIDs]) generally have higher detection limits than fixed-site laboratory instruments and cannot identify specific chemicals. Therefore, to meet the detection limit requirements and provide chemical-specific data, an appropriate field measurement method for organic vapors must employ a gas chromatograph with heated sampler and PID detection, at a minimum.

For analysis of inorganic and organic chemicals, fixed-site laboratory analyses will employ the EPA SW-846 methods (EPA 1986, 31732; EPA 1986, 31733) that are cited in Appendix IV of the ER Project *Quality Assurance Project Plan Requirements for Sampling and Analysis* (QAPP) (LANL 1996, 53450). The required EPA SW-846 methods allow reliable detection and quantitation of all target inorganic analytes at levels less than the all-soils horizon background values except for antimony. The estimated detection limit (EDL) for analysis of antimony by inductively coupled plasma emission spectroscopy (ICPES) is 12 mg/kg, which is greater than the ER Project all-soils background value (1 mg/kg) but less than the soil SAL value (31 mg/kg).

The EPA SW-846 methods allow reliable detection and quantitation of all VOC and SVOC target analytes at levels less than the soil SAL values, except for seven SVOCs. The following SVOC analytes have soil estimated quantitation limits (EQLs) for the EPA SW-846 analysis (0.330 mg/kg) that are greater than the soil SAL value: m-benzidine (0.0019 mg/kg), benzo[a]pyrene (0.061 mg/kg), bis(2-chloroethyl) ether (0.074 mg/kg), dibenz[a,h]anthracene (0.061 mg/kg), hexachlorobenzene (0.280 mg/kg), N-nitrosodi-n-propylamine (0.063 mg/kg), and N-nitrosodimethylamine (0.0087 mg/kg). No standard, readily available method exists that could achieve EQLs as low as several parts per billion in soil for these compounds.

For analysis of radionuclides, the Laboratory-approved methods cited in the ER Project QAPP (LANL 1996, 53450) will be employed. The detection limits for the approved methods are below background activity levels for those radionuclides for which background values are available. For radionuclides for

which no ER Project background values are available, including plutonium isotopes, fission and activation products, and many naturally occurring radionuclides, the detection limits are below the soil SAL values.

The bias and precision of fixed-site laboratory analyses for inorganic and organic chemicals will be assessed using the standard QC procedures described in the EPA SW-846 methods. For radiological measurements, QC procedures similar to the EPA SW-846 procedures will be employed. Negative bias may result in the need to resample if reported concentrations are near action levels.

4.0 SAMPLING AND ANALYSIS PLAN IMPLEMENTATION

The field and measurement methods proposed for sample collection and analysis are discussed in the following sections. Field quality assessment/quality control samples, such as field blanks and collocated samples, will be collected according to the most recent ER Project guidance (LANL 1996, 53450).

4.1 Field Methods

An initial health and safety (H&S) survey of the sites to be sampled will be performed by the site safety officer and/or the ER Project site safety officer before conducting drilling, excavating, and/or sampling activities. No personnel will be allowed to enter the sites until the sites have been surveyed for H&S issues. The sites will be monitored for alpha, beta, and gamma radiation and for safety hazards including confined space entry, slips, trips, and falls according to the site-specific health and safety plan (SSHASP). The results of the H&S survey will be documented by the site safety officer on the ESH-1 Direct Survey Results Form and by the field team leader (FTL) on the Daily Activity Log.

The initial survey will take many short count-time (1 to 10 seconds) measurements. The short count-time measurements will provide low-resolution, qualitative data over a large area and will allow rapid identification of specific point sources of near-surface radioactivity ("hot spots"). Longer count-time (60 seconds or longer) measurements will be taken at locations where radiological anomalies are detected and at selected representative locations within each site to be sampled to achieve higher resolution data. The "hot spot" radiological measurements will be recorded onto site maps with a resolution of at least 1 in 25 ft. The radiometric measurements and maps will be documented by the FTL on the Daily Activity Log.

Planned sample locations will be located in the field before sampling and will be described and documented by the FTL on the Daily Activity Log. The actual sample site and sampling conditions will be described and documented on the Sample Collection Log. The sample material will be described on the Sample Collection Log and/or the Core Description Log, when applicable. Sample collection methods will be documented on the Sample Collection Log. Surface samples, hand-auger holes, hollow-stem auger drilling, and excavation (trenching) methods will be used to collect soil samples as described below.

The soil and sediment samples will be field screened for gross-alpha, -beta, and -gamma radiation and for volatile organic vapors at the time of sampling. The field screening data will be recorded by the site safety officer on the Direct Survey Results Form and by the FTL on the Sample Collection Log. Information about the field screening equipment calibration will be recorded by the site radiological control technician (RCT) on the Direct Survey Results Form and by the FTL on the Daily Activity Log.

If other field screening methods are identified that appropriately detect contamination, those field screening methods will be considered for use during sample collection. Appropriate field screening methods (such as head-space screening for VOCs) may be used to select sample locations from borehole

samples and to screen samples for fixed-site laboratory analyses, as necessary. The implementation of field screening methods will be documented by the FTL on the Daily Activity Log.

Soil and sediment samples will be collected using the methods and ER Project standard operating procedures (SOPs) listed in Table 4.1-1 (LANL 1991, 21556). The tools used to collect surface and subsurface soil samples will be determined by the FTL with consideration given for the accessibility of the specific sampling site, the depth of samples to be collected, safety concerns, and the presence of flowing or standing surface water. A scoop or spade will be used to collect surface sediment samples at depths of 0 to 0.5 ft. A hand auger will generally be used to collect samples ranging in depth from 1 to 5 ft, and a drill rig with a hollow-stem auger split-spoon core barrel will generally be used to collect samples from depths greater than 5 ft. If surface water is present at the sampling location, a scoop, trowel, or hand corer will be used to collect grab sediment samples. Where additional subsurface detail is required by the sampling plan, excavations using mechanical equipment such as a backhoe may be used to expose pipelines and/or trenches.

TABLE 4.1-1

SUMMARY OF REQUIREMENTS FOR SOIL AND SEDIMENT SAMPLING METHODS

Sampling Tools	Sample Types	Sampling Depth (ft)	LANL-ER-SOP
Spade and scoop	Surface grab	0–1	06.09
Hand auger	Surface or subsurface grab	0–5	06.10
Ring sampler	Undisturbed surface soil grab	0–1	06.11
Scoop and trowel	Grab (under surface water)	0–0.5	06.14
Hand corer	Grab (under surface water)	0–0.5	06.14

Drilling methods (hollow-stem auger and rotary drilling) are described in LANL-ER-SOP-04.01, R0, "Drilling Methods and Drill Site Management." Hand-auger surface and subsurface grab sampling methods are described in LANL-ER-SOP-06.10, R0, "Hand Auger and Thin-Wall Tube Sampler." Trenching methods (pit excavation) are described in LANL-ER-SOP-03.10, R0, "Trenching and Logging." Grab sampling is described in LANL-ER-SOP-06.09, R0, "Spade and Scoop Method of Collection of Soil Samples." Other applicable SOPs for drilling operations and subsurface sampling are listed in Table 4.1-2. All borehole core intervals (maximum 5-ft lengths) will be field screened for gross-alpha, -beta, and -gamma radiation using hand-held instruments. These measurements may be used to bias the collection of core samples.

TABLE 4.1-2

REQUIREMENTS FOR SUBSURFACE AND CORE SAMPLING METHODS

Activity	LANL-ER-SOP
Trenching and logging	03.10
Drilling methods and drill-site management	04.01
General borehole logging	04.04
Core-barrel sampling for subsurface earth materials	06.26
Field logging, handling, and documentation of borehole samples	12.01

If trenching is used to expose grab sample points associated with buried pipelines, samples for VOC and SVOC analysis will be collected using the appropriate method as determined by the FTL with consideration given to the size and stability of the trench, H&S concerns, and the availability of appropriate sampling equipment. If possible (because of safety concerns and the dimensions of the trench) extension handles will be used with standard hand-auger and thin-wall tube samplers to collect the VOC samples directly from the bottom of the trench. If safety concerns do not allow access to the trench for direct sampling, VOC samples may be collected from a backhoe bucket or similar excavation equipment using conventional methods. Regardless of the method used, the FTL will ensure the integrity of the samples and will document the sampling method on the Daily Activity Log.

All samples will be collected in accordance with the applicable ER Project SOPs (LANL 1991, 21556) for the collection, preservation, identification, storage, transport, and documentation of environmental samples, as described in the ER Project QAPP (LANL 1996, 53450). Decontamination of sampling equipment will be performed in accordance with LANL-ER-SOP-01.08, R0, "Field Decontamination of Drilling and Sampling Equipment." Wash water and other wastes generated during the sampling operation will be managed and disposed of in accordance with LANL-ER-AP-05.3, R0, "Management of Environmental Restoration Waste" (LANL 1995, 49708).

Each sample location will be marked or permanently monumented (where possible), photographed, and assigned a unique ER Project sample location identification number. All samples will be field screened using hand-held instruments at the point of collection for gross radioactivity and organic vapors. When the samples are submitted to the Sample Management Office (SMO), gross-alpha, -beta, and -gamma radiation measurements will be taken on each sample before they are transported to a fixed-site laboratory.

4.2 Measurement Methods

Soil, sediment, and borehole core samples collected according to criteria outlined in Section 2.0 will undergo full-suite analyses for organic chemicals, inorganic chemicals, and/or radionuclides. All analyses will be performed at ER Project-approved fixed-site laboratories. The analytical suites and methods for analysis of organic chemicals are listed in Table 4.2-1. The analytical suites include VOCs, SVOCs, and PCBs that will be analyzed in selected samples. Analysis for VOCs will be performed on any sample for which a significant organic vapor measurement is obtained by field screening. All analyses for organic chemicals will be performed according to EPA SW-846 protocols (EPA 1986, 31733). The detailed analyte lists, EQLs, required QC procedures, and the acceptance criteria are found in the ER Project analytical services statement of work (LANL 1995, 49738).

TABLE 4.2-1

ANALYTE SUITES AND ANALYTICAL METHODS FOR ANALYSIS OF ORGANIC CHEMICALS IN SOIL, SEDIMENT, AND CORE SAMPLES

Analyte Suite	Analytical Method	Analytical Protocol
VOCs	GC/MS	SW-8260
SVOCs	GC/MS	SW-8270
PCBs	GC/ECD	SW-8081A or SW-8082

The target analytes, EDLs, and analytical methods for inorganic chemicals are listed in Table 4.2-2. All analyses for inorganic chemicals will be performed according to EPA SW-846 protocols using mineral acid sample extraction procedures for the ICPES, graphite furnace atomic absorption (GFAA), and inductively coupled plasma mass spectrometry (ICPMS) techniques.

TABLE 4.2-2

ANALYTE LIST, ESTIMATED DETECTION LIMITS, AND ANALYTICAL METHODS FOR INORGANIC CHEMICALS IN SOIL, SEDIMENT, AND CORE SAMPLES

Analyte	EDL (mg/kg)	Analytical Method	Analytical Protocol
Aluminum	40	ICPES	SW-6010B
Antimony	12	ICPES or ICPMS	SW-6010B or SW-6020
Arsenic	2	GFAA or ICPMS	SW-7060 or SW-6020
Barium	40	ICPES	SW-6010B
Beryllium	1	ICPES	SW-6010B
Cadmium	1	ICPES	SW-6010B
Calcium	500	ICPES	SW-6010B
Chromium	2	ICPES	SW-6010B
Cobalt	10	ICPES	SW-6010B
Copper	5	ICPES	SW-6010B
Iron	20	ICPES	SW-6010B
Lead	0.6	GFAA or ICPMS	SW-7421 or SW-6020
Magnesium	1000	ICPES	SW-6010B
Manganese	3	ICPES	SW-6010B
Mercury	0.1	CVAA	SW-7471A
Nickel	8	ICPES	SW-6010B
Potassium	500	ICPES	SW-6010B
Selenium	1	GFAA or ICPMS	SW-7741 or SW-6020
Silver	2	ICPES	SW-6010B
Sodium	500	ICPES	SW-6010B
Thallium	2	GFAA or ICPMS	SW-7841 or SW-6020
Vanadium	10	ICPES	SW-6010B
Zinc	4	ICPES	SW-6010B

The target analytes and their half-lives, detected emission, EQLs, and analytical methods for radionuclides are listed in Table 4.2-3. Before chemical separation and counting for alpha or beta emissions, soil samples will undergo a complete digestion or fusion procedure. Tritium in the water fraction distilled from the soil sample will be measured by liquid scintillation counting. The gravimetric moisture content of the sample will also be determined, and the tritium results will be converted to units of pCi/g of dry sample. The analyte list for the gamma spectroscopy analysis includes long-lived activation and fission products, as well as their shorter lived (half-life less than 180 days) daughter products. The shorter lived daughter products are usually included in the analyte list to verify the presence of the longer lived parents. The shorter lived radionuclides are not considered to be COPCs. Soil and sediment samples will be prepared for gamma spectroscopy measurements by homogenization and drying; no sample extraction will be performed. The required QC procedures and acceptance criteria for both the inorganic chemical and radionuclide analyses are found in the ER Project analytical services statement of work (LANL 1995, 49738).

TABLE 4.2-3

ANALYTE LIST, ESTIMATED QUANTITATION LIMITS, AND ANALYTICAL METHODS FOR RADIONUCLIDES IN SOIL, SEDIMENT, AND CORE SAMPLES

Analyte	Half-Life (yr)	Detected Emission	EQL (pCi/g)	Analytical Method
^{3}H	12.3	β	300 pCi/L	Liquid scintillation counting
^{238}Pu	87.7	α	0.1	α-Spectrometry
$^{239,240}Pu$	2.410×10^{4}	α	0.1	α-Spectrometry
^{90}Sr	29.1	β	2.0	Gas proportional counting
^{228}Th	1.913	α	0.1	α-Spectrometry
^{230}Th	7.54×10^{4}	α	0.1	α-Spectrometry
^{232}Th	1.40×10^{10}	α	0.1	α-Spectrometry
^{234}U	2.46×10^{5}	α	0.1	α-Spectrometry
^{235}U	7.04×10^{8}	α	0.1	α-Spectrometry
^{238}U	4.47×10^{9}	α	0.1	α-Spectrometry
Gamma spectroscopy analytes	–	γ	1[b]	γ-Spectroscopy

a. The ^{239}Pu and ^{240}Pu isotopes cannot be distinguished by alpha spectrometry. The half-life of ^{239}Pu is given.
b. The contract-required EQL for ^{241}Am and ^{137}Cs is 1 pCi/g; the value for other analytes will vary.

4.3 Field Decisions

The sampling design described in Section 2.0 requires that field decisions be made at several points. More details are provided in this section.

4.3.1 Appropriate Placement of Borehole Locations

The drilling and trenching sites are located at former waste line trenches or at locations where waste lines still exist. Samples are to be collected from the soil/tuff interface from beneath these waste lines. The field team geologist will inspect borehole core and/or cuttings to determine if the location is appropriate to collect the intended samples. If tuff is encountered at a depth above which the base of a trench is expected, the location of the borehole will be relocated appropriately.

4.3.2 Biased Sampling from Borehole Cores Based on Geological Criteria

4.3.2.1 Backfill/Tuff Interface

In most locations sampled during the Phase I RFI, the backfill material was described as sand and/or clay with tuff cobbles, whereas the top of the tuff was nonwelded and soft but usually consolidated and relatively homogeneous. The field team geologist will identify the boundary. The first foot of tuff below the backfill/tuff interface will be sampled in all boreholes.

4.3.2.2 Fracture Fill Material

Fill material lining fractures in the tuff is of particular interest in modeling contaminant transport. The field team geologist will examine all cores to identify discrete fractures or fracture zones from which sufficient fill material can be recovered for analysis. Samples of fracture fill material for chemical analyses will be collected if deemed appropriate by the field team geologist.

4.3.3 Biased Sampling from Borehole Cores Based on Field Beta/Gamma Radiation Measurements

Background beta/gamma radiation activity levels may be slightly higher in tuff than in backfill material, but they are generally in the range of 200 to 400 counts per minute as measured with a GM pancake probe meter. Media-specific background activity levels will be established in the field. If above-background levels are measured in the core from a given borehole, the backfill material sample and/or the tuff will be collected within 1 ft of the point where the highest measurements are observed.

Default sampling depths, which will be used if no above-background beta/gamma radiation activity levels are reported, are provided in Section 2.0.

4.4 Sample Handling

All samples will be identified in accordance with LANL-ER-SOP-01.04, R3, "Sample Control and Field Documentation." Chain-of-custody requirements described in LANL-ER-SOP-01.04, R3 will be implemented. The SMO will be consulted regarding the appropriate sample containers and preservation. Samples will be packaged and shipped in accordance with LANL-ER-SOP-01.03, R1, "Handling, Packaging and Shipping of Samples." All samples will be shipped from the SMO to fixed-site laboratories for analysis. Samples will be screened for gross radiation at a mobile radiological van before shipment. The results of radiological screening conducted in the mobile radiological van will be documented and sent to the SMO along with the samples.

4.5 Data Tracking

The data management scheme described in Sections A10 and B10 of the ER Project QAPP (LANL 1996, 53450) will be followed. Manually recorded data will be reviewed by the field team as required by LANL-ER-SOP-1.01, R0, "General Instructions for Field Investigations"; LANL-ER-SOP-01.04, R3; and LANL-ER-SOP-03.12, R0, "Field and Laboratory Notebook Documentation for Environmental Restoration Earth Science Studies." Data generated by the analytical laboratories will be submitted to the SMO in accordance with the requirements of the ER Project analytical services statement of work (LANL 1995, 49738). The reporting requirements include electronic and hard copy deliverables for routine analyses. The SMO is responsible for data verification, validation, and transmittal to the Facility for Information Management, Analysis, and Display (FIMAD).

5.0 DATA ASSESSMENT

5.1 Verification and Routine Validation

Data generated by the analytical laboratories will undergo the verification and baseline validation procedures described in Sections D1 and D2 of the ER Project QAPP (LANL 1996, 53450). Field data will be reviewed for accuracy and completeness by the field team at the time of collection.

5.2 Data Quality Assessment

Reconciliation of the data with the investigation objectives will be accomplished using the qualitative data quality assessment methods described in Section D3 of the ER Project QAPP (LANL 1996, 53450). The assessment team will evaluate the sufficiency of the data set for decision-making purposes using their best professional judgment. The assessment team shall consist of a geologist, human health risk assessor, ecological risk assessor, statistician, and chemist (at a minimum). The data quality assessment process outlined in Figure D-3 of the ER Project QAPP (LANL 1996, 53450) will be followed.

6.0 ADMINISTRATION

6.1 Project Task Organization

The Field Unit 4 project task organization for implementing the field activities described in this SAP is shown in Table 6.1-1.

TABLE 6.1-1

FIELD UNIT 4 KEY PERSONNEL

Functional Role	Organization	Phone
Field Project Management		
Field Project Leader	EES-13	667-4308
Technical Team Leader	EES-1	667-2492
Field Team Manager	ERM/Golder	662-3700
Management Support Leader	LATA	662-9080
Field Team		
Field Team Leader	SAIC	672-3666
Geologist	SAIC	672-3666
Site Safety Officer	SAIC	672-3666
Field Technician/Sampler	ERM	662-3700
Field Technician/Sampler	SAIC	672-3666
Technical/Assessment Team		
Assessment Team Leader	LATA	662-9080
Human Health Risk Assessor	Neptune	662-0707
Ecological Risk Assessor	EES-15	665-3742
Statistician	Neptune	662-0707
Chemist	LATA	662-9080
Alternate Personnel		
Alternate FTL/Geologist	SAIC	672-3666
Alternate Site Safety Officer/Sampler	ERM/Golder	662-3700
Coordinator		
Field Project Coordinator	DOE/LAAO	667-5101

6.2 Training

All ER Project personnel involved with the execution of this SAP will have fulfilled the required training for applicable roles in accordance with the ER Project worker positions matrix in administrative procedure LANL-ER-AP-05.2, R1, "Determination, Completion, and Documentation of Environmental Restoration Worker Training" (LANL 1995, 49708). ER Project personnel training records are located on-site during field activities and will be available for inspection. ER Project personnel will not perform tasks under site conditions that require special training beyond that documented in their training records.

6.3 Records

Field records will document sample collection and tracking, H&S briefings and checks of monitoring equipment performance, and nonsampling activities such as site inspections and walkovers, which are documented as engineering surveys on Daily Activity Logs. Table 6.3-1 is a summary of required field documents, the appropriate requirement reference, and document recipients. All original documents will be transferred to the ER Project Records-Processing Facility (RPF) in accordance with administrative procedure LANL-ER-AP-02.1, R1, "Procedure for LANL ER Records Management" (LANL 1995, 49708).

TABLE 6.3-1

FIELD ACTIVITY DOCUMENTATION

Document	Requirement Reference	Document Recipients
Sample Collection and Tracking		
Daily Activity Log	LANL-ER-SOP-01.04, R3* Attachment E	FU4 file, RPF
Sample Collection Log	LANL-ER-SOP-01.04, R3* Attachment B	FU4 file, RPF
Core Sample Log	LANL-ER-SOP-12.01, R1* Attachment E	FU4 file, RPF
Daily Drilling Summary	LANL-ER-SOP-12.01, R1* Section 8 (form attached)	FU4 file, RPF
Daily Report Form	FU4 Guidance (form attached)	FU4 file, RPF
Chain of Custody/Request for Analysis Forms	LANL-ER-SOP-01.04, R3* Attachment C	FU4 file, RPF
Electronic Follower (Chain of Custody/Request for Analysis)	LANL-ER-SOP-01.04, R3* Section 6.1.5	SMO
Health and Safety		
Tailgate Safety Meeting/Meeting Attendees	FU4 Guidance (form attached)	FU4 file, RPF
Flameionization Detector Field Data Form	FU4 Guidance (form attached)	FU4 file, RPF
Direct Survey Form	ESH-1 Guidance (form attached)	FU4 file, RPF
Smear Survey Form	ESH-1 Guidance (form attached)	FU4 file, RPF
LAS Survey Form	ESH-1 Guidance (form attached)	FU4 file, RPF
Radiation Grid Survey Form	FU4 Guidance (form attached)	FU4 file, RPF
Daily Safety Inspection Checklist	FU4 Guidance (form attached)	FU4 file, RPF
Daily Drill Rig Inspection Checklist	FU4 Guidance (form attached)	FU4 file, RPF
PPE Inspection Checklist	FU4 Guidance (form attached)	FU4 file, RPF
Equipment and Item Removal Log	FU4 Guidance (form attached)	FU4 file, RPF
Site Access List	FU4 Guidance (form attached)	FU4 file, RPF
Engineering Surveys		
Daily Activity Log	ER-SOP-01.04, R3* Attachment E	FU4 file, RPF

*LANL 1991, 21556

Photographs and videotapes may be used to document observations and sample collection activities. Site visit photographic documentation will be referenced on a Daily Activity Log in accordance with ER-SOP-01.04, R3.

6.4 Oversight

Oversight, review, and approval of ER Project field activities are currently provided by the following Laboratory groups.

- ESH-1 for RCT support and oversight
- ESH-5 for review, approval, and oversight of the SSHASP
- ESH-19 for oversight of the waste management plan and/or the Waste Characterization Strategy Form
- CST-5 and CST-17 for review and approval of the waste management plan and/or the Waste Characterization Strategy Form

The ER Project Office may schedule an audit of sampling activities to ensure the quality of field performance. Such audits will conform to the ER Project quality procedures LANL-ER-QP-01.1Q, R0, "Audits" and LANL-ER-QP-01.2Q, R0, "Surveys" (LANL 1995, 49708). ESH-5 will evaluate the ER Project field operations to determine compliance with H&S requirements.

6.5 Inspection and Acceptance Policies

All activities associated with this SAP will follow Laboratory policies on inspections and acceptance. All sampling equipment, including sample containers, rinsate water, and sample preservation reagents, will be inspected by the FTL upon receipt. The SMO provides the sample containers used for sample collection. The sample containers are certified by the manufacturer for prescribed cleanliness and quality. Sample preservation reagents are received from reputable chemical suppliers with reagent purity certification on the container label.

6.6 Reports to Management

The FTL will submit daily activity reports to the field team manager during field activities.

6.7 Field Forms

The following field forms, which are not included in the SOPs, will be used to execute the SAP. See Attachment III of this SAP for copies of the forms.

- ESH-1 Direct Survey Form
- ESH-1 LAS Survey Form (LAS = large area swipe)
- ESH-1 Smear Survey Form
- ESH-1 Smear Continuation Form

- FU 04 Equipment and Item Removal Log
- FU 04 Site Access List
- FU 04 Survey Form
- FU 04 Tailgate Safety Meeting

7.0 REFERENCES

Emelity, L. A., April 19, 1982. "Monthly Achievement Report for April 1982," Los Alamos National Laboratory Memorandum H7-82-149 to Jesse Aragon (H-Division) from L. A. Emelity (H-7), Los Alamos, New Mexico. **(Emelity 1982, ER ID Number 797)**

Environmental Restoration Decision Support Council, January 2, 1996. "Risk-Based Corrective Action Process," Los Alamos National Laboratory Report LA-UR-96-111, Los Alamos, New Mexico. **(Environmental Restoration Decision Support Council 1996, ER ID Number 53751)**

EPA (US Environmental Protection Agency), November 1986. "Test Methods for Evaluating Solid Waste, Volume IA: Laboratory Manual, Physical/Chemical Methods," SW-846, Third Edition, Washington, DC. **(EPA 1986, ER ID Number 31732)**

EPA (US Environmental Protection Agency), November 1986. "Test Methods for Evaluating Solid Waste, Volume IB: Laboratory Manual, Physical/Chemical Methods," SW-846, Third Edition, Washington, DC. **(EPA 1986, ER ID Number 31733)**

EPA (US Environmental Protection Agency), December 1989. "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)," Interim Final, EPA 540/1-89/002, Office of Emergency and Remedial Response, Washington, DC. **(EPA 1989, ER ID Number 8021)**

EPA (US Environmental Protection Agency), April 10, 1990. Module VIII of RCRA Permit No. NM0890010515, EPA Region VI, issued to Los Alamos National Laboratory, Los Alamos, New Mexico, effective May 23, 1990, EPA Region VI, Hazardous Waste Management Division, Dallas, Texas. **(EPA 1990, ER ID Number 1585)**

EPA (US Environmental Protection Agency), September 1, 1995. "Region IX Preliminary Remediation Goals (PRGs) Second Half 1995," EPA Region IX, Technical Support Section, San Francisco, California. **(EPA 1995, ER ID Number 53970)**

Fresquez, P., March 12, 1991. "Results of an Environmental Restoration Interim Action (ERIA) Reconnaissance Survey of a Proposed Parking Lot East of TA-48," Los Alamos National Laboratory Memorandum HSE-8:91-376 to Henry Nunes (HSE-13) from Phil Fresquez (HSE-8), Los Alamos, New Mexico. **(Fresquez 1991, ER ID Number 819)**

Fresquez, P., May 31, 1991. "Results of an Environmental Restoration Interim Action (ERIA) Reconnaissance Survey at the Site of the Weapons Isotope Separator Facility at TA-48," Los Alamos National Laboratory Memorandum HSE-8:91-900 to Robert Gonzales (HSE-13) from Phil Fresquez (HSE-8), Los Alamos, New Mexico. **(Fresquez 1991, ER ID Number 21358)**

LANL (Los Alamos National Laboratory), November 25, 1985. "Cross Index of NPDES Serial #s to Technical Areas and Types of Discharge," Los Alamos, New Mexico. **(LANL 1985, ER ID Number 853)**

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Vol. I–IV, Los Alamos National Laboratory Report LA-UR-90-3400, prepared by International Technology Corporation, Contract No. 9-XS8-0062R-1, Los Alamos, New Mexico. **(LANL 1990, ER ID Number 7511)**

LANL (Los Alamos National Laboratory), May 1991. "Environmental Restoration Standard Operating Procedures," Vol. I–II, Los Alamos, New Mexico. **(LANL 1991, ER ID Number 21556**

LANL (Los Alamos National Laboratory), September 17, 1991. NPDES Outfalls, Los Alamos, New Mexico. **(LANL 1991, ER ID Number 21557)**

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1129," Los Alamos National Laboratory Report LA-UR-92-800, Los Alamos, New Mexico. **(LANL 1992, ER ID Number 7666)**

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, ER ID Number 49738)**

LANL (Los Alamos National Laboratory), August 21, 1995. "Administrative and Quality Procedures for Environmental Restoration," Los Alamos, New Mexico. **(LANL 1995, ER ID Number 49708)**

LANL (Los Alamos National Laboratory), September 1995. "RFI Report for Potential Release Sites 48-001, 48-002(e), 48-003, 48-005, 48-007(a), 48-007(b), 48-007(c), 48-007(d), 48-007(f), 48-010," Los Alamos National Laboratory Report LA-UR-95-3328, Los Alamos, New Mexico. **(LANL 1995, ER ID Number 50295)**

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, ER ID Number 53450)**

Longmire, P. A., D. E. Broxton, and S. L. Reneau, October 1995. "Natural Background Geochemistry and Statistical Analysis of Selected Soil Profiles, Sediments, and Bandelier Tuff, Los Alamos, New Mexico," Los Alamos National Laboratory Report LA-UR-95-3468, Los Alamos, New Mexico. **(Longmire et al. 1995, ER ID Number 52227)**

Longmire, P., S. Reneau, P. Watt, L. McFadden, J. Gardner, C. Duffy, and R. Ryti, January 1995. "Natural Background Geochemistry, Geomorphology, and Pedogenesis of Selected Soil Profiles and Bandelier Tuff, Los Alamos, NM" (draft), Los Alamos National Laboratory Report LA-12913-MS, Los Alamos, New Mexico. **(Longmire et al. 1995, ER ID Number 48818)**

Pratt, A., June 2, 1994. "Addendum to the OU 1129 RFI Work Plan," Los Alamos National Laboratory Memorandum EES-13-ER-05-94-011 to Tracy Glatzmaier (EES-5) from Allyn Pratt (EES-13), Los Alamos, New Mexico. **(Pratt 1994, ER ID Number 43475)**

Attachment I

Laboratory/DOE Responses

Los Alamos National Laboratory

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Date: May 6, 1996
Refer to: EM/ER:96-231

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

SUBJECT: RESPONSE TO THE NOTICE OF DEFICIENCY (NOD) FOR TECHNICAL AREA (TA) 48 RECOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT

Dear Mr. Garcia:

Enclosed is the Los Alamos National Laboratory's response to the Environmental Protection Agency's NOD concerning the TA-48 RFI Report. A certification form signed by the appropriate officials is also enclosed. The NOD was received at the Los Alamos Area Office on April 4, 1996. The enclosed response repeats each comment from the NOD for convenience in reviewing.

Please contact Allyn Pratt at (505) 667-4308 or Bob Simeone at (505) 667-0587, if you have any questions regarding the response to the NOD.

Sincerely,

Jorg Jansen, Program Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

JJ/TT/el

Enclosure: Response to NOD for TA-48 RFI Report

The University of California is an Equal Opportunity Employer

Cy (w/ enc.):
D. Griswold, ERD, AL, MS A906
J. Harry, EM/ER, MS M992
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R. Kern, NMED-HRMB
N. Naraine, EM-453, DOE-HQ
D. Neleigh, EPA, R.6, 6PD-N, 2 copies
A. Pratt, EES-13, MS J521
B. Simeone, LAAO, MS A316
T. Taylor, LAAO, MS A316
N. Weber, NMED-AIP, MS J993
J. White, ESH-19, MS K490
S. Yanicak, NMED-AIP, J993
EM/ER File (CT # C081), MS M992
RPF, MS M707

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T. Glatzmaier, DDEES/ER, MS M992
D. McInroy, EM/ER, MS M992
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J. Vozella, LAAO, MS A316

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: RESPONSE TO THE NOTICE OF DEFICIENCY (NOD) FOR THE TECHNICAL AREA (TA) 48 RECOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT (FORMER OPERABLE UNIT 1129)

Name: _____ Date: 5-9-96

Jorg Jansen, P
Environmental
Los Alamos Na

Tom Baca, Program Director
Environmental Management
Los Alamos National Laboratory

Name: _____ Date: 5/9/96

Joseph Vozella,
Acting Assistant Area Manager of
Environment Projects
Environment, Safety, and Health Branch
DOE-Los Alamos Area Office

or

Theodore J. Taylor
Program Manager
Environment Restoration Program
DOE-Los Alamos Area Office

RESPONSE TO NOTICE OF DEFICIENCY FOR TECHNICAL AREA (TA) 48 RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT (FORMER OPERABLE UNIT 1129)

No. 1 3.1.1 Inorganic Analyses, P. 3-2

The report indicates that holding times for various soil and water samples were exceeded by as much as two months. Were the holding times errors due to laboratory oversights or backlog, or other circumstances? Is any additional sampling anticipated to corroborate the results of those analyses which are "regarded as estimated"?

Holding time errors for these samples were caused by a backlog at the internal laboratories used for the analyses. No additional sampling is proposed to validate the estimated data from samples for which holding times were exceeded. The two field QC water samples for which holding times were exceeded by two months are not critical to the conclusions for any potential release site (PRS) in this report because sufficient QC samples still exist to evaluate sampling procedure bias and precision. The only soil samples affected by the missed holding times are GFAA data for arsenic and selenium. Selenium data by GFAA represent only nine percent of the data set for these analytes, the remaining analyses were performed by XRF for which sample holding times were satisfied. Data quality concerns for arsenic are discussed in Comment Response 3.

No. 2 3.1.1.2 Comparison of SW-846 and EDXRF Sample results, P. 3-3

The comparison of EDXRF and SW-846 ICPES methods indicates that the EDXRF results were significantly higher for barium, calcium, chromium, copper, iron, lead, manganese, and potassium. LANL shall present an explanation as to how this discrepancy will impact the risk assessment process.

The high bias of XRF data for these analytes relative to data derived from SW-846 methods introduces a conservative bias into the risk assessment process. Sample digestion procedures for SW-846 trace metal analyses specify a partial sample digestion using nitric acid. This sample digestion procedure does not extract elements present in the silicate minerals of the soil particles. By contrast, XRF analysis is sensitive to most or all of the elements present in silicate minerals as well as to elements in the acid-soluble portion of the sample. Because only the acid-digestible fraction of a sample is likely to correspond to the sample fraction soluble in gastrointestinal and intercellular fluids, the lower SW-846 values are more appropriate for comparing to screening values or cleanup levels based on contaminant intake via soil ingestion, inhalation, or

dermal absorption exposure routes. Use of the XRF data for screening purposes, however, is appropriate because additional bias introduced by this analytical method is conservative.

No. 3 3.1.1.3 Evaluation of Quality Control Data for SW-846 and EDXRF Analyses, p. 3-5

The report indicates that the EDXRF data quality for arsenic is insufficient for screening assessment purposes. Will LANL be collecting additional samples for arsenic analyses?

LANL acknowledges that arsenic data at TA-48 are not of sufficient quality for performing quantitative risk-based evaluations, including quantitative screening assessments. XRF data for arsenic exhibited a significant low bias and a high false negative rate, and the SW-846 arsenic data are from samples for which holding times were exceeded. Nevertheless, LANL maintains it is not cost-effective to resample for arsenic at TA-48 because existing data, although admittedly of poor quality, are sufficient to show that widespread arsenic contamination at high concentrations does not exist at TA-48. Additionally, no industrial processes at TA-35 have been identified in historical documents that would suggest that arsenic is a potential contaminant at these PRSs. Resampling for arsenic is therefore not proposed at TA-48.

No. 4 3.1.2.2 Semivolatile Organic Compound Analyses, p. 3-11

Numerous SVOC samples were extracted without the required method blank being concurrently extracted. Reported dates of sample extraction do not agree with the dates of method blank extraction and in one instance, no method blank extraction was performed. Although review of the data does not indicate the samples had contamination introduced during sample preparation, other than possibly phalates, the lax quality control practices in conjunction with previously mentioned exceedances in holding times tends to taint the entire data package. How does LANL propose to address these problems?

LANL acknowledges that quality control procedures for the TA-48 data set were not implemented in a manner consistent with standard industry practice and LANL's own quality control directives. The analytical laboratory used for many of the sample analyses is no longer employed by the ER Project and future reports by this field unit (FU) will not exhibit the degree of quality control problems experienced here.

No. 5 3.1.2.3 Polychlorinated Biphenyl Compound Analysis, p. 3-11

PCB holding time for one sample was exceeded by one month. This sample should be identified in the text and compared to other samples which met holding times to validate the statement that "the usability of the data is not affected", as the report suggests.

Comparison of data for the affected PCB sample with data from samples at other locations is not inherently meaningful because the assumption that PCB concentrations at disparate locations are identical cannot be defended. LANL maintains, however, that the missed holding time for the single PCB sample is not meaningful in the context of the Phase I assessment because PCBs are sufficiently stable in a soil medium that if gross PCB contamination existed at the sampling location in question, the sample data would still indicate their presence.

No. 6 3.1.4 High Explosives Analyses, p. 3-14:

The report indicates that "no explosive analyses were performed at this site". The rationale for not conducting explosives' analyses, such as no historical use or presence of explosives in the area, should be stated.

LANL concurs. The rationale for not conducting explosives analyses is that no current or historical use or presence of explosives has been identified at the TA-48 laboratory site. TA-48 facility operations and processes are described in the Introduction, page 1-1, of the RFI Report for PRSs 48-001, 48-002, 48-003, 48-005, 48-007(a), 48-007(c), 48-007(d), 48-007(f), and 48-010, and in greater detail in Chapter 3, pages 3-87 through 3-107, of the RFI Work Plan for Operable Unit (OU) 1129. TA-48, the Radiochemistry Site, is currently used for chemical and radiochemical analyses, radioactive waste disposal research, and radioisotope production for nuclear medicine.

No. 7 - 3.1.5 Field Quality Control Activities, p. 3-14:

The presence of lead above 5 ppb in 17 of 24 field QC water samples and the fact that all regular water samples analyzed contained less than 5 ppb lead, indicates that lead contamination was introduced into the QC samples through the sample preparation process. A complete audit of the QC sample preparation process should be conducted to identify at which point the contamination is being introduced.

LANL concurs. The FU undertook an aggressive internal audit of the analytical findings. While no specific procedural finding could be attributed to the lead hits in the QC water samples, a change in vendors of the water alleviated the issue.

No. 8 3.2.1 Background Comparison, p. 3-19

The statement, "At the discretion of the project statistician, additional analysis of a background value may by performed before carrying a COPC forward to the SAL comparison.", needs clarification. Which background values required "additional analysis"? What form of "correction" was applied before performing the background screening?

This statement refers to the process of performing a statistical test comparing site data and background data for a chemical to determine if the two distributions are significantly different. Generally, such statistical tests are

performed only if UTL values are exceeded in one or more samples. Background values and tests for comparing site and background distributions of chemicals are described in *Risk-Based Corrective Action Process* (Environmental Restoration Decision Support Council 1996, 53751). Statistical tests of this nature were not performed for the TA-48 data set and this statement was included in the text only because such tests are a potential part of the screening process. This statement may be disregarded in the TA-48 RFI Report.

No. 9 3.2.3 Ecotoxicological Screening Assessment Methodology

The process of identifying PRSs that may be excluded from further ecological risk evaluation based on an assigned "minimum habitat quality criteria" is flawed by the fact that no "habitat" could ever receive a biological activity score of zero. A potential for access by receptors is always present from birds and/or mammals.

Technically we agree that biological activity in close proximity with contaminated media is never zero. A receptor accessibility score of zero simply means that the amount of biological activity expected for the site is below a *de* minimus level where other site disturbances are thought to overwhelm any potential for a contaminant-caused effect.

The zero score is a useful tool for sorting PRSs in groups having contamination problems of different magnitudes and urgency. The goal of the habitat evaluation is to identify areas where ecological risk is the paramount value or where it is not. When a site has low habitat value because of disturbances not related to contamination, then remediation of the site will do little to improve habitat quality. These areas typically are highly industrialized (even paved) or otherwise subjected to frequent human disturbance. A PRS with an accessibility score of zero should not contribute to a cumulative risk problem (as long as the no transport assumption holds), because their contribution is assumed to be insignificant.

The habitat evaluation certainly can be improved, and we are evaluating several approaches to do so. Proximity of PRSs to buildings and depth to contamination are two of many criteria that could be used to define an objective way to set priorities for ecological risk. We welcome any suggestions you have for evaluating site quality.

No. 10 Table ES-1, p. 4-1

Based on the above mentioned analytical problems, the NFA recommendations for all PRSs within this RFI seems premature pending further investigation or an adequate explanation that the sampling and analysis errors have no impact on the decision making process.

Specific comments regarding the adequacy of the data set to support NFA recommendations have been addressed throughout these comment responses.

No. 11 4.1 Aggregate K, p. 4-2:

The report indicates that the TA-48 contains nine stacks which release VOCs and perchloric acid. The fume hoods are reported to contain scrubbers designed to scrub contaminated exhaust air before it is released to the stacks, however, no explanation is given as to the ultimate disposition of the scrubber waters. Please clarify.

According to TA-48 facility personnel, the scrubber waters are discharged via direct line to the TA-50 low-level radioactive wastewater treatment plant.

No. 12 4.1.1 Previous Investigations for Aggregate K, p. 4-2

A table should be included presenting the results of the five surface and five subsurface soil samples which were collected north of TA-48 as part of the April 1991, ER Interim Action reconnaissance survey.

The summary results (and the original work plan) for the referenced samples are included as attachments (LANL memos, symbols HSE-8:91-900 and -507, respectively). A tabular summary of the results will be provided in the final TA-48 Phase II sampling report, scheduled for second quarter, FY97.

No. 13 4.1.2 Field Investigations for Aggregate K, p. 4-4:

The use of an organic vapor analyzer (OVA) is an inadequate technique to locate surface soil contamination. Any VOCs that may have been present most likely volatilized long ago. Generally, surface soils contaminated with organics will be visible to the naked eye long before they are detected with the OVA instrument, unless the soil is disturbed, thereby releasing the VOCs which may be just under the surface. A surface soil sample analyzed using methods described in SW-848 is the most reliable way of locating surface soil contamination.

LANL concurs, the use of an organic vapor analyzer is not the proper instrument to locate surface soil contamination. However, the OVA was used during the field surveys primarily as a health and safety (H&S) precaution and to identify any VOC "hot spots", if present. The use of the OVA for surface screening was not intended to screen out sample locations. The rationale for the use of the OVA agrees with the comment, that surface VOCs would have long since volatilized, but for H&S and screening purposes the OVA is routinely used as a screening tool.

No. 14 Deviations from the Work Plan, p. 4-5:

Subsurface sampling using a hand auger alone is an inappropriate method for collecting VOC samples. Unless a split spoon or core barrel is driven beyond the bottom of the auger hole to collect an undisturbed samples, VOC results, if any are recorded, will not be representative of actual conditions due to the volatilization that occurs during the churning action of the soil created by the auger.

LANL concurs. VOC samples need to be collected with a split spoon or core barrel sampler. However, the method used to collect subsurface soil samples for VOC analyses from a hand-auger assumes that not all VOCs will volatilize in the few seconds between when the sample is retrieved and bottled. The sampling method used insures that the exposure time before bottling the sample is minimized; once the sample is retrieved, a grab sample is immediately collected for VOCs prior to homogenizing the remaining sample for other constituents. The Phase I sample and analysis plan was designed to confirm the presence of COPCs and not necessarily define the full extent of contaminants. Therefore, the use of the hand-auger for collection of subsurface samples for VOC analysis is an appropriate tool for Phase I sampling. Alternative sampling methods, using split spoon or core barrels, will be used at PRSs where VOCs are identified by SW-846 methods.

No. 15 4.1.2.2 Results of Field Screening, p. 4-5:

The OVA scans resulted in "No elevated measurements indicative of contamination..". LANL shall explain the criteria for "elevated measurements".

Field screening of soils and samples using the OVA identifies organic vapors in the soil, both anthropogenic and natural. VOCs are naturally generated by the decay of organic matter in the soil. Experience has shown that natural VOCs occur between 5 to 10 ppm in local soils, and if decaying organic matter is noted in the soil concurrent with a few ppm reading of the OVA, these measurements are considered background. The criteria for elevated measurements may be specific to individual sites, based on the amount of natural organic material in the soil, and may be identified by the on-site geologist. The statement is based on professional observational judgment at the site, not on a quantitative threshold.

No. 16 4.1.3 Screening Assessment for Aggregate K, p. 4-6

The text indicates that various sets of sample results cannot be compared due to differences in analytical methods (EDXRF vs. SW-846), analyses conducted at fixed and mobile labs not being comparable or large uncertainties associated with the mobile lab analyses. Typically, SW-846 methods are used to correlate XRF results and likewise, a fixed laboratory will be used as a QA for a mobile laboratory. It appears that the sample results cannot be validated due to this lack of comparison of sample results. LANL shall develop a protocol for

sending at least 20% of all samples to fixed off-site laboratory to ensure proper QA for sample results

Sample data from TAs 35 and 48 have been combined and a sufficient data set exists to correlate SW-846 and XRF data for nine inorganic chemicals. UTL values based on these data have been calculated for these elements. Because the correlation of these XRF UTLs and UTL values published in Longmire et al. (1995, 48818; 1995, 1266) for total digestion (hydrofluoric acid) sample preparation are very good, the total digestion UTLs can be used as surrogates for many remaining elements. A discussion of the use of XRF data for background comparisons and screening assessment is presented in Section 3.1.3 of Chapter 3.0 of the TA-35 RFI Report, May, 1996.

FU 4 ceased using mobile laboratory facilities after the 1995 field season. Therefore, development of a QA protocol for validating mobile laboratory data is no longer relevant to FU 4.

The mobile laboratory data for radionuclides were not compared to fixed-site laboratory data because of the poor quality of the mobile laboratory data. Since the TA-48 RFI Report was published, additional information regarding quality of the mobile laboratory radiological data has become available. The mobile laboratory radiological data presented in the TA-48 RFI Report are no longer considered usable for screening assessment purposes and conclusions based on these data should be disregarded. Conclusions based on nonradiological and fixed-site laboratory radiological data are unaffected. An addendum to the TA-48 RFI Report providing the results of the Phase I investigation for radionuclides will be submitted once the radionuclide data have been corrected for problems including improper background count subtraction and possible misallocation of peaks by the system software. This will be included in the final TA-48 phase II sampling report, scheduled for second quarter, FY97.

No. 17 4.1.3.3 Risk Assessment, p. 4-9

Explain why no human health or ecological risk assessment was performed for PRS 48-001.

No human health risk assessment was performed for PRS 48-001 because no COPCs were identified in the screening assessment presented in Section 4.1.3 of Chapter 4.0 of the TA-48 RFI Report. Ecological risk assessments are not performed on a PRS-specific basis but data from this PRS will be included in the future TA-48 reports (see #12) incorporating data from multiple PRSs within an ecological exposure unit defined by criteria such as home ranges of animals, plant communities, and topographical considerations.

No. 18 4.2.2 Field Investigations for Aggregate M, p. 4-11:

a. As previously stated, an OVA should not be used to detect surface soil contamination.

b. As previously stated, a hand auger should not be used to collect VOC samples.

a. LANL concurs. As previously stated, an OVA should not be used to detect surface soil contamination.

Please see response to Comment #13.

b. LANL concurs. As previously stated, a hand auger should not be used to collect VOC samples.

Please see response to Comment #14.

No. 19 Deviations from the Work Plan, p. 4-12:

Aerial photographic analysis should be utilized for determining potential sample locations.

LANL concurs. Review of aerial photographs was performed routinely at all PRS sites and the mention of this activity was inadvertently omitted only in this RFI report. Please see response #27.

No. 20 4.2.3 Screening Assessment of Aggregate M, 4-15

Identify exactly which inorganic and organic constituents were sampled for. All data should be presented in tabular form regardless of the fact that individual sample results may not exceed "background" values.

Presentation of data in this RFI report followed the RFI report format current at the date of publication and agreed upon among LANL, DOE, and their regulatory agencies. The RFI report format has changed since the publication of the TA-48 RFI Report and current reports have an appendix that contains a list of analytes measured by each analytical method. Table formats for site-specific results specify that only analytes exceeding comparative values at each particular step in the data assessment process be included. All data evaluated in an RFI report are available for inspection in electronic data files maintained by the Facility for Information Management and Display at the Laboratory.

No. 21 4.2.3.1 Comparison to background and SAL values, p. 4-19

Although no evidence exists that lithium (4 ppm) is associated with the processes at TA-48, an explanation regarding the significance of this concentration at this location should be provided.

FU 4 attaches no particular significance to the referenced lithium hit. Background concentration data for lithium in soil at the Laboratory have not been collected nor does EPA publish a reference dose for lithium to allow calculation of risk-based screening values. However, lithium concentrations in

rhyolites such as tuff have been measured elsewhere. Total lithium concentrations ranged from 9 to 100 ppm among 13 samples taken at an ash flow in New Zealand (Handbook of Geochemistry, Volume II-1, K.H. Wedepohl, ed., 1978). SW-846 methods only measure the nitric acid-soluble fraction of lithium in a sample, therefore a value of several ppm (below the range in the literature for total lithium) is not unexpected and in no way appears indicative of an environmental release.

Daily intake of lithium from food sources is estimated to be approximately 2 mg (Casarett and Doull's Toxicology, 4th Ed.). At a concentration of 4 mg/kg in soil, and assuming a standard screening soil ingestion rate of 100 mg soil per day, daily lithium intake via soil ingestion would be approximately 0.0004 mg. Thus, the daily intake via food is calculated to be approximately 5,000 times greater than via soil ingestion. Exposure to lithium in soil at this concentration is therefore deemed to be insignificant from a human health standpoint.

No. 22 4.3.2 Field Investigations for Aggregate N, p. 4-23:

As previously stated, an OVA should not be used to detect surface soil contamination. To "screen-out" potential soil sampling locations based on OVA measurements is not appropriate.

LANL concurs. Please see response to comment #13. The use of the OVA as a screening tool during site surveys did not "screen-out" sample locations, it is used primarily as a Health and Safety screen. Sample locations were determined based on guidance from the SAP, and additional sample locations would have been selected if VOCs were detected at sites. Field screening using the OVA during sample collection was performed on the disturbed soil material immediately upon retrieval from the sampling equipment. If VOCs were detected, samples would have been collected for VOC analyses.

No. 23 4.3.3 Screening Assessment for Aggregate N, p. 4-27:

The text indicates that the analytical data quality evaluation revealed several problems that affect the screening assessment for aggregate N. LANL shall collect additional samples at those sample locations in question.

LANL concurs. A phase II sampling plan will be prepared to address radiological contamination and the referenced data quality issues associated with Aggregate N (please see comment response No. 24). Please note that the data quality associated with the XRF results for nickel (former waste line 37, sample nos. 48-2027 through 48-2036) did not impact the screening assessment. Also, it is important to note that the results of confirmation samples, the samples sent to external analytic laboratories, for the outfall for former waste line 37 (Sample Nos. N48-2027, N48-2036), indicate Ni concentration at <2 ppm. See #24 below.

No. 24 4.3.3 Constituents Identified as Potential COCs, p. 4-30:

The presence of contaminants has been established at depths of 6 to 7.4 feet at the site of Line 38. The report indicates the single borehole is insufficient to determine the extent of contamination. Additional borings should be conducted to define the extent of contamination. LANL shall submit a schedule for submitting additional sampling plans for this location along with a field schedule for the sampling.

LANL concurs. A phase II sampling and analysis plan (SAP) will be prepared that supports the objective to determine the extent of contamination associated with the former waste line 38 at Aggregate N. This new data will also be used to validate the Phase I results where data quality impacted its usability for decision purposes. This SAP will address all sampling requirements identified by this NOD. The planned date for submitting a draft Phase II SAP for EPA and NMED review and comment is October 30, 1996. Allowing for a 30-day regulator review period, implementation will occur following DOE approval and consideration of regulator comments.

No. 25 Constituents not Identified as Potential COCs, p. 4-31

a. Although no PAH compounds exceeded their EQL, the fact that SALs were exceeded may require an evaluation of the PAH relative potency factors, in addition to the potential cumulative effects of the benzidine and nitrosoamine concentrations.

b. The fact that "no evidence exists that lithium was associated with the acid waste lines" does not justify discontinuing further evaluation of this compound. Explain the significance of this concentration (7.3 ppm) at this location.

a. Potency factors for PAHs based on the carcinogenicity of benzo(a)pyrene form the basis of the SAL values for other PAHs including benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. The reporting limits for these SALs is a function of the GC-mass spectrometry method used for their analyses. The source material for PAHs in the environment is generally a petroleum hydrocarbon product and therefore multiple PAHs, and often associated VOCs, are detected in the same sample along with undifferentiated organic compounds such as alkanes and alkenes. No evidence of other PAHs or VOCs was observed in Aggregate N samples. If a PAH release had occurred at Aggregate N data for these carcinogenic PAHs, and for other PAHs and VOCs for which detection limits are below SALs, would show evidence of the release.

b. Please see response to Comment # 21.

No. 26 4.3.4 Conclusions and Recommendations for Aggregate N, p. 4-34:

The text indicates that "..it is recommended that final disposition of PRS No. 48-005 be deferred until later when the TA-48 facilities are decommissioned." Please define "later".

The wording in the text did not provide a specific decommissioning date. The TA-48 facilities are still in use and no plans currently exist for decommissioning of the buildings or the TA-48 site. The current long-term engineering facility plan shows this facility in use for another 30 years. The phase II sample and analysis plan (SAP) involved in resolving comment No. 24 will also include sampling of the former waste lines in PRS No. 48-005, both inside and outside the fence.

No. 27 4.4 Aggregate X, p. 4-35:

a. Nearly all of the PRSs in Aggregate X are currently paved with asphalt, however no historical account of the paving is provided. Historical aerials should be reviewed to determine potential sampling locations.

Please refer to Figure 4-5, page 4-38, in the RFI Report for the following response:

Review of a 1974 aerial photo indicates that the area from the west border of Figure 4-5 extending to the dashed line (fence) east of building 15 was paved with the exception of the area directly beneath buildings 17 and 31. All buildings present in Figure 4-5 were not present in the 1974 photo, and soil and grass is visible in the unpaved area beneath the present location of buildings 17 and 31. Aerial photos from 1986 indicate that by that time the area beneath buildings 17 and 31 had been paved and all buildings represented in Figure 4-5 are present. Aerial photos from 1991 provide the first photographic evidence of the large paved area (TA-48-45 parking lot) shown in the center of Figure 4-5. As described in 4.4.1 Previous Investigations for Aggregate X on page 4-35 of the RFI Report, sampling was conducted in this area prior to paving during a 1990 reconnaissance survey for the proposed parking lot.

PRS 48-002(e) is located in an area which was paved in the 1974 aerial photo. As described in Deviations from the Work Plan on page 4-36 of the RFI Report, subsurface sample 48-2037 was collected from an isolated area of exposed soil which is most likely a remnant from the unpaved area which existed previously beneath the present location of building 17. The sample was collected to identify potential infiltration of contaminants in an unpaved area; the results of which, along with the results from surface sample 48-2057, are summarized in Figure 4-5. In addition, seven surface and five subsurface samples were collected from the unpaved area that is now the TA-48-45 parking lot as part of the previously mentioned 1990 reconnaissance survey. As described in 4.4.1 Previous Investigations for Aggregate X on page 4-35 of the RFI Report, no

significant concentrations of organic, inorganic, or radiological constituents were identified.

The conceptual model for Aggregate X on which the selection of sample locations was based is supported by the historical account of paving as indicated by aerial photos from 1974, 1986, and 1991, and also by the results of the reconnaissance survey sampling event conducted in 1990.

b. As previously stated, an OVA should not be relied on to locate surface soil contamination.

LANL concurs. Please see comment responses #13 and #22 .

No. 28 - 4.3.3 Screening Assessment for Aggregate X, p. 4-40:

The text indicates that samples from locations 48-2037 and 48-2057 were "lost in analysis". Are additional samples anticipated to be collected from these locations? LANL shall provide a timeframe for the collection of additional samples.

Please see response to comment #24 for the schedule.

No. 29. 4.4.3.3 Risk Assessment, p. 4-46

Explain why the human health or ecological risk assessment was not performed at Aggregate X.

As discussed in Section 4.4.4 of Chapter 4.0 of the TA-48 RFI Report, a human health risk assessment was not performed because the maximum concentrations of COPCs were not significantly elevated above SALs and the SAL values, which are based on a residential exposure scenario, are highly conservative in their application to Aggregate X considering the small area of the PRSs and the industrial land use characteristics of the site. However, as described in Comment Response 16, the radiological data obtained from the mobile laboratory facility are no longer considered adequate to support the screening assessments in the TA-48 RFI Report. Therefore, as for the other PRS aggregates in the report, conclusions and recommendations based on mobile laboratory radiological data should be disregarded. Ecological risk assessments are not performed for individual PRSs, as discussed in Comment Response 17.

No. 30 Data Interpretation, p. 4-45:

Radionuclides and manganese are confirmed COCs at PRS 48-007 (a and b) and 48-010. The extent of contamination in the water and soil media at the outfalls and the wetland in Aggregate X have not been established.

Manganese exceeds the action level (drinking water standard) in the wetland. Have New Mexico groundwater discharge standards been considered prior to recommending NFA for these PRSs?

As stated in this NOD response, further characterization of PRS Nos. 48-007(a and b) and 48-010 is required to determine the maximum levels of potential COCs and establish the lateral and vertical extent and distribution of contamination at the outfalls and wetland. As discussed in Comment Responses 16 and 29, radionuclide data for TA-48 are no longer considered adequate to support the screening assessment process. Pending correction of the radionuclide data and submission of an addendum to the TA-48 RFI Report, no conclusions based on mobile laboratory radiological data are valid.

A sampling and analysis plan (SAP) will be prepared (please see response to comment #24) that supports the objective of initially confirming those radiological COCs that are based on mobile lab facility results. Subsequently, the extent of contamination will be determined, if necessary, for these PRSs.

Manganese was detected in a water sample at a concentration of 590 µg/L, approximately three times above the health-based SAL value of 180 µg/L and the New Mexico groundwater standard of 200 µg/L. Because the small wetland created by the NPDES outfalls at Aggregate X cannot feasibly be considered a potential source of drinking water, application of these water quality criteria to the surface water sample data was not considered appropriate beyond a cursory screening. As discussed in Section 4.4.4 of Chapter 4.0 of the TA-48 RFI Report, a Class III permit modification is sought despite the fact that the extent of contamination has not been well defined because the NPDES outfalls [PRS Nos. 49-007(a and d)] that are the prominent source of contamination for PRS No. 48-010 are regulated under an authority outside the HSWA module of the Laboratory's RCRA operating permit.

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Environmental Restoration Program
Los Alamos, New Mexico 87544
505-667-7203/FAX 505-665-4504

Date: October 17, 1996
Refer to: EM/ER:96-533

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

SUBJECT: RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION FOR TA-48 RFI REPORT

Dear Mr. Garcia:

Enclosed are two copies of the Los Alamos National Laboratory's response to the New Mexico Environment Department's (NMED's) request for additional information for Technical Area (TA) 48, Resource Conservation and Recovery Act Facility Investigation Report, Solid Waste Management Units 48-001, 48-002(e), 48-003, 48-005, 48-007(a, b, c, d, and f), and 48-010. A certification form signed by the appropriate officials is also enclosed.

In the original response to the Notice of Deficiency for TA-48, we said that we would send a sampling and analysis plan to NMED by October 30, 1996. However, in light of recent agreements with NMED, we will have internal review only prior to implementing the activities. NMED will be informed of the activities as the work progresses via the monthly reports.

Please contact Allyn Pratt at (505) 667-4308 or Bob Simeone at (505) 667-0587 if you have any questions regarding the response.

Sincerely,

Jorg Jansen, Program Manager
LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JJ/TT/bp

Enclosures: (1) Response to Request for Additional Information for TA-48 RFI Report
(2) Certification

The University of California is an Equal Opportunity Employer

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K. Zamora, LAAO, MS A316

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION FOR TECHNICAL AREA 48 RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT

No. 1

Ecological Risk Assessments will need to be conducted for these SWMUs following the approach which has been agreed to by the NMED and the EPA.

Further ecological risk assessment at this site will be conducted following the ecological risk assessment methodology currently being implemented by Los Alamos National Laboratory (LANL). A sampling and analysis plan (SAP) for Technical Area 48 is being prepared as committed in the May 1996 response to the original notice of deficiency (NOD). Although the ecological risk assessment methodology will not have been fully implemented when the SAP is written, LANL ecologists will participate in designing the SAP to ensure that data required to address ecological concerns are collected.

No. 2

SWMU 48-005: LANL shall conduct sampling for waste line 36 which was not done in conjunction with the other lines. LANL should include this area with the other sampling plans to be submitted in October 30, 1996, or LANL shall provide a schedule for submittal of this work plan within thirty days of receipt of this letter.

Field Unit 4 will include sampling of waste line 36 with the SAP for other abandoned waste lines in SWMU 48-005 (waste lines 34, 37, and 38). A release of contaminated water from waste line 36 is known to have occurred in 1982 at the northwest corner of building TA-48-1 (Emelity 1982, 797). Investigation of residual soil contamination in the area of the reported release will be addressed in the forthcoming SAP.

No. 3

In the NOD Response No. 30, LANL indicates that these sites are regulated under the NPDES program. While the discharge from these outfalls may fall under NPDES program, this program does not address corrective action or require cleanups of problem areas. Therefore, these sites do not meet the requirements for no further action. Analysis should be conducted for organics and inorganics in future sampling as analysis for these constituents was extremely limited during Phase I sampling.

The Environmental Restoration (ER) Project does not consider an outfall to be a potential release site if the outfall is subject to regulation under Section 402 of the Clean Water Act as a point source discharge because the wastewater discharge is not a solid waste (40 CFR 261.4[a][2]). Also, the Clean Water Act and the Resource Conservation and Recovery Act cannot have duplicative authority over the same material. However, the ER Project does consider outfalls to be potential release sites if they were active before the Clean Water Act was passed because at that time no regulations existed to govern wastewater discharges to the environment.

Because the outfall at SWMU 48-007(d) was active before the Clean Water Act was passed, a SAP for SWMUs 48-007(a and d) and 48-010 is being prepared to address historical contamination (as committed in the May 1996 response to the original NOD). In accordance with the original NOD response, radionuclide contaminants will be further characterized. In addition, analysis for organics and inorganics will be addressed in the SAP.

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: Response To Request For Additional Information For TA-48 RFI Report

Name: _____ Date: 10-17-96

Jorg Jansen, Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

or

Tom Baca, Program Director
Environmental Management
Los Alamos National Laboratory

Name: _____ Date: 10/17/96

Joseph Vozella,
Acting Assistant Area Manager of
Environment Projects
Environment, Safety, and Health Branch
DOE-Los Alamos Area Office

or

Theodore J. Taylor
Program Manager
Environment Restoration Program
DOE-Los Alamos Area Office

Attachment II

Data Tables

TABLE AII-1

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS No. 48-001*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Am-241	Ce-144	Co-60	Cs-137	Pu-238
SAL	N/A	N/A	N/A	22	56	1.1	5.1	27
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	N.A.
48-2001	AAA3445	0–0.5	Soil	0.027	0.128	-0.317	0.401	0.019
48-2002	AAA3448	0–0.5	Soil	0.023	0.316	-0.323	0.202	0.018
48-2002	AAA3476	0–0.5	Soil	0.018	NA	NA	NA	0.013
48-2002	AAA3449	0.5–1	Soil	0.022	0.126	-0.296	0.0476	0.011
48-2003	AAA3451	0–0.5	Soil	0.024	0.0904	-0.365	0.0536	0.003
48-2003	AAA3452	0.5–1	Soil	0.038	0.0928	-0.327	0.649	0.034
48-2004	AAA3454	0–0.7	Soil	0.017	0.202	-0.354	0.0873	0.019
48-2005	AAA3457	0–0.2	Soil	0.019	0.458	-0.327	1.62	0.017

Part 2

Location ID	Sample ID	Depth (ft)	Media	Pu-239,240	Ru-106	Th-228	Th-230
SAL	N/A	N/A	N/A	24	13	1.7	0.18
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.
48-2001	AAA3445	0–0.5	Soil	0.078	-0.797	0.883 J-	0.651 J-
48-2002	AAA3448	0–0.5	Soil	0.455	-0.638	0.619 J-	0.576 J-
48-2002	AAA3476	0–0.5	Soil	0.055	NA	0.889	0.851
48-2002	AAA3449	0.5–1	Soil	0.046	-0.607	1.019 J-	0.729 J-
48-2003	AAA3451	0–0.5	Soil	0.992	-1.54	1.165 J-	1.057 J-
48-2003	AAA3452	0.5–1	Soil	0.096	-0.682	0.662 J-	0.576 J-
48-2004	AAA3454	0–0.7	Soil	0.943	-1.05	0.957	0.579
48-2005	AAA3457	0–0.2	Soil	0.106	-1.07	0.918	0.714

Part 3

Location ID	Sample ID	Depth (ft)	Media	Th-232	U-234	U-235	U-238
SAL	N/A	N/A	N/A	0.77	13	10	67
All-soils UTL	N/A	N/A	N/A	N.A.	1.94	0.084	1.82
48-2001	AAA3445	0–0.5	Soil	1.075 J-	0.987	0.035 J-	1.082
48-2002	AAA3448	0–0.5	Soil	0.874 J-	0.947 J-	0.041 J-	0.916 J-
48-2002	AAA3476	0–0.5	Soil	1.058	0.932	0.068 J-	1.03
48-2002	AAA3449	0.5–1	Soil	1.263 J-	0.747	0.026 J-	0.752
48-2003	AAA3451	0–0.5	Soil	1.445 J-	0.967	0.036 J-	0.993
48-2003	AAA3452	0.5–1	Soil	0.846 J-	1.75	0.069 J-	2.0
48-2004	AAA3454	0–0.7	Soil	0.921	0.917	0.044 J-	0.999
48-2005	AAA3457	0–0.2	Soil	1.01	2.42	0.077 J-	2.77

*pCi/g

TABLE AII-2

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS No. 48-002(e)*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Am-241	Ce-144	Co-60	Cs-137	Pu-238
SAL	N/A	N/A	N/A	22	56	1.1	5.1	27
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	N.A.
48-2037	AAA3545	0–0.5	Soil	-0.0101	<.486	<.209	<.257	0.169
48-2037	AAA3546	0.5–1.5	Soil	-0.0579	NA	NA	NA	-0.0451
48-2037	AAA3547	1.5–3	Soil	-0.338	NA	NA	NA	0.317
48-2057	AAA3782	0–0.5	Soil	0.197	NA	NA	NA	0.0754

Part 2

Location ID	Sample ID	Depth (ft)	Media	Pu-239,240	Ru-106	Th-228	Th-230
SAL	N/A	N/A	N/A	24	13	1.7	0.18
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.
48-2037	AAA3545	0–0.5	Soil	0.39	<1.38	1.09	1.72 J+
48-2037	AAA3546	0.5–1.5	Soil	-0.148	NA	1.47	1.75 J+
48-2037	AAA3547	1.5–3	Soil	0.128	NA	1.85	3.07 J+
48-2057	AAA3782	0–0.5	Soil	0.258	NA	1.0	1.80 J+

Part 3

Location ID	Sample ID	Depth (ft)	Media	Th-232	U-234	U-235	U-238
SAL	N/A	N/A	N/A	0.77	13	10	67
All-soils UTL	N/A	N/A	N/A	N.A.	1.94	0.084	1.82
48-2037	AAA3545	0–0.5	Soil	1.58	1.46	0.0927	1.5
48-2037	AAA3546	0.5–1.5	Soil	1.06	1.18	0.199	1.37
48-2037	AAA3547	1.5–3	Soil	0.672	1.04	-0.168	0.951
48-2057	AAA3782	0–0.5	Soil	1.03	1.21	0.111	1.35

*pCi/g

TABLE AII-3

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Ag	Al	As	As (XRF)	Ba	Ba (XRF)
SAL	N/A	N/A	N/A	383	77000	N.A.	N.A.	5300	5300
All-soils UTL	N/A	N/A	N/A	N.A.	38700	7.82	18.1	315	561
48-2010	AAA3401	4–5	Qbt3	<1	1900	0.6	<10	18	159
48-2010	AAA3416	4–5	Qbt3	<1	2100	0.6	NA	17	NA
48-2010	AAA3402	8.5–9.5	Qbt3	NA	NA	NA	<10	NA	201
48-2010	AAA3403	14–15	Qbt3	NA	NA	NA	<10	NA	161
48-2011	AAA4449	1.7–3.7	Soil	NA	NA	NA	<10	NA	282
48-2011	AAA4450	7–8	Qbt3	<1	28000	4.7	<10	86	206
48-2011	AAA4461	7–8	Qbt3	<1	20000	3.5	NA	80	NA
48-2011	AAA4451	11–12	Qbt3	NA	NA	NA	<10	NA	203
48-2011	AAA3542	14–15	Qbt3	NA	NA	NA	<10	NA	154
48-2012	AAA3404	4–5	Qbt3	NA	NA	NA	<10	NA	188
48-2012	AAA3405	9–10	Qbt3	NA	NA	NA	<10	NA	147
48-2012	AAA3406	14–15	Qbt3	NA	NA	NA	<10	NA	116
48-2012	AAA3412	14–15	Qbt3	NA	NA	NA	<10	NA	159
48-2013	AAA4452	2.5–3.8	Soil	NA	NA	NA	<10	NA	282
48-2013	AAA4465	2.5–3.8	Soil	NA	NA	NA	<10	NA	144
48-2013	AAA4453	9–10	Qbt3	NA	NA	NA	<10	NA	317
48-2013	AAA4454	14–15	Qbt3	<1	970	0.7	<10	22	135
48-2014	AAA3407	4–5	Qbt3	NA	NA	NA	<10	NA	235
48-2014	AAA3408	7–7.2	Qbt3	<1	3100	1.4	<10	34	189
48-2014	AAA3409	9–10	Qbt3	NA	NA	NA	<10	NA	164
48-2014	AAA4473	14–15	Qbt3	NA	NA	NA	<10	NA	396
48-2015	AAA4455	0.5–1.5	Soil	NA	NA	NA	<10	NA	146
48-2015	AAA4456	4–5	Qbt3	NA	NA	NA	<10	NA	146
48-2015	AAA4457	9–10	Qbt3	NA	NA	NA	<10	NA	131
48-2015	AAA3543	14–15	Qbt3	NA	NA	NA	<10	NA	161
48-2016	AAA3493	0–0.5	Soil	NA	NA	NA	<10	NA	252
48-2017	AAA3494	0–0.5	Soil	<1	3500	2.0	<10	56	276
48-2017	AAA3502	0–0.5	Soil	<1	3700	2.5	NA	60	NA
48-2018	AAA3495	0–0.5	Soil	NA	NA	NA	<10	NA	262
48-2019	AAA3496	0–0.5	Soil	NA	NA	NA	<10	NA	219
48-2020	AAA3497	0–0.5	Soil	NA	NA	NA	<10	NA	599
48-2020	AAA3499	0–0.5	Soil	NA	NA	NA	<10	NA	580
48-2054	AAA3512	0–0.5	Soil	<1	1600	0.8	<10	40	680
48-2054	AAA3514	0.5–1.5	Soil	NA	NA	NA	<10	NA	512
48-2054	AAA3515	1.5–2.5	Soil	NA	NA	NA	<10	NA	433
48-2055	AAA3513	0–0.5	Soil	NA	NA	NA	<10	NA	326
48-2055	AAA3516	0.5–1.5	Soil	NA	NA	NA	<10	NA	523
48-2055	AAA3470	1.5–2.5	Soil	NA	NA	NA	<10	NA	547
48-2055	AAA3471	2.5–3.5	Soil	NA	NA	NA	<10	NA	476

*mg/kg

TABLE AII-3 (continued)

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Be	Ca	Ca (XRF)	Cd	Cd (XRF)	Co
SAL	N/A	N/A	N/A	N.A.	N.A.	N.A.	38	38	4600
All-soils UTL	N/A	N/A	N/A	1.95	6120	10900	2.7	N.A.	19.2
48-2010	AAA3401	4–5	Qbt3	0.84	570	1900	<.4	<10	<.5
48-2010	AAA3416	4–5	Qbt3	0.80	470	NA	<.4	NA	0.6
48-2010	AAA3402	8.5–9.5	Qbt3	NA	NA	2500	NA	<10	NA
48-2010	AAA3403	14–15	Qbt3	NA	NA	1700	NA	<10	NA
48-2011	AAA4449	1.7–3.7	Soil	NA	NA	3300	NA	<10	NA
48-2011	AAA4450	7–8	Qbt3	2.2	3600	6000	<.4	<10	4.0
48-2011	AAA4461	7–8	Qbt3	2.1	3500	NA	<.4	NA	3.6
48-2011	AAA4451	11–12	Qbt3	NA	NA	4400	NA	<10	NA
48-2011	AAA3542	14–15	Qbt3	NA	NA	2100	NA	<10	NA
48-2012	AAA3404	4–5	Qbt3	NA	NA	2500	NA	<10	NA
48-2012	AAA3405	9–10	Qbt3	NA	NA	1800	NA	<10	NA
48-2012	AAA3406	14–15	Qbt3	NA	NA	1800	NA	<10	NA
48-2012	AAA3412	14–15	Qbt3	NA	NA	1900	NA	<10	NA
48-2013	AAA4452	2.5–3.8	Soil	NA	NA	4800	NA	<10	NA
48-2013	AAA4465	2.5–3.8	Soil	NA	NA	3500	NA	<10	NA
48-2013	AAA4453	9–10	Qbt3	NA	NA	5100	NA	<10	NA
48-2013	AAA4454	14–15	Qbt3	0.31	390	1700	<.4	<10	1.7
48-2014	AAA3407	4–5	Qbt3	NA	NA	3700	NA	<10	NA
48-2014	AAA3408	7–7.2	Qbt3	0.68	660	2200	<.4	<10	1.0
48-2014	AAA3409	9–10	Qbt3	NA	NA	1700	NA	<10	NA
48-2014	AAA4473	14–15	Qbt3	NA	NA	2000	NA	<10	NA
48-2015	AAA4455	0.5–1.5	Soil	NA	NA	2000	NA	<10	NA
48-2015	AAA4456	4–5	Qbt3	NA	NA	2200	NA	<10	NA
48-2015	AAA4457	9–10	Qbt3	NA	NA	2200	NA	<10	NA
48-2015	AAA3543	14–15	Qbt3	NA	NA	1800	NA	<10	NA
48-2016	AAA3493	0–0.5	Soil	NA	NA	6100	NA	<10	NA
48-2017	AAA3494	0–0.5	Soil	0.41	3900	9000	<.4	<10	1.4
48-2017	AAA3502	0–0.5	Soil	0.47	2300	NA	<.4	NA	1.0
48-2018	AAA3495	0–0.5	Soil	NA	NA	11500	NA	<10	NA
48-2019	AAA3496	0–0.5	Soil	NA	NA	8100	NA	<10	NA
48-2020	AAA3497	0–0.5	Soil	NA	NA	9700	NA	<10	NA
48-2020	AAA3499	0–0.5	Soil	NA	NA	10200	NA	<10	NA
48-2054	AAA3512	0–0.5	Soil	0.16	1900	13000	<.4	<10	1.6
48-2054	AAA3514	0.5–1.5	Soil	NA	NA	10600	NA	<10	NA
48-2054	AAA3515	1.5–2.5	Soil	NA	NA	7800	NA	<10	NA
48-2055	AAA3513	0–0.5	Soil	NA	NA	6500	NA	<10	NA
48-2055	AAA3516	0.5–1.5	Soil	NA	NA	8300	NA	<10	NA
48-2055	AAA3470	1.5–2.5	Soil	NA	NA	8700	NA	<10	NA
48-2055	AAA3471	2.5–3.5	Soil	NA	NA	7300	NA	<10	NA

*mg/kg

TABLE AII-3 (continued)

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Cr	Cr (XRF)	Cu	Cu (XRF)	Fe	Fe (XRF)
SAL	N/A	N/A	N/A	210	210	2800	2800	N.A.	N.A.
All-soils UTL	N/A	N/A	N/A	19.3	45.1	15.5	16.7	21300	27400
48-2010	AAA3401	4–5	Qbt3	23	<10	3.0	<10	6200	9500
48-2010	AAA3416	4–5	Qbt3	25	NA	2.9	NA	6300	NA
48-2010	AAA3402	8.5–9.5	Qbt3	NA	<10	NA	<10	NA	13200
48-2010	AAA3403	14–15	Qbt3	NA	<10	NA	<10	NA	9000
48-2011	AAA4449	1.7–3.7	Soil	NA	<10	NA	<10	NA	11200
48-2011	AAA4450	7–8	Qbt3	14	22	8.7	16	21000	29900
48-2011	AAA4461	7–8	Qbt3	9.7	NA	7.4	NA	17000	NA
48-2011	AAA4451	11–12	Qbt3	NA	23	NA	<10	NA	19000
48-2011	AAA3542	14–15	Qbt3	NA	17	NA	<10	NA	10700
48-2012	AAA3404	4–5	Qbt3	NA	<10	NA	<10	NA	11700
48-2012	AAA3405	9–10	Qbt3	NA	<10	NA	11	NA	8800
48-2012	AAA3406	14–15	Qbt3	NA	<10	NA	<10	NA	13500
48-2012	AAA3412	14–15	Qbt3	NA	<10	NA	<10	NA	11900
48-2013	AAA4452	2.5–3.8	Soil	NA	15	NA	<10	NA	12300
48-2013	AAA4465	2.5–3.8	Soil	NA	<10	NA	14	NA	14300
48-2013	AAA4453	9–10	Qbt3	NA	21	NA	19	NA	22700
48-2013	AAA4454	14–15	Qbt3	2.5	<10	<.6	<10	5700	8700
48-2014	AAA3407	4–5	Qbt3	NA	<10	NA	13	NA	12000
48-2014	AAA3408	7–7.2	Qbt3	180	<10	7.3	<10	6300	12700
48-2014	AAA3409	9–10	Qbt3	NA	<10	NA	10	NA	8500
48-2014	AAA4473	14–15	Qbt3	NA	<10	NA	<10	NA	10900
48-2015	AAA4455	0.5–1.5	Soil	NA	<10	NA	<10	NA	10300
48-2015	AAA4456	4–5	Qbt3	NA	17	NA	<10	NA	11100
48-2015	AAA4457	9–10	Qbt3	NA	<10	NA	11	NA	9600
48-2015	AAA3543	14–15	Qbt3	NA	10	NA	<10	NA	8900
48-2016	AAA3493	0–0.5	Soil	NA	<10	NA	<10	NA	19800
48-2017	AAA3494	0–0.5	Soil	6.0	<10	4.0	<10	6600	19800
48-2017	AAA3502	0–0.5	Soil	2.2	NA	3.1	NA	6700	NA
48-2018	AAA3495	0–0.5	Soil	NA	<10	NA	22	NA	23400
48-2019	AAA3496	0–0.5	Soil	NA	36	NA	17	NA	21500
48-2020	AAA3497	0–0.5	Soil	NA	20	NA	11	NA	20900
48-2020	AAA3499	0–0.5	Soil	NA	21	NA	14	NA	18600
48-2054	AAA3512	0–0.5	Soil	4.5	<10	5.1	<10	4900	19100
48-2054	AAA3514	0.5–1.5	Soil	NA	30	NA	15	NA	19600
48-2054	AAA3515	1.5–2.5	Soil	NA	17	NA	17	NA	19500
48-2055	AAA3513	0–0.5	Soil	NA	<10	NA	<10	NA	18000
48-2055	AAA3516	0.5–1.5	Soil	NA	<10	NA	15	NA	17500
48-2055	AAA3470	1.5–2.5	Soil	NA	<10	NA	12	NA	18700
48-2055	AAA3471	2.5–3.5	Soil	NA	21	NA	17	NA	18700

*mg/kg

TABLE AII-3 (continued)

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Hg (XRF)	K	[illegible]RF)	Li	Mg	Mn
SAL	N/A	N/A	N/A	23	N.A.	[illegible] A.	1500	N.A.	N.A.
All-soils UTL	N/A	N/A	N/A	N.A.	3410	38700	N.A.	4610	714
48-2010	AAA3401	4–5	Qbt3	<10	160	32200	2.6	380	240
48-2010	AAA3416	4–5	Qbt3	NA	270	NA	1.9	380	230
48-2010	AAA3402	8.5–9.5	Qbt3	<10	NA	29500	NA	NA	NA
48-2010	AAA3403	14–15	Qbt3	<10	NA	32500	NA	NA	NA
48-2011	AAA4449	1.7–3.7	Soil	<10	NA	29400	NA	NA	NA
48-2011	AAA4450	7–8	Qbt3	<10	2300	22500	20	3500	110
48-2011	AAA4461	7–8	Qbt3	NA	1800	NA	16	2600	100
48-2011	AAA4451	11–12	Qbt3	<10	NA	28200	NA	NA	NA
48-2011	AAA3542	14–15	Qbt3	<10	NA	30900	NA	NA	NA
48-2012	AAA3404	4–5	Qbt3	<10	NA	31400	NA	NA	NA
48-2012	AAA3405	9–10	Qbt3	<10	NA	31800	NA	NA	NA
48-2012	AAA3406	14–15	Qbt3	<10	NA	32100	NA	NA	NA
48-2012	AAA3412	14–15	Qbt3	<10	NA	32100	NA	NA	NA
48-2013	AAA4452	2.5–3.8	Soil	<10	NA	30000	NA	NA	NA
48-2013	AAA4465	2.5–3.8	Soil	<10	NA	31600	NA	NA	NA
48-2013	AAA4453	9–10	Qbt3	<10	NA	25100	NA	NA	NA
48-2013	AAA4454	14–15	Qbt3	<10	250	30800	1.4	270	260
48-2014	AAA3407	4–5	Qbt3	<10	NA	30700	NA	NA	NA
48-2014	AAA3408	7–7.2	Qbt3	<10	280	30900	2.4	450	250
48-2014	AAA3409	9–10	Qbt3	<10	NA	32400	NA	NA	NA
48-2014	AAA4473	14–15	Qbt3	<10	NA	31900	NA	NA	NA
48-2015	AAA4455	0.5–1.5	Soil	<10	NA	31300	NA	NA	NA
48-2015	AAA4456	4–5	Qbt3	<10	NA	31900	NA	NA	NA
48-2015	AAA4457	9–10	Qbt3	<10	NA	33600	NA	NA	NA
48-2015	AAA3543	14–15	Qbt3	<10	NA	32400	NA	NA	NA
48-2016	AAA3493	0–0.5	Soil	<10	NA	46200	NA	NA	NA
48-2017	AAA3494	0–0.5	Soil	<10	630	43300	3.6	1000	230
48-2017	AAA3502	0–0.5	Soil	NA	570	NA	4.0	800	350
48-2018	AAA3495	0–0.5	Soil	<10	NA	41700	NA	NA	NA
48-2019	AAA3496	0–0.5	Soil	<10	NA	43900	NA	NA	NA
48-2020	AAA3497	0–0.5	Soil	<10	NA	34800	NA	NA	NA
48-2020	AAA3499	0–0.5	Soil	<10	NA	33400	NA	NA	NA
48-2054	AAA3512	0–0.5	Soil	<10	280	31100	3.0	970	100
48-2054	AAA3514	0.5–1.5	Soil	<10	NA	36100	NA	NA	NA
48-2054	AAA3515	1.5–2.5	Soil	<10	NA	38200	NA	NA	NA
48-2055	AAA3513	0–0.5	Soil	<10	NA	37900	NA	NA	NA
48-2055	AAA3516	0.5–1.5	Soil	<10	NA	33900	NA	NA	NA
48-2055	AAA3470	1.5–2.5	Soil	<10	NA	34600	NA	NA	NA
48-2055	AAA3471	2.5–3.5	Soil	<10	NA	37500	NA	NA	NA

*mg/kg

TABLE AII-3 (continued)

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Mn (XRF)	Mo	Na	Ni	Ni (XRF)	Pb
SAL	N/A	N/A	N/A	N.A.	380	N.A.	1500	1500	400
All-soils UTL	N/A	N/A	N/A	681	N.A.	915	15.2	22.5	23.3
48-2010	AAA3401	4–5	Qbt3	365	1.7	55	8.5	<10	2
48-2010	AAA3416	4–5	Qbt3	NA	1.6	57	9.3	NA	7
48-2010	AAA3402	8.5–9.5	Qbt3	429	NA	NA	NA	<10	NA
48-2010	AAA3403	14–15	Qbt3	330	NA	NA	NA	<10	NA
48-2011	AAA4449	1.7–3.7	Soil	254	NA	NA	NA	<10	NA
48-2011	AAA4450	7–8	Qbt3	145	<1	180	10.0	10	13
48-2011	AAA4461	7–8	Qbt3	NA	<1	150	7.0	NA	10
48-2011	AAA4451	11–12	Qbt3	616	NA	NA	NA	<10	NA
48-2011	AAA3542	14–15	Qbt3	245	NA	NA	NA	<10	NA
48-2012	AAA3404	4–5	Qbt3	269	NA	NA	NA	<10	NA
48-2012	AAA3405	9–10	Qbt3	241	NA	NA	NA	<10	NA
48-2012	AAA3406	14–15	Qbt3	212	NA	NA	NA	<10	NA
48-2012	AAA3412	14–15	Qbt3	209	NA	NA	NA	<10	NA
48-2013	AAA4452	2.5–3.8	Soil	310	NA	NA	NA	<10	NA
48-2013	AAA4465	2.5–3.8	Soil	340	NA	NA	NA	<10	NA
48-2013	AAA4453	9–10	Qbt3	481	NA	NA	NA	<10	NA
48-2013	AAA4454	14–15	Qbt3	352	<1	81	<2	<10	7
48-2014	AAA3407	4–5	Qbt3	323	NA	NA	NA	10	NA
48-2014	AAA3408	7–7.2	Qbt3	604	6.2	73	52.0	<10	9
48-2014	AAA3409	9–10	Qbt3	294	NA	NA	NA	<10	NA
48-2014	AAA4473	14–15	Qbt3	346	NA	NA	NA	<10	NA
48-2015	AAA4455	0.5–1.5	Soil	341	NA	NA	NA	<10	NA
48-2015	AAA4456	4–5	Qbt3	349	NA	NA	NA	<10	NA
48-2015	AAA4457	9–10	Qbt3	354	NA	NA	NA	<10	NA
48-2015	AAA3543	14–15	Qbt3	332	NA	NA	NA	<10	NA
48-2016	AAA3493	0–0.5	Soil	571	NA	NA	NA	<10	NA
48-2017	AAA3494	0–0.5	Soil	597	<1	65	9.0	<10	11
48-2017	AAA3502	0–0.5	Soil	NA	<1	52	5.0	NA	11
48-2018	AAA3495	0–0.5	Soil	951	NA	NA	NA	<10	NA
48-2019	AAA3496	0–0.5	Soil	666	NA	NA	NA	<10	NA
48-2020	AAA3497	0–0.5	Soil	473	NA	NA	NA	<10	NA
48-2020	AAA3499	0–0.5	Soil	441	NA	NA	NA	16	NA
48-2054	AAA3512	0–0.5	Soil	431	<1	69	9.0	<10	6
48-2054	AAA3514	0.5–1.5	Soil	474	NA	NA	NA	<10	NA
48-2054	AAA3515	1.5–2.5	Soil	477	NA	NA	NA	<10	NA
48-2055	AAA3513	0–0.5	Soil	448	NA	NA	NA	11	NA
48-2055	AAA3516	0.5–1.5	Soil	369	NA	NA	NA	<10	NA
48-2055	AAA3470	1.5–2.5	Soil	431	NA	NA	NA	<10	NA
48-2055	AAA3471	2.5–3.5	Soil	385	NA	NA	NA	<10	NA

*mg/kg

TABLE AII-3 (continued)

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Pb (XRF)	Sb	Sb (XRF)	Se	Se (XRF)	Sr
SAL	N/A	N/A	N/A	400	31	31	380	380	46000
All-soils UTL	N/A	N/A	N/A	28.4	N.A.	1.45	1.7	N.A.	N.A.
48-2010	AAA3401	4–5	Qbt3	14	<.06	<10	<.2	<10	2.9
48-2010	AAA3416	4–5	Qbt3	NA	<.06	NA	<.2	NA	3.0
48-2010	AAA3402	8.5–9.5	Qbt3	15	NA	<10	NA	<10	NA
48-2010	AAA3403	14–15	Qbt3	16	NA	<10	NA	<10	NA
48-2011	AAA4449	1.7–3.7	Soil	<10	NA	<10	NA	<10	NA
48-2011	AAA4450	7–8	Qbt3	21	<.08	<10	<.2	<10	21.0
48-2011	AAA4461	7–8	Qbt3	NA	<.08	NA	<.2	NA	20.0
48-2011	AAA4451	11–12	Qbt3	14	NA	<10	NA	<10	NA
48-2011	AAA3542	14–15	Qbt3	12	NA	<10	NA	<10	NA
48-2012	AAA3404	4–5	Qbt3	11	NA	<10	NA	<10	NA
48-2012	AAA3405	9–10	Qbt3	14	NA	<10	NA	<10	NA
48-2012	AAA3406	14–15	Qbt3	<10	NA	<10	NA	<10	NA
48-2012	AAA3412	14–15	Qbt3	10	NA	<10	NA	<10	NA
48-2013	AAA4452	2.5–3.8	Soil	15	NA	<10	NA	<10	NA
48-2013	AAA4465	2.5–3.8	Soil	16	NA	<10	NA	<10	NA
48-2013	AAA4453	9–10	Qbt3	21	NA	<10	NA	<10	NA
48-2013	AAA4454	14–15	Qbt3	11	<.08	<10	<.2	<10	2.4
48-2014	AAA3407	4–5	Qbt3	15	NA	<10	NA	<10	NA
48-2014	AAA3408	7–7.2	Qbt3	<10	<.06	<10	<.2	<10	3.5
48-2014	AAA3409	9–10	Qbt3	10	NA	<10	NA	<10	NA
48-2014	AAA4473	14–15	Qbt3	<10	NA	<10	NA	<10	NA
48-2015	AAA4455	0.5–1.5	Soil	11	NA	<10	NA	<10	NA
48-2015	AAA4456	4–5	Qbt3	11	NA	<10	NA	<10	NA
48-2015	AAA4457	9–10	Qbt3	12	NA	<10	NA	<10	NA
48-2015	AAA3543	14–15	Qbt3	18	NA	<10	NA	<10	NA
48-2016	AAA3493	0–0.5	Soil	24	NA	<10	NA	<10	NA
48-2017	AAA3494	0–0.5	Soil	19	<.08	<10	<.2	<10	20.0
48-2017	AAA3502	0–0.5	Soil	NA	<.08	NA	<.2	NA	13.0
48-2018	AAA3495	0–0.5	Soil	25	NA	<10	NA	<10	NA
48-2019	AAA3496	0–0.5	Soil	41	NA	<10	NA	<10	NA
48-2020	AAA3497	0–0.5	Soil	16	NA	<10	NA	<10	NA
48-2020	AAA3499	0–0.5	Soil	17	NA	<10	NA	<10	NA
48-2054	AAA3512	0–0.5	Soil	17	0.085	<10	<.2	<10	8.3
48-2054	AAA3514	0.5–1.5	Soil	20	NA	<10	NA	<10	NA
48-2054	AAA3515	1.5–2.5	Soil	18	NA	<10	NA	<10	NA
48-2055	AAA3513	0–0.5	Soil	18	NA	<10	NA	<10	NA
48-2055	AAA3516	0.5–1.5	Soil	19	NA	<10	NA	<10	NA
48-2055	AAA3470	1.5–2.5	Soil	18	NA	<10	NA	<10	NA
48-2055	AAA3471	2.5–3.5	Soil	17	NA	<10	NA	<10	NA

*mg/kg

TABLE AII-3 (continued)

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Th (XRF)	Tl (XRF)	Tl	U (XRF)	V	Zn	Zn (XRF)
SAL	N/A	N/A	N/A	N.A.	N.A.	N.A.	230	540	23000	23000
All-soils UTL	N/A	N/A	N/A	22.1	N.A.	1	5.33	41.9	50.8	76.6
48-2010	AAA3401	4–5	Qbt3	14	569	<.02	<10	3.4	32	29
48-2010	AAA3416	4–5	Qbt3	NA	NA	<.02	NA	3.0	33	NA
48-2010	AAA3402	8.5–9.5	Qbt3	17	705	NA	<10	NA	NA	65
48-2010	AAA3403	14–15	Qbt3	18	560	NA	<10	NA	NA	31
48-2011	AAA4449	1.7–3.7	Soil	<10	781	NA	<10	NA	NA	29
48-2011	AAA4450	7–8	Qbt3	22	1556	0.18	<10	23.0	42	47
48-2011	AAA4461	7–8	Qbt3	NA	NA	0.15	NA	17.0	34	NA
48-2011	AAA4451	11–12	Qbt3	16	971	NA	<10	NA	NA	35
48-2011	AAA3542	14–15	Qbt3	16	668	NA	<10	NA	NA	30
48-2012	AAA3404	4–5	Qbt3	14	695	NA	<10	NA	NA	34
48-2012	AAA3405	9–10	Qbt3	17	542	NA	<10	NA	NA	28
48-2012	AAA3406	14–15	Qbt3	10	599	NA	<10	NA	NA	25
48-2012	AAA3412	14–15	Qbt3	16	609	NA	10	NA	NA	18
48-2013	AAA4452	2.5–3.8	Soil	17	951	NA	<10	NA	NA	51
48-2013	AAA4465	2.5–3.8	Soil	20	867	NA	<10	NA	NA	49
48-2013	AAA4453	9–10	Qbt3	18	1272	NA	<10	NA	NA	43
48-2013	AAA4454	14–15	Qbt3	13	552	<.06	<10	2.5	26	24
48-2014	AAA3407	4–5	Qbt3	16	830	NA	<10	NA	NA	33
48-2014	AAA3408	7–7.2	Qbt3	20	696	0.08	<10	5.1	38	58
48-2014	AAA3409	9–10	Qbt3	17	540	NA	<10	NA	NA	31
48-2014	AAA4473	14–15	Qbt3	15	684	NA	<10	NA	NA	32
48-2015	AAA4455	0.5–1.5	Soil	11	631	NA	<10	NA	NA	29
48-2015	AAA4456	4–5	Qbt3	14	667	NA	<10	NA	NA	38
48-2015	AAA4457	9–10	Qbt3	16	587	NA	<10	NA	NA	32
48-2015	AAA3543	14–15	Qbt3	21	567	NA	<10	NA	NA	28
48-2016	AAA3493	0–0.5	Soil	<10	1596	NA	<10	NA	NA	44
48-2017	AAA3494	0–0.5	Soil	11	1626	<.06	<10	9.0	89	35
48-2017	AAA3502	0–0.5	Soil	NA	NA	<.06	NA	7.4	41	NA
48-2018	AAA3495	0–0.5	Soil	14	2017	NA	<10	NA	NA	83
48-2019	AAA3496	0–0.5	Soil	<10	2132	NA	13	NA	NA	59
48-2020	AAA3497	0–0.5	Soil	<10	2771	NA	<10	NA	NA	60
48-2020	AAA3499	0–0.5	Soil	<10	2182	NA	<10	NA	NA	90
48-2054	AAA3512	0–0.5	Soil	<10	2599	<.06	<10	11.0	160	34
48-2054	AAA3514	0.5–1.5	Soil	<10	2469	NA	<10	NA	NA	45
48-2054	AAA3515	1.5–2.5	Soil	<10	2006	NA	<10	NA	NA	36
48-2055	AAA3513	0–0.5	Soil	14	1591	NA	<10	NA	NA	37
48-2055	AAA3516	0.5–1.5	Soil	<10	2082	NA	<10	NA	NA	30
48-2055	AAA3470	1.5–2.5	Soil	<10	2225	NA	<10	NA	NA	35
48-2055	AAA3471	2.5–3.5	Soil	<10	2035	NA	<10	NA	NA	31

*mg/kg

TABLE AII-4

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Am-241	Ce-144	Co-60	Cs-137	Pu-238	Pu-239, 240
SAL	N/A	N/A	N/A	22	56	1.1	5.1	27	24
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
48-2010	AAA3401	4–5	Qbt3	0.148	NA	NA	NA	0.009	0.005
48-2010	AAA3402	8.5–9.5	Qbt3	-0.084	NA	NA	NA	0.011	0.001
48-2010	AAA3403	14–15	Qbt3	-0.017	0.048	0.026	0.009	0.009	0.011
48-2010	AAA3410	14–15	Qbt3	-0.011	-0.031	-0.071	-0.04	0.011	0.001
48-2011	AAA4449	1.7–3.7	Soil	0.024	-1.14	0.013	0.278	0.044	0.087
48-2011	AAA4459	1.7–3.7	Soil	NA	-0.56	0.0411	0.167	0.041	0.077
48-2011	AAA4450	7–8	Qbt3	0.007	NA	NA	NA	0.096	0.103
48-2011	AAA4451	9–10	Qbt3	0.002	NA	NA	NA	0.055	0.326
48-2011	AAA3542	14–15	Qbt3	0.005	NA	NA	NA	0.027	0.292
48-2012	AAA3404	4–5	Qbt3	-0.092	0.16	-0.025	0.075	0.005	0.009
48-2012	AAA3405	9–10	Qbt3	-0.046	NA	NA	NA	0.002	0.001
48-2012	AAA3406	14–15	Qbt3	-0.019	NA	NA	NA	0.002	0.005
48-2013	AAA4452	2.5–3.8	Soil	0.008	NA	NA	NA	0.058	0.069
48-2013	AAA4453	9–10	Qbt3	0.001	-1.1	0.0111	0.0874	0.114	0.09
48-2013	AAA4454	14–15	Qbt3	0.01	NA	NA	NA	0.023	0.117
48-2014	AAA3407	4–5	Qbt3	0.073	NA	NA	NA	0.007	0.045
48-2014	AAA3408	7.0–7.2	Qbt3	-0.085	NA	NA	NA	0.092	0.001
48-2014	AAA3409	9–10	Qbt3	0.001	NA	NA	NA	0.277	0.002
48-2014	AAA4473	14–15	Qbt3	0.025	NA	NA	NA	0.002	0.002
48-2015	AAA4455	0.5–1.5	Soil	0.009	NA	NA	NA	0.081	0.059
48-2015	AAA4456	4–5	Qbt3	0.003	NA	NA	NA	0.021	0.008
48-2015	AAA4457	9–10	Qbt3	0.011	NA	NA	NA	0.006	0.1
48-2015	AAA3543	14–15	Qbt3	0.002	NA	NA	NA	0.0	0.014
48-2016	AAA3493	0–0.5	Soil	-0.03	<.6115	<.1947	0.4976	0.0204	0.0456
48-2017	AAA3494	0–0.5	Soil	-0.0212	<.5268	<.2677	0.6634	-0.0047	0.0234
48-2018	AAA3495	0–0.5	Soil	-0.0442	<.6492	<.1813	0.7439	-0.0053	0.0373
48-2018	AAA3501	0–0.5	Soil	0.022	<.517	<.2364	0.7424	0.0106	0.066
48-2019	AAA3496	0–0.5	Soil	0.153	<.8559	<.3	2.549	0.0957	0.941
48-2020	AAA3497	0–0.5	Soil	1.16	<.4349	<.1419	0.5148	0.162	6.4
48-2054	AAA3512	0–0.5	Soil	0.545	<.5688	<.2368	0.2296	0.0594	2.08
48-2054	AAA3514	0.5–1.5	Soil	0.292	NA	NA	NA	0.053	1.74
48-2054	AAA3515	1.5–2.5	Soil	0.601	NA	NA	NA	0.0667	0.935
48-2055	AAA3513	0–0.5	Soil	0.213	<.594	<.1789	<.2699	-0.126	0.339
48-2055	AAA3516	0.5–1.5	Soil	0.291	NA	NA	NA	0.0815	3.15
48-2055	AAA3470	1.5–2.5	Soil	0.713	NA	NA	NA	0.0921	2.74
48-2055	AAA3471	2.5–3.5	Soil	0.337	NA	NA	NA	0.0081	1.16

*pCi/g

TABLE AII-4 (continued)

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS No. 48-003*

Location ID	Sample ID	Depth (ft)	Media	Ru-106	Th-228	Th-230	Th-232	U-234	U-235	U-238
SAL	N/A	N/A	N/A	13	1.7	0.18	0.77	13	10	67
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	1.94	0.084	1.82
48-2010	AAA3401	4–5	Qbt3	NA	1.077	0.631	1.02	0.676	0.036	0.599
48-2010	AAA3402	8.5–9.5	Qbt3	NA	1.038	0.568	1.009	0.653	0.045	0.613
48-2010	AAA3403	14–15	Qbt3	-0.121	1.002	0.646	0.984	0.689	0.041	0.685
48-2010	AAA3410	14–15	Qbt3	0.191	1.171	0.703	1.095	0.752	0.032	0.64
48-2011	AAA4449	1.7–3.7	Soil	-0.894	1.072	0.616	1.159	0.629 J-	0.031 J-	0.733 J-
48-2011	AAA4459	1.7–3.7	Soil	-1.15	0.798	0.472	0.832	0.613	0.031	0.697
48-2011	AAA4450	7–8	Qbt3	NA	1.287	0.652	1.19	0.443	0.031	0.491
48-2011	AAA4451	9–10	Qbt3	NA	1.077	0.616	1.086	0.6 J-	0.031 J-	0.597 J-
48-2011	AAA3542	14–15	Qbt3	NA	1.09	0.596	1.105	0.608 J-	-0.006 J-	0.501 J-
48-2012	AAA3404	4–5	Qbt3	-0.072	1.018	0.586	0.986	0.685	0.032	0.689
48-2012	AAA3405	9–10	Qbt3	NA	0.98	0.574	1.036	0.581	0.059	0.622
48-2012	AAA3406	14–15	Qbt3	NA	0.977	0.581	1.032	0.631	0.036	0.761
48-2013	AAA4452	2.5–3.8	Soil	NA	0.963	0.586	1.002	0.633 J-	-0.005 J-	0.646 J-
48-2013	AAA4453	9–10	Qbt3	-0.988	0.849	0.444	0.925	0.616 J-	0.1 J-	0.588 J-
48-2013	AAA4454	14–15	Qbt3	NA	0.796	0.515	0.966	0.435	0.03	0.427
48-2014	AAA3407	4–5	Qbt3	NA	0.955	0.577	0.932	0.712	0.054	0.685
48-2014	AAA3408	7.0–7.2	Qbt3	NA	1.056	0.568	0.964	0.658	0.014	0.586
48-2014	AAA3409	9–10	Qbt3	NA	1.261	0.568	1.095	0.644	0.036	0.694
48-2014	AAA4473	14–15	Qbt3	NA	0.991	0.604	1.041	0.667	0.045	0.739
48-2015	AAA4455	0.5–1.5	Soil	NA	1.049	0.52	0.976	0.587	0.011	0.552
48-2015	AAA4456	4–5	Qbt3	NA	0.897	0.543	1.053	0.508 J-	0.023 J-	0.487 J-
48-2015	AAA4457	9–10	Qbt3	NA	0.918	0.625	1.067	0.535 J-	0.013 J-	0.506 J-
48-2015	AAA3543	14–15	Qbt3	NA	0.783	0.589	0.922	0.57 J-	0.011 J-	0.547 J-
48-2016	AAA3493	0–0.5	Soil	<1.217	0.974 J-	0.685 J-	0.921 J-	1.33	0.105	1.46
48-2017	AAA3494	0–0.5	Soil	<1.342	1.52 J-	1.27 J-	1.15 J-	1.56	0.112	2.18
48-2018	AAA3495	0–0.5	Soil	<.9786	1.48 J-	0.958 J-	1.2 J-	1.95	0.147	1.91
48-2018	AAA3501	0–0.5	Soil	<1.175	1.03 J-	1.04 J-	0.97 J-	1.82	0.06	1.96
48-2019	AAA3496	0–0.5	Soil	<2.034	1.44 J-	1.69 J-	1.37 J-	3.48	0.167	3.97
48-2020	AAA3497	0–0.5	Soil	<1.419	1.42 J-	1.31 J-	1.47 J-	2.23	0.258	1.76
48-2054	AAA3512	0–0.5	Soil	<1.311	1.49 J-	1.01 J-	1.25 J-	2.14	0.403	1.99
48-2054	AAA3514	0.5–1.5	Soil	NA	1.36 J-	1.05 J-	1.28 J-	3.02	0.32	2.93
48-2054	AAA3515	1.5–2.5	Soil	NA	1.92 J-	2.35 J-	1.61 J-	1.75	0.122	1.74
48-2055	AAA3513	0–0.5	Soil	<1.023	1.44 J-	1.48 J-	1.28 J-	1.34	0.0548	1.19
48-2055	AAA3516	0.5–1.5	Soil	NA	1.38 J-	1.35 J-	1.29 J-	2.1	0.1	1.53
48-2055	AAA3470	1.5–2.5	Soil	NA	1.42 J-	1.02 J-	1.13 J-	6.63	0.373	5.64
48-2055	AAA3471	2.5–3.5	Soil	NA	1.37 J-	1.23 J-	0.752 J-	1.95	0.105	1.62

*pCi/g

TABLE AII-5

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 34*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Acetone	Ag	Al	As	As (XRF)	Ba
SAL	N/A	N/A	N/A	2000	383	77000	N.A.	N.A.	5300
All-soils UTL	N/A	N/A	N/A	N/A	N.A.	38700	2.82	18.1	315
48-2021	AAA3693	2.5–3.7	Soil	ND	NA	NA	NA	<10	NA
48-2021	AAA3708	2.5–3.7	Soil	0.047	NA	NA	NA	NA	NA
48-2021	AAA3694	9–10	Qbt3	ND	NA	NA	NA	<10	NA
48-2021	AAA3709	9–10	Qbt3	NA	NA	NA	NA	<10	NA
48-2021	AAA3695	14–15	Qbt3	ND	<1	2700	0.8	<10	20
48-2022	AAA3696	4–5	Qbt3	ND	NA	NA	NA	<10	NA
48-2022	AAA3697	9–10	Qbt3	ND	NA	NA	NA	<10	NA
48-2022	AAA3703	9–10	Qbt3	0.029	NA	NA	NA	NA	NA
48-2022	AAA3698	14–15	Qbt3	ND	NA	NA	NA	<10	NA
48-2023	AAA3699	4–5	Qbt3	0.032	<1	10000	3.1	<10	72
48-2023	AAA3711	4–5	Qbt3	NA	<1	7200	2.7	NA	53
48-2023	AAA3700	9–10	Qbt3	ND	NA	NA	NA	<10	NA
48-2023	AAA3701	14–15	Qbt3	ND	NA	NA	NA	<10	NA
48-2067	AAA3803	4.47–5	Soil	ND	NA	NA	NA	<4	NA
48-2067	AAA3804	6.4–7	Soil	ND	NA	NA	NA	<4	NA
48-2068	AAA3806	7–8	Soil	ND	NA	NA	NA	<4	NA
48-2069	AAA3810	2.5–3	Soil	ND	NA	NA	NA	<4	NA
48-2069	AAA3811	5.5–7	Soil	ND	NA	NA	NA	<4	NA

Part 2

Location ID	Sample ID	Depth (ft)	Media	Ba (XRF)	Be	Ca	Ca (XRF)	Cd	Cd (XRF)
SAL	N/A	N/A	N/A	5300	N.A.	N.A.	N.A.	38	38
All-soils UTL	N/A	N/A	N/A	561	1.95	6120	10900	2.7	N.A.
48-2021	AAA3693	2.5–3.7	Soil	504	NA	NA	4500	NA	<10
48-2021	AAA3708	2.5–3.7	Soil	NA	NA	NA	NA	NA	NA
48-2021	AAA3694	9–10	Qbt3	153	NA	NA	1900	NA	<10
48-2021	AAA3709	9–10	Qbt3	141	NA	NA	2200	NA	<10
48-2021	AAA3695	14–15	Qbt3	155	0.49	610	2300	<.4	<10
48-2022	AAA3696	4–5	Qbt3	186	NA	NA	2500	NA	<10
48-2022	AAA3697	9–10	Qbt3	116	NA	NA	1900	NA	<10
48-2022	AAA3703	9–10	Qbt3	NA	NA	NA	NA	NA	NA
48-2022	AAA3698	14–15	Qbt3	156	NA	NA	2300	NA	<10
48-2023	AAA3699	4–5	Qbt3	180	0.91	2200	6200	<.4	<10
48-2023	AAA3711	4–5	Qbt3	NA	0.83	2100	NA	<.4	NA
48-2023	AAA3700	9–10	Qbt3	203	NA	NA	6700	NA	<10
48-2023	AAA3701	14–15	Qbt3	138	NA	NA	2600	NA	<10
48-2067	AAA3803	4.47–5	Soil	702	NA	NA	7100	NA	<3
48-2067	AAA3804	6.4–7	Soil	203	NA	NA	5300	NA	<3
48-2068	AAA3806	7–8	Soil	460	NA	NA	5100	NA	<3
48-2069	AAA3810	2.5–3	Soil	510	NA	NA	6100	NA	<3
48-2069	AAA3811	5.5–7	Soil	286	NA	NA	4600	NA	<3

*mg/kg

TABLE AII-5 (continued)

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 34*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Co	Cr	Cr (XRF)	Cu	Cu (XRF)	Fe
SAL	N/A	N/A	N/A	4600	210	210	2800	2800	N.A.
All-soils UTL	N/A	N/A	N/A	19.2	19.3	45.1	15.5	16.7	21300
48-2021	AAA3693	2.5–3.7	Soil	NA	NA	16	NA	<10	NA
48-2021	AAA3708	2.5–3.7	Soil	NA	NA	NA	NA	NA	NA
48-2021	AAA3694	9–10	Qbt3	NA	NA	<10	NA	<10	NA
48-2021	AAA3709	9–10	Qbt3	NA	NA	<10	NA	<10	NA
48-2021	AAA3695	14–15	Qbt3	<1	2.8	10	1.2	<10	5800
48-2022	AAA3696	4–5	Qbt3	NA	NA	<10	NA	<10	NA
48-2022	AAA3697	9–10	Qbt3	NA	NA	<10	NA	<10	NA
48-2022	AAA3703	9–10	Qbt3	NA	NA	NA	NA	NA	NA
48-2022	AAA3698	14–15	Qbt3	NA	NA	<10	NA	<10	NA
48-2023	AAA3699	4–5	Qbt3	2.9	5.5	<10	1.2	<10	12000
48-2023	AAA3711	4–5	Qbt3	1.2	4.0	NA	1.2	NA	9700
48-2023	AAA3700	9–10	Qbt3	NA	NA	<10	NA	<10	NA
48-2023	AAA3701	14–15	Qbt3	NA	NA	<10	NA	<10	NA
48-2067	AAA3803	4.47–5	Soil	NA	NA	20	NA	<8	NA
48-2067	AAA3804	6.4–7	Soil	NA	NA	<13	NA	<8	NA
48-2068	AAA3806	7–8	Soil	NA	NA	<13	NA	<8	NA
48-2069	AAA3810	2.5–3	Soil	NA	NA	<13	NA	<8	NA
48-2069	AAA3811	5.5–7	Soil	NA	NA	<13	NA	<8	NA

Part 2

Location ID	Sample ID	Depth (ft)	Media	Fe (XRF)	Hg (XRF)	K	K (XRF)	Li	Mg
SAL	N/A	N/A	N/A	N.A.	23	N.A.	N.A.	1500	N.A.
All-soils UTL	N/A	N/A	N/A	27400	N.A.	3410	38700	N.A.	4610
48-2021	AAA3693	2.5–3.7	Soil	17200	<10	NA	25100	NA	NA
48-2021	AAA3708	2.5–3.7	Soil	NA	NA	NA	NA	NA	NA
48-2021	AAA3694	9–10	Qbt3	9100	<10	NA	32300	NA	NA
48-2021	AAA3709	9–10	Qbt3	9700	<10	NA	33000	NA	NA
48-2021	AAA3695	14–15	Qbt3	11300	<10	350	31600	2.8	520
48-2022	AAA3696	4–5	Qbt3	13500	<10	NA	32400	NA	NA
48-2022	AAA3697	9–10	Qbt3	9400	<10	NA	32500	NA	NA
48-2022	AAA3703	9–10	Qbt3	NA	NA	NA	NA	NA	NA
48-2022	AAA3698	14–15	Qbt3	11100	<10	NA	32200	NA	NA
48-2023	AAA3699	4–5	Qbt3	23600	<10	1200	28900	7.3	1700
48-2023	AAA3711	4–5	Qbt3	NA	NA	850	NA	5.4	1300
48-2023	AAA3700	9–10	Qbt3	14900	<10	NA	31100	NA	NA
48-2023	AAA3701	14–15	Qbt3	12000	<10	NA	31100	NA	NA
48-2067	AAA3803	4.47–5	Soil	23200	<5	NA	20500	NA	NA
48-2067	AAA3804	6.4–7	Soil	14700	<5	NA	31500	NA	NA
48-2068	AAA3806	7–8	Soil	16700	<5	NA	26000	NA	NA
48-2069	AAA3810	2.5–3	Soil	18600	<5	NA	26600	NA	NA
48-2069	AAA3811	5.5–7	Soil	11800	<5	NA	30500	NA	NA

*mg/kg

TABLE AII-5 (continued)

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 34*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Mn	Mn (XRF)	Mo	Na	Ni	Ni (XRF)
SAL	N/A	N/A	N/A	N.A.	N.A.	380	N.A.	1500	1500
All-soils UTL	N/A	N/A	N/A	714	681	N.A.	915	15.2	22.5
48-2021	AAA3693	2.5–3.7	Soil	NA	320	NA	NA	NA	<10
48-2021	AAA3708	2.5–3.7	Soil	NA	NA	NA	NA	NA	NA
48-2021	AAA3694	9–10	Qbt3	NA	315	NA	NA	NA	<10
48-2021	AAA3709	9–10	Qbt3	NA	334	NA	NA	NA	<10
48-2021	AAA3695	14–15	Qbt3	200	322	<1	160	<2	<10
48-2022	AAA3696	4–5	Qbt3	NA	363	NA	NA	NA	<10
48-2022	AAA3697	9–10	Qbt3	NA	322	NA	NA	NA	<10
48-2022	AAA3703	9–10	Qbt3	NA	NA	NA	NA	NA	NA
48-2022	AAA3698	14–15	Qbt3	NA	333	NA	NA	NA	<10
48-2023	AAA3699	4–5	Qbt3	270	171	<1	170	7	<10
48-2023	AAA3711	4–5	Qbt3	190	NA	<1	150	5	NA
48-2023	AAA3700	9–10	Qbt3	NA	485	NA	NA	NA	<10
48-2023	AAA3701	14–15	Qbt3	NA	247	NA	NA	NA	<10
48-2067	AAA3803	4.47–5	Soil	NA	624	NA	NA	NA	<13
48-2067	AAA3804	6.4–7	Soil	NA	<16	NA	NA	NA	<13
48-2068	AAA3806	7–8	Soil	NA	491	NA	NA	NA	<13
48-2069	AAA3810	2.5–3	Soil	NA	466	NA	NA	NA	<13
48-2069	AAA3811	5.5–7	Soil	NA	360	NA	NA	NA	<13

Part 2

Location ID	Sample ID	Depth (ft)	Media	Pb	Pb (XRF)	Sb	Sb (XRF)	Se	Se (XRF)	Sr
SAL	N/A	N/A	N/A	400	400	31	31	380	380	46000
All-soils UTL	N/A	N/A	N/A	23.3	28.4	N.A.	1.45	1.7	N.A.	N.A.
48-2021	AAA3693	2.5–3.7	Soil	NA	22	NA	<10	NA	<10	NA
48-2021	AAA3708	2.5–3.7	Soil	NA	NA	NA	NA	NA	NA	NA
48-2021	AAA3694	9–10	Qbt3	NA	12	NA	<10	NA	<10	NA
48-2021	AAA3709	9–10	Qbt3	NA	14	NA	<10	NA	<10	NA
48-2021	AAA3695	14–15	Qbt3	<4	<10	<.08	<10	0.4	<10	5.9
48-2022	AAA3696	4–5	Qbt3	NA	18	NA	<10	NA	<10	NA
48-2022	AAA3697	9–10	Qbt3	NA	13	NA	<10	NA	<10	NA
48-2022	AAA3703	9–10	Qbt3	NA	NA	NA	NA	NA	NA	NA
48-2022	AAA3698	14–15	Qbt3	NA	11	NA	<10	NA	<10	NA
48-2023	AAA3699	4–5	Qbt3	12	17	<.08	<10	0.6	<10	17
48-2023	AAA3711	4–5	Qbt3	11	NA	<.60	NA	<.2	NA	16
48-2023	AAA3700	9–10	Qbt3	NA	11	NA	<10	NA	<10	NA
48-2023	AAA3701	14–15	Qbt3	NA	17	NA	<10	NA	<10	NA
48-2067	AAA3803	4.47–5	Soil	NA	22	NA	5	NA	<4	NA
48-2067	AAA3804	6.4–7	Soil	NA	15	NA	<4	NA	<4	NA
48-2068	AAA3806	7–8	Soil	NA	14	NA	7	NA	<4	NA
48-2069	AAA3810	2.5–3	Soil	NA	18	NA	7	NA	<4	NA
48-2069	AAA3811	5.5–7	Soil	NA	15	NA	<4	NA	<4	NA

*mg/kg

TABLE AII-5 (continued)

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 34*

Location ID	Sample ID	Depth (ft)	Media	Th (XRF)	Ti (XRF)	Tl	U (XRF)	V	Zn	Zn (XRF)
SAL	N/A	N/A	N/A	N.A.	N.A.	N.A.	230	540	23000	23000
All-soils UTL	N/A	N/A	N/A	22.1	N.A.	1	5.33	41.9	50.8	76.6
48-2021	AAA3693	2.5–3.7	Soil	15	2389	NA	<10	NA	NA	30
48-2021	AAA3708	2.5–3.7	Soil	NA	NA	NA	NA	NA	NA	NA
48-2021	AAA3694	9–10	Qbt3	11	574	NA	<10	NA	NA	35
48-2021	AAA3709	9–10	Qbt3	15	646	NA	<10	NA	NA	32
48-2021	AAA3695	14–15	Qbt3	<10	631	<.04	<10	3.6	33	41
48-2022	AAA3696	4–5	Qbt3	21	839	NA	<10	NA	NA	42
48-2022	AAA3697	9–10	Qbt3	18	593	NA	10	NA	NA	34
48-2022	AAA3703	9–10	Qbt3	NA	NA	NA	NA	NA	NA	NA
48-2022	AAA3698	14–15	Qbt3	11	699	NA	<10	NA	NA	40
48-2023	AAA3699	4–5	Qbt3	16	1322	<.04	<10	11.0	34	34
48-2023	AAA3711	4–5	Qbt3	NA	NA	<.20	NA	8.9	29	NA
48-2023	AAA3700	9–10	Qbt3	18	821	NA	<10	NA	NA	41
48-2023	AAA3701	14–15	Qbt3	17	769	NA	<10	NA	NA	32
48-2067	AAA3803	4.47–5	Soil	11	3840	NA	<8	NA	NA	32
48-2067	AAA3804	6.4–7	Soil	14	<10	NA	<8	NA	NA	38
48-2068	AAA3806	7–8	Soil	10	2410	NA	<8	NA	NA	36
48-2069	AAA3810	2.5–3	Soil	14	2440	NA	<8	NA	NA	39
48-2069	AAA3811	5.5–7	Soil	<8	1110	NA	<8	NA	NA	33

*mg/kg

TABLE AII-6

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS No. 48-005, LINE 34*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Am-241	Ce-144	Co-60	Cs-137	Pu-238	Pu-239,240
SAL	N/A	N/A	N/A	22	56	1.1	5.1	27	24
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
48-2021	AAA3693	2.5–3.7	Soil	-0.001	0.125	0.0487	0.0357	0.005	0.02
48-2021	AAA3712	2.5–3.7	Qbt3	0.007	0.222	0.0795	0.0123	0.008	0.076
48-2021	AAA3694	9–10	Qbt3	-0.002	NA	NA	NA	0.005	0.081
48-2021	AAA3695	14–15	Qbt3	0.007	NA	NA	NA	0.005	0.014
48-2022	AAA3696	4–5	Qbt3	0.004	NA	NA	NA	-0.007	0.005
48-2022	AAA3697	9–10	Qbt3	0.005	NA	NA	NA	0.0	0.073
48-2022	AAA3698	14–15	Qbt3	-0.004	NA	NA	NA	-0.001	0.041
48-2023	AAA3699	4–5	Qbt3	0.005	NA	NA	NA	0.0	0.136
48-2023	AAA3700	9–10	Qbt3	0.007	0.303	0.0203	0.0129	0.001	0.03
48-2023	AAA3701	14–15	Qbt3	-0.011	NA	NA	NA	0.002	0.029
48-2067	AAA3803	4.47–5	Soil	0.0 R	NA	NA	NA	0.0186	0.0037
48-2067	AAA3804	6.4–7	Soil	-0.0066 R	NA	NA	NA	0.0095	0.0
48-2068	AAA3806	7–8	Soil	0.049 R	NA	NA	NA	0.0348	0.0056
48-2069	AAA3810	2.5–3	Soil	0.0 J-	0.0	<.0578	<.0479	0.0088	0.0
48-2069	AAA3811	5.5–7	Soil	-0.0189 J-	NA	NA	NA	0.0111	0.0009

Part 2

Location ID	Sample ID	Depth (ft)	Media	Ru-106	Th-228	Th-230	Th-232	U-234	U-235	U-238
SAL	N/A	N/A	N/A	13	1.7	0.18	0.77	13	10	67
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	1.94	0.084	1.82
48-2021	AAA3693	2.5–3.7	Soil	0.241	0.196	0.162	0.235	0.667	0.024	0.656
48-2021	AAA3712	2.5–3.7	Qbt3	0.462	0.922	0.759	1.103	0.668	0.041	0.751
48-2021	AAA3694	9–10	Qbt3	NA	0.922	0.631	1.134	0.594	0.04	0.613
48-2021	AAA3695	14–15	Qbt3	NA	0.804	0.587	1.01	0.474	0.02	0.497
48-2022	AAA3696	4–5	Qbt3	NA	0.791	0.549	0.909	0.501	0.014	0.491
48-2022	AAA3697	9–10	Qbt3	NA	0.746	0.493	0.916	0.454	0.043	0.48
48-2022	AAA3698	14–15	Qbt3	NA	0.919	0.618	1.126	0.629	0.012	0.504
48-2023	AAA3699	4–5	Qbt3	NA	0.906	0.664	1.18	0.554	0.023	0.548
48-2023	AAA3700	9–10	Qbt3	0.0279	0.807	0.575	0.964	0.545	0.026	0.502
48-2023	AAA3701	14–15	Qbt3	NA	0.887	0.621	1.083	0.555	0.017	0.6
48-2067	AAA3803	4.47–5	Soil	NA	1.58	1.51 J-	1.48	0.913	0.0447	1.02
48-2067	AAA3804	6.4–7	Soil	NA	1.14	0.888 J-	1.17	0.579	0.0363	0.706
48-2068	AAA3806	7–8	Soil	NA	1.08	1.19 J-	1.36	0.777	0.019	0.777
48-2069	AAA3810	2.5–3	Soil	0.0	1.5	1.1 J-	1.28	0.65	0.0547	0.705
48-2069	AAA3811	5.5–7	Soil	NA	1.01	0.661 J-	0.95	0.579	0.0217	0.64

*pCi/g

TABLE AII-7

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 37*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Acetone	Ag	Al	As	As (XRF)	Ba
SAL	N/A	N/A	N/A	2000	383	77000	N.A.	N.A.	5300
All-soils UTL	N/A	N/A	N/A	N/A	N.A.	38700	7.82	18.1	315
48-2024	AAA3717	4–5	Soil	ND	NA	NA	NA	<10	NA
48-2024	AAA3718	8–9	Soil	ND	NA	NA	NA	<10	NA
48-2024	AAA3719	14–15	Qbt3	ND	NA	NA	NA	<10	NA
48-2025	AAA3720	4–5	Soil	0.042	NA	NA	NA	<10	NA
48-2025	AAA3721	5.5–6.5	Soil	ND	<1	5900	1.1	<10	63
48-2025	AAA4481	5.5–6.5	Soil	0.054	NA	NA	NA	NA	NA
48-2025	AAA4482	5.5–6.5	Soil	NA	<1	5800	1.2	NA	47
48-2025	AAA3722	7.5–8.5	Soil	0.200	NA	NA	NA	<10	NA
48-2025	AAA4475	9–10	Soil	0.050	NA	NA	NA	<10	NA
48-2025	AAA4476	13–14	Qbt3	0.025	NA	NA	NA	<10	NA
48-2027	AAA3429	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2028	AAA3430	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2029	AAA3431	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2030	AAA3432	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2030	AAA3440	0–0.5	Soil	NA	NA	NA	NA	<4	NA
48-2031	AAA3433	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2032	AAA3434	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2033	AAA3435	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2034	AAA3436	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2035	AAA3437	0–0.5	Soil	NA	NA	NA	NA	<10	NA
48-2036	AAA3438	0–0.5	Soil	NA	NA	NA	NA	<10	NA

Part 2

Location ID	Sample ID	Depth (ft)	Media	Ba (XRF)	Be	2-Butanone	Ca	Ca (XRF)	Cd
SAL	N/A	N/A	N/A	5300	N.A.	8700	N.A.	N.A.	38
All-soils UTL	N/A	N/A	N/A	561	1.95	N/A	6120	10900	2.7
48-2024	AAA3717	4–5	Soil	356	NA	ND	NA	4600	NA
48-2024	AAA3718	8–9	Soil	332	NA	ND	NA	4400	NA
48-2024	AAA3719	14–15	Qbt3	143	NA	ND	NA	2100	NA
48-2025	AAA3720	4–5	Soil	290	NA	ND	NA	4200	NA
48-2025	AAA3721	5.5–6.5	Soil	266	0.54	ND	1100	3900	<.4
48-2025	AAA4481	5.5–6.5	Soil	NA	NA	ND	NA	NA	NA
48-2025	AAA4482	5.5–6.5	Soil	NA	0.50	NA	1100	NA	<.4
48-2025	AAA3722	7.5–8.5	Soil	425	NA	0.053	NA	5100	NA
48-2025	AAA4475	9–10	Soil	160	NA	ND	NA	1900	NA
48-2025	AAA4476	13–14	Qbt3	139	NA	ND	NA	2200	NA
48-2027	AAA3429	0–0.5	Soil	204	NA	NA	NA	5900	NA
48-2028	AAA3430	0–0.5	Soil	454	NA	NA	NA	58000	NA
48-2029	AAA3431	0–0.5	Soil	215	NA	NA	NA	5900	NA
48-2030	AAA3432	0–0.5	Soil	416	NA	NA	NA	10900	NA
48-2030	AAA3440	0–0.5	Soil	400	NA	NA	NA	7900	NA
48-2031	AAA3433	0–0.5	Soil	346	NA	NA	NA	9400	NA
48-2032	AAA3434	0–0.5	Soil	225	NA	NA	NA	6500	NA
48-2033	AAA3435	0–0.5	Soil	231	NA	NA	NA	7100	NA
48-2034	AAA3436	0–0.5	Soil	284	NA	NA	NA	6400	NA
48-2035	AAA3437	0–0.5	Soil	279	NA	NA	NA	7000	NA
48-2036	AAA3438	0–0.5	Soil	400	NA	NA	NA	7600	NA

*mg/kg

TABLE AII-7 (continued)

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 37*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Cd (XRF)	Co	Cr	Cr (XRF)	Cu	Cu (XRF)
SAL	N/A	N/A	N/A	38	4600	210	210	2800	2800
All-soils UTL	N/A	N/A	N/A	N.A.	19.2	19.3	45.1	15.5	16.7
48-2024	AAA3717	4–5	Soil	<10	NA	NA	12	NA	13
48-2024	AAA3718	8–9	Soil	<10	NA	NA	10	NA	<10
48-2024	AAA3719	14–15	Qbt3	<10	NA	NA	14	NA	<10
48-2025	AAA3720	4–5	Soil	<10	NA	NA	10	NA	<10
48-2025	AAA3721	5.5–6.5	Soil	<10	4.0	3.0	12	10.0	16
48-2025	AAA4481	5.5–6.5	Soil	NA	NA	NA	NA	NA	NA
48-2025	AAA4482	5.5–6.5	Soil	NA	1.9	3.8	NA	5.2	NA
48-2025	AAA3722	7.5–8.5	Soil	<10	NA	NA	39	NA	<10
48-2025	AAA4475	9–10	Soil	<10	NA	NA	25	NA	10
48-2025	AAA4476	13–14	Qbt3	<10	NA	NA	107	NA	<10
48-2027	AAA3429	0–0.5	Soil	<10	NA	NA	<10	NA	10
48-2028	AAA3430	0–0.5	Soil	<10	NA	NA	38	NA	<10
48-2029	AAA3431	0–0.5	Soil	<10	NA	NA	10	NA	<10
48-2030	AAA3432	0–0.5	Soil	<10	NA	NA	22	NA	<10
48-2030	AAA3440	0–0.5	Soil	<3	NA	NA	22	NA	<8
48-2031	AAA3433	0–0.5	Soil	<10	NA	NA	28	NA	<10
48-2032	AAA3434	0–0.5	Soil	<10	NA	NA	<10	NA	<10
48-2033	AAA3435	0–0.5	Soil	<10	NA	NA	<10	NA	<10
48-2034	AAA3436	0–0.5	Soil	<10	NA	NA	<10	NA	<10
48-2035	AAA3437	0–0.5	Soil	<10	NA	NA	<10	NA	16
48-2036	AAA3438	0–0.5	Soil	<10	NA	NA	26	NA	14

Part 2

Location ID	Sample ID	Depth (ft)	Media	Di-n-butyl phthalate	Fe	Fe (XRF)	Hg (XRF)	K	K (XRF)
SAL	N/A	N/A	N/A	6500	N.A.	N.A.	23	N.A.	N.A.
All-soils UTL	N/A	N/A	N/A	N/A	21300	27400	N.A.	3410	38700
48-2024	AAA3717	4–5	Soil	ND	NA	15600	<10	NA	26600
48-2024	AAA3718	8–9	Soil	ND	NA	14700	<10	NA	28800
48-2024	AAA3719	14–15	Qbt3	ND	NA	10400	<10	NA	31700
48-2025	AAA3720	4–5	Soil	0.850	NA	13700	<10	NA	28200
48-2025	AAA3721	5.5–6.5	Soil	1.800	7100	13600	<10	660	30200
48-2025	AAA4481	5.5–6.5	Soil	NA	NA	NA	NA	NA	NA
48-2025	AAA4482	5.5–6.5	Soil	NA	6600	NA	NA	700	NA
48-2025	AAA3722	7.5–8.5	Soil	ND	NA	17000	<10	NA	25700
48-2025	AAA4475	9–10	Soil	ND	NA	11600	<10	NA	32500
48-2025	AAA4476	13–14	Qbt3	ND	NA	12600	<10	NA	32200
48-2027	AAA3429	0–0.5	Soil	ND	NA	20700	<10	NA	52200
48-2028	AAA3430	0–0.5	Soil	NA	NA	34600	<10	NA	32000
48-2029	AAA3431	0–0.5	Soil	ND	NA	25000	<10	NA	53400
48-2030	AAA3432	0–0.5	Soil	ND	NA	32400	<10	NA	46500
48-2030	AAA3440	0–0.5	Soil	NA	NA	24800	<5	NA	39100
48-2031	AAA3433	0–0.5	Soil	ND	NA	28200	<10	NA	48400
48-2032	AAA3434	0–0.5	Soil	ND	NA	28200	<10	NA	51300
48-2033	AAA3435	0–0.5	Soil	ND	NA	26900	<10	NA	50500
48-2034	AAA3436	0–0.5	Soil	ND	NA	25600	<10	NA	49000
48-2035	AAA3437	0–0.5	Soil	ND	NA	27900	<10	NA	48900
48-2036	AAA3438	0–0.5	Soil	ND	NA	30400	<10	NA	35600

*mg/kg

TABLE AII-7 (continued)

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 37*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Li	Mg	Mn (XRF)	Mo	Na	Ni	Ni (XRF)
SAL	N/A	N/A	N/A	1500	N.A.	N.A.	380	N.A.	1500	1500
All-soils UTL	N/A	N/A	N/A	N.A.	4610	681	N.A.	915	15.2	22.5
48-2024	AAA3717	4–5	Soil	NA	NA	438	NA	NA	NA	<10
48-2024	AAA3718	8–9	Soil	NA	NA	434	NA	NA	NA	<10
48-2024	AAA3719	14–15	Qbt3	NA	NA	367	NA	NA	NA	<10
48-2025	AAA3720	4–5	Soil	NA	NA	462	NA	NA	NA	10
48-2025	AAA3721	5.5–6.5	Soil	6	890	462	<1	100	4	<10
48-2025	AAA4481	5.5–6.5	Soil	NA	NA	NA	NA	NA	NA	NA
48-2025	AAA4482	5.5–6.5	Soil	5	900	NA	<1	110	<2	NA
48-2025	AAA3722	7.5–8.5	Soil	NA	NA	398	NA	NA	NA	14
48-2025	AAA4475	9–10	Soil	NA	NA	315	NA	NA	NA	<10
48-2025	AAA4476	13–14	Qbt3	NA	NA	449	NA	NA	NA	<10
48-2027	AAA3429	0–0.5	Soil	NA	NA	767	NA	NA	NA	<10 R
48-2028	AAA3430	0–0.5	Soil	NA	NA	1103	NA	NA	NA	<10 R
48-2029	AAA3431	0–0.5	Soil	NA	NA	876	NA	NA	NA	<10 R
48-2030	AAA3432	0–0.5	Soil	NA	NA	1185	NA	NA	NA	<10 R
48-2030	AAA3440	0–0.5	Soil	NA	NA	850	NA	NA	NA	<13
48-2031	AAA3433	0–0.5	Soil	NA	NA	1121	NA	NA	NA	<10 R
48-2032	AAA3434	0–0.5	Soil	NA	NA	755	NA	NA	NA	<10 R
48-2033	AAA3435	0–0.5	Soil	NA	NA	830	NA	NA	NA	<10 R
48-2034	AAA3436	0–0.5	Soil	NA	NA	1195	NA	NA	NA	<10 R
48-2035	AAA3437	0–0.5	Soil	NA	NA	1042	NA	NA	NA	<10 R
48-2036	AAA3438	0–0.5	Soil	NA	NA	998	NA	NA	NA	<10 R

Part 2

Location ID	Sample ID	Depth (ft)	Media	Pb	Pb (XRF)	Sb	Sb (XRF)	Se	Se (XRF)	Sr
SAL	N/A	N/A	N/A	400	400	31	31	380	380	46000
All-soils UTL	N/A	N/A	N/A	23.3	28.4	N.A.	1.45	1.7	N.A.	N.A.
48-2024	AAA3717	4–5	Soil	NA	22	NA	<10	NA	<10	NA
48-2024	AAA3718	8–9	Soil	NA	20	NA	<10	NA	<10	NA
48-2024	AAA3719	14–15	Qbt3	NA	14	NA	<10	NA	<10	NA
48-2025	AAA3720	4–5	Soil	NA	15	NA	<10	NA	<10	NA
48-2025	AAA3721	5.5–6.5	Soil	7	22	<.06	<10	<.2	<10	10
48-2025	AAA4481	5.5–6.5	Soil	NA	NA	NA	NA	NA	NA	NA
48-2025	AAA4482	5.5–6.5	Soil	8	NA	<.06	NA	<.2	NA	10
48-2025	AAA3722	7.5–8.5	Soil	NA	28	NA	<10	NA	<10	NA
48-2025	AAA4475	9–10	Soil	NA	17	NA	<10	NA	<10	NA
48-2025	AAA4476	13–14	Qbt3	NA	14	NA	<10	NA	<10	NA
48-2027	AAA3429	0–0.5	Soil	NA	10	NA	<10	NA	<10	NA
48-2028	AAA3430	0–0.5	Soil	NA	31	NA	<10	NA	<10	NA
48-2029	AAA3431	0–0.5	Soil	NA	12	NA	<10	NA	<10	NA
48-2030	AAA3432	0–0.5	Soil	NA	24	NA	<10	NA	<10	NA
48-2030	AAA3440	0–0.5	Soil	NA	25	NA	<10	NA	<4	NA
48-2031	AAA3433	0–0.5	Soil	NA	22	NA	<10	NA	<10	NA
48-2032	AAA3434	0–0.5	Soil	NA	19	NA	<10	NA	<10	NA
48-2033	AAA3435	0–0.5	Soil	NA	22	NA	<10	NA	<10	NA
48-2034	AAA3436	0–0.5	Soil	NA	22	NA	<10	NA	<10	NA
48-2035	AAA3437	0–0.5	Soil	NA	15	NA	<10	NA	<10	NA
48-2036	AAA3438	0–0.5	Soil	NA	25	NA	<10	NA	<10	NA

*mg/kg

TABLE AII-7 (continued)

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 37*

Location ID	Sample ID	Depth (ft)	Media	Th (XRF)	Ti (XRF)	Tl	U (XRF)	V	Zn	Zn (XRF)
SAL	N/A	N/A	N/A	N.A.	N.A.	N.A.	230	540	23000	23000
All-soils UTL	N/A	N/A	N/A	22.1	N.A.	1	5.33	41.9	50.8	76.6
48-2024	AAA3717	4–5	Soil	27	1994	NA	<10	NA	NA	35
48-2024	AAA3718	8–9	Soil	23	1752	NA	<10	NA	NA	36
48-2024	AAA3719	14–15	Qbt3	18	596	NA	<10	NA	NA	33
48-2025	AAA3720	4–5	Soil	14	1553	NA	<10	NA	NA	41
48-2025	AAA3721	5.5–6.5	Soil	23	1359	0.08	10	8.6	40	49
48-2025	AAA4481	5.5–6.5	Soil	NA	NA	NA	NA	NA	NA	NA
48-2025	AAA4482	5.5–6.5	Soil	NA	NA	0.06	NA	7.8	29	NA
48-2025	AAA3722	7.5–8.5	Soil	21	2357	NA	<10	NA	NA	42
48-2025	AAA4475	9–10	Soil	27	667	NA	<10	NA	NA	40
48-2025	AAA4476	13–14	Qbt3	14	675	NA	<10	NA	NA	49
48-2027	AAA3429	0–0.5	Soil	<10	1397	NA	<10	NA	NA	26
48-2028	AAA3430	0–0.5	Soil	21	3737	NA	15	NA	NA	47
48-2029	AAA3431	0–0.5	Soil	<10	1843	NA	<10	NA	NA	35
48-2030	AAA3432	0–0.5	Soil	16	4431	NA	<10	NA	NA	42
48-2030	AAA3440	0–0.5	Soil	10	3347	NA	<8	NA	NA	37
48-2031	AAA3433	0–0.5	Soil	<10	3296	NA	12	NA	NA	39
48-2032	AAA3434	0–0.5	Soil	10	2477	NA	<10	NA	NA	35
48-2033	AAA3435	0–0.5	Soil	13	2399	NA	<10	NA	NA	38
48-2034	AAA3436	0–0.5	Soil	<10	2949	NA	13	NA	NA	32
48-2035	AAA3437	0–0.5	Soil	<10	3039	NA	<10	NA	NA	29
48-2036	AAA3438	0–0.5	Soil	12	4111	NA	14	NA	NA	39

*mg/kg

TABLE AII-8

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS No. 48-005, LINE 37*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Am-241	Ce-144	Co-60	Cs-137	Pu-238	Pu-239,240
SAL	N/A	N/A	N/A	22	56	1.1	5.1	27	24
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
48-2024	AAA3717	4–5	Soil	NA	NA	NA	NA	-0.275	-0.251
48-2024	AAA3718	8–9	Soil	-0.0459	<.8399	<.348	<.284	-0.0209	0.0523
48-2024	AAA4471	8–9	Soil	-0.0098	<.5643	<.2677	<.183	-0.0576	-0.032
48-2024	AAA3719	14–15	Qbt3	-0.0427	NA	NA	NA	-0.513	-0.476
48-2025	AAA3720	4–5	Soil	-0.2	NA	NA	NA	-0.62	-0.542
48-2025	AAA3721	5.5–6.5	Soil	0.12	<.9852	<.3449	<.29	0.102	0.0793
48-2025	AAA3722	7.5–8.5	Soil	0.104	NA	NA	NA	0.119	0.0501
48-2025	AAA4475	9–10	Soil	-0.359	NA	NA	NA	0.0597	-0.006
48-2025	AAA4476	13–14	Qbt3	0.0025	NA	NA	NA	-0.4	-0.332
48-2027	AAA3429	0–0.5	Soil	0.008	NA	NA	NA	0.001	0.002
48-2028	AAA3430	0–0.5	Soil	0.0125	-12.9	0.0333	0.736	0.02	0.056
48-2028	AAA3442	0–0.5	Soil	NA	-7.65	0.0798	0.902	0.014	0.046
48-2029	AAA3431	0–0.5	Soil	0.008	NA	NA	NA	0.003	0.005
48-2030	AAA3432	0–0.5	Soil	0.029	NA	NA	NA	0.005	0.05
48-2031	AAA3433	0–0.5	Soil	0.022	-8.63	-0.0917	1.05	0.005	0.064
48-2032	AAA3434	0–0.5	Soil	0.029	NA	NA	NA	0.002	0.029
48-2033	AAA3435	0–0.5	Soil	0.019	NA	NA	NA	0.005	0.025
48-2034	AAA3436	0–0.5	Soil	0.021	NA	NA	NA	0.008	0.05
48-2035	AAA3437	0–0.5	Soil	NA	NA	NA	NA	0.015	0.023
48-2036	AAA3438	0–0.5	Soil	0.024	NA	NA	NA	0.006	0.013

Part 2

Location ID	Sample ID	Depth (ft)	Media	Ru-106	Th-228	Th-230	Th-232	U-234	U-235	U-238
SAL	N/A	N/A	N/A	13	1.7	0.18	0.77	13	10	67
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	1.94	0.084	1.82
48-2024	AAA3717	4–5	Soil	NA	2.35	3.85 J+	1.6 J+	0.356	0.0727	0.754
48-2024	AAA3718	8–9	Soil	<1.903	2.64 J+	1.27 J+	0.88	0.719	0.123	1.05
48-2024	AAA4471	8–9	Soil	<1.311	1.61 J+	0.594 J+	0.907	1.08	0.0893	1.12
48-2024	AAA3719	14–15	Qbt3	NA	1.81 J+	1.51 J+	0.751	0.659	0.0121	0.973
48-2025	AAA3720	4–5	Soil	NA	1.03	2.32 J+	1.39	1.26	0.0925	0.767
48-2025	AAA3721	5.5–6.5	Soil	<1.899	1.23 J+	3.11 J+	2.07	1.5	-0.0171	0.906
48-2025	AAA3722	7.5–8.5	Soil	NA	3.29 J+	1.34 J+	1.18	2.21	0.272	1.69
48-2025	AAA4475	9–10	Soil	NA	1.62 J+	1.76 J+	1.26	0.593	-0.0037	0.691
48-2025	AAA4476	13–14	Qbt3	NA	1.88 J+	2.07	1.62	0.868	0.0315	0.84
48-2027	AAA3429	0–0.5	Soil	NA	0.849	0.474	0.851	0.607	0.024	0.685
48-2028	AAA3430	0–0.5	Soil	0.885	1.08	0.896	1.06	1.389	0.02	1.317
48-2028	AAA3442	0–0.5	Soil	3.0	1.23	1.02	1.18	1.084	0.04	1.249
48-2029	AAA3431	0–0.5	Soil	NA	1.04	0.62	1.02	0.509	0.009	0.561
48-2030	AAA3432	0–0.5	Soil	NA	1.16	0.621	0.84	1.484	0.036	1.69
48-2031	AAA3433	0–0.5	Soil	0.293	1.12	0.837	1.09	2.154	0.093	2.133
48-2032	AAA3434	0–0.5	Soil	NA	1.02	0.632	0.974	0.898	0.05	0.94
48-2033	AAA3435	0–0.5	Soil	NA	NA	0.492	0.737	0.928	0.019	1.061
48-2034	AAA3436	0–0.5	Soil	NA	0.677	0.499	0.683	3.022	0.147	3.321
48-2035	AAA3437	0–0.5	Soil	NA	0.526	0.77	0.741	0.797	0.04	0.867
48-2036	AAA3438	0–0.5	Soil	NA	0.776	0.401	0.654	0.855	0.045	0.879

*pCi/g

TABLE AII-9

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 38*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Acetone	Ag	Al	As	As (XRF)	Ba
SAL	N/A	N/A	N/A	2000	383	77000	N.A.	N.A.	5300
All-soils UTL	N/A	N/A	N/A	N/A	N.A.	38700	7.82	18.1	315
48-2026	AAA3723	1.5–2.5	Soil	0.056	NA	NA	NA	<10	NA
48-2026	AAA3724	6–7.4	Soil	0.081	<1	7800	2	<10	84
48-2026	AAA4469	14–15	Qbt3	ND	NA	NA	NA	<10	NA
48-2026	AAA4484	14–15	Qbt3	NA	NA	NA	NA	<10	NA

Part 2

Location ID	Sample ID	Depth (ft)	Media	Ba (XRF)	Be	Ca	Ca (XRF)	Cd	Cd (XRF)
SAL	N/A	N/A	N/A	5300	N.A.	N.A.	N.A.	38	38
All-soils UTL	N/A	N/A	N/A	561	1.95	6120	10900	2.7	N.A.
48-2026	AAA3723	1.5–2.5	Soil	638	NA	NA	11100	NA	<10
48-2026	AAA3724	6–7.4	Soil	530	0.54	3700	7700	<.4	<10
48-2026	AAA4469	14–15	Qbt3	137	NA	NA	2000	NA	<10
48-2026	AAA4484	14–15	Qbt3	136	NA	NA	1800	NA	<10

Part 3

Location ID	Sample ID	Depth (ft)	Media	Co	Cr	Cr (XRF)	Cu	Cu (XRF)
SAL	N/A	N/A	N/A	4600	210	210	2800	2800
All-soils UTL	N/A	N/A	N/A	19.2	19.3	45.1	15.5	16.7
48-2026	AAA3723	1.5–2.5	Soil	NA	NA	14	NA	<10
48-2026	AAA3724	6–7.4	Soil	3.5	5.8	27	3	12
48-2026	AAA4469	14–15	Qbt3	NA	NA	10	NA	<10
48-2026	AAA4484	14–15	Qbt3	NA	NA	<10	NA	<10

Part 4

Location ID	Sample ID	Depth (ft)	Media	Di-n-butyl phthalate	Fe	Fe (XRF)	Hg (XRF)	K
SAL	N/A	N/A	N/A	6500	N.A.	N.A.	23	N.A.
All-soils UTL	N/A	N/A	N/A	N/A	21300	27400	N.A.	3410
48-2026	AAA3723	1.5–2.5	Soil	0.470	NA	16400	<10	NA
48-2026	AAA3724	6–7.4	Soil	ND	8500	16400	<10	900
48-2026	AAA4469	14–15	Qbt3	ND	NA	10500	<10	NA
48-2026	AAA4484	14–15	Qbt3	NA	NA	10800	<10	NA

*mg/kg

TABLE AII-9 (continued)

RFI RESULTS FOR INORGANIC AND ORGANIC CHEMICALS AT PRS No. 48-005, LINE 38*

Part 1

Location ID	Sample ID	Depth (ft)	Media	K (XRF)	Li	Mg	Mn	Mn (XRF)	Mo
SAL	N/A	N/A	N/A	N.A.	1500	N.A.	N.A.	N.A.	380
All-soils UTL	N/A	N/A	N/A	38700	N.A.	4610	714	681	N.A.
48-2026	AAA3723	1.5–2.5	Soil	23200	NA	NA	NA	430	NA
48-2026	AAA3724	6–7.4	Soil	24700	6.5	1300	230	412	<1
48-2026	AAA4469	14–15	Qbt3	32400	NA	NA	NA	302	NA
48-2026	AAA4484	14–15	Qbt3	32700	NA	NA	NA	297	NA

Part 2

Location ID	Sample ID	Depth (ft)	Media	Na	Ni	Ni (XRF)	Pb	Pb (XRF)	Sb
SAL	N/A	N/A	N/A	N.A.	1500	1500	400	400	31
All-soils UTL	N/A	N/A	N/A	915	15.2	22.5	23.3	28.4	N.A.
48-2026	AAA3723	1.5–2.5	Soil	NA	NA	20	NA	24	NA
48-2026	AAA3724	6–7.4	Soil	110	5	17	8	19	<.06
48-2026	AAA4469	14–15	Qbt3	NA	NA	<10	NA	19	NA
48-2026	AAA4484	14–15	Qbt3	NA	NA	<10	NA	19	NA

Part 3

Location ID	Sample ID	Depth (ft)	Media	Sb (XRF)	Se	Se (XRF)	Sr	Th (XRF)	Ti (XRF)
SAL	N/A	N/A	N/A	31	380	380	46000	N.A.	N.A.
All-soils UTL	N/A	N/A	N/A	1.45	1.7	N.A.	N.A.	22.1	N.A.
48-2026	AAA3723	1.5–2.5	Soil	<10	NA	<10	NA	14	2439
48-2026	AAA3724	6–7.4	Soil	<10	<.2	<10	18	16	2206
48-2026	AAA4469	14–15	Qbt3	<10	NA	<10	NA	18	668
48-2026	AAA4484	14–15	Qbt3	<10	NA	<10	NA	21	606

Part 4

Location ID	Sample ID	Depth (ft)	Media	Tl	U (XRF)	V	Zn	Zn (XRF)
SAL	N/A	N/A	N/A	N.A.	230	540	23000	23000
All-soils UTL	N/A	N/A	N/A	1	5.33	41.9	50.8	76.6
48-2026	AAA3723	1.5–2.5	Soil	NA	<10	NA	NA	53
48-2026	AAA3724	6–7.4	Soil	0.08	<10	13	29	30
48-2026	AAA4469	14–15	Qbt3	NA	<10	NA	NA	44
48-2026	AAA4484	14–15	Qbt3	NA	<10	NA	NA	35

*mg/kg

TABLE AII-10

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS No. 48-005, LINE 38*

Part 1

Location ID	Sample ID	Depth (ft)	Media	Am-241	Pu-238	Pu-239,240	Th-228
SAL	N/A	N/A	N/A	22	27	24	1.7
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.
48-2026	AAA3723	1.5–2.5	Soil	0.0449	5.19	0.104	1.6 J+
48-2026	AAA3724	6–7.4	Soil	5.27	223	11.9	1.88 J+
48-2026	AAA4469	14–15	Qbt3	0.145	-0.0238	0.0304	1.29 J+

Part 2

Location ID	Sample ID	Depth (ft)	Media	Th-230	Th-232	U-234	U-235	U-238
SAL	N/A	N/A	N/A	0.18	0.77	13	10	67
All-soils UTL	N/A	N/A	N/A	N.A.	N.A.	1.94	0.084	1.82
48-2026	AAA3723	1.5–2.5	Soil	1.31 J+	0.83	1.13	-0.112	1.04
48-2026	AAA3724	6–7.4	Soil	1.24	0.993	1.32	0.411	0.749
48-2026	AAA4469	14–15	Qbt3	1.08 J+	1.13	2.04	0.0672	1.19

*pCi/g

TABLE AII-11

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS Nos. 48-007(a and d) AND 48-010*

Part 1

PRS	Location ID	Sample ID	Depth (ft)	Media	As (XRF)	Ba (XRF)	Ca (XRF)	Cd (XRF)	Cr (XRF)
SAL	N/A	N/A	N/A	N/A	N.A.	5300	N.A.	38	210
All-soils UTL	N/A	N/A	N/A	N/A	18.1	561	10900	N.A.	45.1
48-007(a,d)	48-2038	AAA3548	0–0.5	Soil	<10	338	5500	<10	<10
48-007(a,d)	48-2038	AAA4430	0–0.5	Soil	<10	323	5300	<10	<10
48-007(a,d)	48-2080	0448-95-0001	0–0.5	Soil	NA	NA	NA	NA	NA
48-007(a,d)	48-2080	0448-95-0002	0–0.5	Soil	NA	NA	NA	NA	NA
48-010	48-2040	AAA3550	0–0.5	Soil	<10	198	2300	<10	<10
48-010	48-2041	AAA3551	0–0.5	Soil	<10	409	4500	<10	<10
48-010	48-2052	AAA4442	0–0.5	Soil	<10	241	3200	<10	<10
48-010	48-2082	0448-95-0005	0–0.5	Soil	NA	NA	NA	NA	NA

Part 2

PRS	Location ID	Sample ID	Depth (ft)	Media	Cu (XRF)	Fe (XRF)	Hg	Hg (XRF)	K (XRF)
SAL	N/A	N/A	N/A	N/A	2800	N.A.	23	23	N.A.
All-soils UTL	N/A	N/A	N/A	N/A	16.7	27400	0.1	N.A.	38700
48-007(a,d)	48-2038	AAA3548	0–0.5	Soil	10	14100	NA	<10	30200
48-007(a,d)	48-2038	AAA4430	0–0.5	Soil	16	12100	NA	<10	32800
48-007(a,d)	48-2080	0448-95-0001	0–0.5	Soil	NA	NA	0.07 J	NA	NA
48-007(a,d)	48-2080	0448-95-0002	0–0.5	Soil	NA	NA	0.07 J	NA	NA
48-010	48-2040	AAA3550	0–0.5	Soil	<10	8800	NA	<10	32000
48-010	48-2041	AAA3551	0–0.5	Soil	<10	12600	NA	<10	27300
48-010	48-2052	AAA4442	0–0.5	Soil	16	11500	NA	<10	31900
48-010	48-2082	0448-95-0005	0–0.5	Soil	NA	NA	0.07 J	NA	NA

Part 3

PRS	Location ID	Sample ID	Depth (ft)	Media	Mn (XRF)	Ni (XRF)	Pb (XRF)	Sb (XRF)	Se (XRF)
SAL	N/A	N/A	N/A	N/A	N.A.	1500	400	31	380
All-soils UTL	N/A	N/A	N/A	N/A	681	22.5	28.4	1.45	N.A.
48-007(a,d)	48-2038	AAA3548	0–0.5	Soil	471	<10	27	<10	<10
48-007(a,d)	48-2038	AAA4430	0–0.5	Soil	450	<10	23	<10	<10
48-007(a,d)	48-2080	0448-95-0001	0–0.5	Soil	NA	NA	NA	NA	NA
48-007(a,d)	48-2080	0448-95-0002	0–0.5	Soil	NA	NA	NA	NA	NA
48-010	48-2040	AAA3550	0–0.5	Soil	310	<10	14	<10	<10
48-010	48-2041	AAA3551	0–0.5	Soil	328	<10	20	<10	<10
48-010	48-2052	AAA4442	0–0.5	Soil	346	<10	21	<10	<10
48-010	48-2082	0448-95-0005	0–0.5	Soil	NA	NA	NA	NA	NA

*mg/kg

TABLE AII-11 (continued)

RFI RESULTS FOR INORGANIC CHEMICALS AT PRS Nos. 48-007(a and d) AND 48-010*

PRS	Location ID	Sample ID	Depth (ft)	Media	Th (XRF)	Ti (XRF)	U (XRF)	Zn (XRF)
SAL	N/A	N/A	N/A	N/A	N.A.	N.A.	230	23000
All-soils UTL	N/A	N/A	N/A	N/A	22.1	N.A.	5.33	76.6
48-007(a,d)	48-2038	AAA3548	0–0.5	Soil	22	1133	<10	54
48-007(a,d)	48-2038	AAA4430	0–0.5	Soil	13	905	<10	42
48-007(a,d)	48-2080	0448-95-0001	0–0.5	Soil	NA	NA	NA	NA
48-007(a,d)	48-2080	0448-95-0002	0–0.5	Soil	NA	NA	NA	NA
48-010	48-2040	AAA3550	0–0.5	Soil	<10	849	<10	33
48-010	48-2041	AAA3551	0–0.5	Soil	17	1701	<10	28
48-010	48-2052	AAA4442	0–0.5	Soil	15	948	<10	50
48-010	48-2082	0448-95-0005	0–0.5	Soil	NA	NA	NA	NA

*mg/kg

TABLE AII-12

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS Nos. 48-007(a and d) AND 48-010*

Part 1

PRS	Location ID	Sample ID	Depth (ft)	Media	Am-241	Ce-144	Co-60	Cs-137	Pu-238
SAL	N/A	N/A	N/A	N/A	22	56	1.1	5.1	27
All-soils UTL	N/A	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.	N.A.
48-007(a,d)	48-2038	AAA3548	0–0.5	Soil	NA	<.76	<.07	<.08	NA
48-007(a,d)	48-2080	0448-95-0001	0–0.5	Soil	NA	NA	NA	NA	0.5
48-007(a,d)	48-2080	0448-95-0002	0–0.5	Soil	NA	NA	NA	NA	0.5
48-010	48-2040	AAA3550	0–0.5	Soil	0.031	NA	NA	NA	0.09
48-010	48-2041	AAA3551	0–0.5	Soil	0.038	<.50	<.07	<.05	0.03
48-010	48-2041	AAA4435	0–0.5	Soil	0.025	<.58	<.11	<.08	0.087

Part 2

PRS	Location ID	Sample ID	Depth (ft)	Media	Pu-239,240	Ru-106	Th-228	Th-230
SAL	N/A	N/A	N/A	N/A	24	13	1.7	0.18
All-soils UTL	N/A	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.
48-007(a,d)	48-2038	AAA3548	0–0.5	Soil	NA	<1.5	NA	NA
48-007(a,d)	48-2080	0448-95-0001	0–0.5	Soil	0.07	NA	NA	NA
48-007(a,d)	48-2080	0448-95-0002	0–0.5	Soil	0.06	NA	NA	NA
48-010	48-2040	AAA3550	0–0.5	Soil	0.039	NA	1.998	0.61
48-010	48-2041	AAA3551	0–0.5	Soil	0.049	<.86	1.739	0.517
48-010	48-2041	AAA4435	0–0.5	Soil	0.032	<1.2	1.794	0.441

Part 3

PRS	Location ID	Sample ID	Depth (ft)	Media	Th-232	U-234	U-235	U-238
SAL	N/A	N/A	N/A	N/A	0.77	13	10	67
All-soils UTL	N/A	N/A	N/A	N/A	N.A.	1.94	0.084	1.82
48-007(a,d)	48-2038	AAA3548	0–0.5	Soil	NA	NA	NA	NA
48-007(a,d)	48-2080	0448-95-0001	0–0.5	Soil	NA	0.75	0.1	0.56
48-007(a,d)	48-2080	0448-95-0002	0–0.5	Soil	NA	0.64	0.04	0.57
48-010	48-2040	AAA3550	0–0.5	Soil	1.017	0.839	0.042	0.805
48-010	48-2041	AAA3551	0–0.5	Soil	0.758	0.593	0.027	0.596
48-010	48-2041	AAA4435	0–0.5	Soil	0.692	0.482	0.023	0.475

*pCi/g

TABLE AII-13

FIXED-SITE LABORATORY RADIONUCLIDE RESULTS FOR PRS Nos. 48-007(b, c, and f)*

Part 1

PRS	Location ID	Sample ID	Depth (ft)	Media	Am-241	Pu-238	Pu-239,240	Th-228
SAL	N/A	N/A	N/A	N/A	22	27	24	1.7
All-soils UTL	N/A	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.
48-007(b)	48-2043	AAA3517	0–0.5	Soil	NA	0.012	0.021	1.17 J-
48-007(b)	48-2044	AAA3518	0–0.5	Soil	NA	0.014	0.007	0.91
48-007(b)	48-2044	AAA3519	0.5–1.5	Soil	NA	0.0	0.001	1.43
48-007(b)	48-2044	AAA3520	1.5–2.5	Soil	NA	0.007	0.001	1.62
48-007(c)	48-2045	AAA3521	0–0.5	Soil	0.047	0.044	0.041	1.063
48-007(c)	48-2046	AAA3522	0–0.5	Soil	0.0456	0.054	0.046	0.918
48-007(c)	48-2046	AAA3523	0.5–1.5	Soil	0.052	0.172	0.164	0.966
48-007(c)	48-2046	AAA3524	1.5–2	Soil	0.024	0.064 J-	0.035 J-	1.31
48-007(f)	48-2047	AAA3525	0–0.5	Soil	0.004	0.001	0.003	1.36
48-007(f)	48-2048	AAA3526	0–0.5	Soil	0.004	0.0	0.003	0.785
48-007(f)	48-2048	AAA3535	0–0.5	Soil	0.0071	0.014	0.012	0.948
48-007(f)	48-2048	AAA3527	0.5–1.5	Soil	0.001	0.01	0.009	0.756

Part 2

PRS	Location ID	Sample ID	Depth (ft)	Media	Th-230	Th-232	U-234	U-235	U-238
SAL	N/A	N/A	N/A	N/A	0.18	0.77	13	10	67
All-soils UTL	N/A	N/A	N/A	N/A	N.A.	N.A.	1.94	0.084	1.82
48-007(b)	48-2043	AAA3517	0–0.5	Soil	0.643	1.2	2.51	0.108	1.95
48-007(b)	48-2044	AAA3518	0–0.5	Soil	0.619	0.891	0.087	0.001	0.143
48-007(b)	48-2044	AAA3519	0.5–1.5	Soil	1.12	1.51	0.841	0.054	1.022
48-007(b)	48-2044	AAA3520	1.5–2.5	Soil	1.11	1.65	0.025	0.003	0.026
48-007(c)	48-2045	AAA3521	0–0.5	Soil	0.791	1.15	1.332	0.148	1.162
48-007(c)	48-2046	AAA3522	0–0.5	Soil	0.613	0.944	0.895	0.04	0.88
48-007(c)	48-2046	AAA3523	0.5–1.5	Soil	0.671	0.91	0.959	0.035	0.823
48-007(c)	48-2046	AAA3524	1.5–2	Soil	0.692	1.35	0.803	0.049	0.43
48-007(f)	48-2047	AAA3525	0–0.5	Soil	0.834	1.37	0.791	0.042	0.712
48-007(f)	48-2048	AAA3526	0–0.5	Soil	0.578	0.812	0.715	0.027	0.642
48-007(f)	48-2048	AAA3535	0–0.5	Soil	0.729	0.913	0.756	0.024	0.694
48-007(f)	48-2048	AAA3527	0.5–1.5	Soil	0.679	0.72	0.529	0.023	0.511

*pCi/g

Attachment III

Field Forms

ESH-1 DIRECT SURVEY FORM

SAMPLE DESCRIPTION

Sample Date/Time: _____ No. Of Samples: _____

TA: _____ Bldg: _____

RCT: _____ Z Number: _____

Phone/Fax: _____

SAMPLE TRACKING NUMBER

PURPOSE OF SURVEY

☐ ROUTINE ☐ PRE-JOB ☐ POST-JOB ☐ HOT-JOB

☐ ITEM RELEASE ☐ OFFSITE SHIPMENT ☐ ONSITE SHIPMENT

☐ NON-ROUTINE/OTHER: _____

INSTRUMENTATION

TYPE	HSE No.	CAL DUE	% EFF

ADDITIONAL INFORMATION

☐ Occurrence No.: _____

☐ Incident No.: _____

☐ RWP No.: _____

Item/Area	Alpha		Beta/Gamma		Remarks
	cpm	dpm	cpm	dpm	

ESH-1 LAS SURVEY FORM

SAMPLE DESCRIPTION

Sample Date/Time: _____ No. Of Samples: _____

TA: _____ Bldg: _____

RCT: _____ Z Number: _____

Phone/Fax: _____

SAMPLE TRACKING NUMBER

PURPOSE OF SURVEY

☐ ROUTINE ☐ PRE-JOB ☐ POST-JOB ☐ HOT-JOB

☐ ITEM RELEASE ☐ OFFSITE SHIPMENT ☐ ONSITE SHIPMENT

☐ NON-ROUTINE/OTHER: _____

INSTRUMENTATION

TYPE	HSE No.	CAL DUE	% EFF

ADDITIONAL INFORMATION:

☐ Occurrence No.: _____

☐ Incident No.: _____

☐ RWP No.: _____

Item/Area	Alpha		Beta/Gamma		Remarks
	cpm	dpm	cpm	dpm	

ESH-1 SMEAR SURVEY FORM

SAMPLE DESCRIPTION

Sample Date/Time: _____ No. Of Samples: _____

TA: _____ Bldg: _____

RCT: _____ Z Number: _____

Phone/Fax: _____

SAMPLE TRACKING NUMBER

PURPOSE OF SURVEY

☐ ROUTINE ☐ PRE-JOB ☐ POST-JOB ☐ HOT-JOB

☐ ITEM RELEASE ☐ OFFSITE SHIPMENT ☐ ONSITE SHIPMENT

☐ NON-ROUTINE/OTHER: _____

INSTRUMENTATION

TYPE	HSE No.	CAL DUE	% EFF

ADDITIONAL INFORMATION

☐ Occurrence No.: _____

☐ Incident No.: _____

☐ RWP No.: _____

Smear No.	Location	Alpha*	Beta*	Gamma*

Smear No.	Location	Alpha*	Beta*	G

*dpm/100 cm2

ESH-1 SMEAR CONTINUATION FORM

Smear No.	Location	Alpha*	Beta*	Gamma*

Smear No.	Location	Alpha*	Beta*	Gamma*

FU 04 EQUIPMENT AND ITEM REMOVAL LOG[a]

Survey Instrument	Smear Counter	Facility
HS Property Number	HS Property Number	
Calibration Due Date	Calibration Due Date	

			Exterior Survey		Interior Monitoring[b]				
Date	RCT: Enter name (print), signature, and Z #	Item Part Number and Description	Direct Survey (dpm/100cm^2)	Smear Survey (dpm/100cm^2)	Required? Yes/No	Direct Survey (dpm/100cm^2)	Smear Survey (dpm/100cm^2)	Responsible Person: Enter name (print), signature, Z #, and organization phone	Comments Write additional comments on back

a Item cannot be released unless survey results are below *LANL Radiological Control Manual* Table 2-2 limits for conditional release and below detectable activity for unconditional release (release to the general public).

b Disassembly and interior monitoring is required unless responsible person verifies by his/her signature that internal contamination is not possible, based upon knowledge of process and previous use.

FU 04 Site Access List

TA _____ Site Work Plan _____ Date _____ / _____ / _____

Page _____ of _____

Badge Z No.	Name	Group	Training	Task	Time Arrived onsite	Time Enter:Exit Zone (Exclusion)				Time Depart Site	Total time Onsite	PPE Level	Time in Exclusion Zone	Signature
111270	Butler, Nancy	ESH-5	24 hr HW	H&S Rep.										
117207	Daymon, Debe	ERM	40 hr HW	Field Team Mgr										
083071	Hutton, Rick	SAIC	40 hr HW	Field Support										
115401	Harris, Jenny	ERM	40 hr HW	Field Tech										
117228	Hayes, John	ERM	40 hr HW	H&S, SSO										
114816	Koch, Richard	SAIC	40 hr HW	Geologist										
099718	Pratt, Allyn	EES-13	40 hr HW: 8 hr Sup	Manager										
108821	Peifer, Marty	ESH-1	40 hr HW	H&S-RCT Supp										
099070	Romero, Carmella	SAIC	40 hr HW: 8 hr Sup	Site Smpl Coord										
117380	Sontag, Leslie	SAIC	40 hr HW: 8 hr Sup	FTL										
013418	Stafford, David	SAIC	40 hr HW: 8 hr Sup	Sample Tech										

03: 2/1/96

FU 04 SURVEY FORM

Item Surveyed: _____ **Page** _____ **of** _____ **Date:** ____ / ____ / ____

Site: _____	α Direct	β/γ Direct	α Removable:	β/γ Removable
RCT/RSP: _____	Ratemeter: _____	Ratemeter: _____	Ratemeter: _____	Ratemeter: _____
Name: _____	Probe: _____	Probe: _____	Probe: _____	Probe: _____
Signature: _____	Cal. Due Date: _____	Cal. Due Date: _____	Cal. Due Date: _____	Cal. Due Date: _____
Comments:	HSE #: _____	HSE #: _____	HSE #: _____	HSE #: _____
	Bkgd: _____cpm Eff: ____%	Bkgd: _____cpm Eff: ____%	Bkgd: _____cpm Eff: ____%	Bkgd: _____cpm Eff: ____%
	MDA: _____	MDA: _____	MDA: _____	MDA: _____

Item Survey	Direct Alpha		Direct Beta/Gamma		Removable Alpha		Removable Beta/Gamma		Dose Rate	Comments
	cpm	dpm/100cm^2	cpm	dpm/100cm^2	cpm	dpm/100cm^2	cpm	dpm/100cm^2	micro-R/hr	

MDC (Ratemeter) = 3σ (units cpm)
MDC (Ratemeter) = MDC/Efficiency × probe correction
MDA (Scaler) = $[2.71 + (4.65 \cdot (b^{\circ} \cdot t_S)^{0.5})]/(\mathrm{Eff} \cdot t_S)$
t_S = Sample Count Rate
b° Background Count Rate

$$\sigma = [0.25 \times (\Sigma(B_i - B)^2)]^{1/2} \text{(units cpm)}$$
$$i = 1$$
B_i = individual background count reading
B = the mean or average of 5 different background count readings from different areas

Probe type
β/γ Ludlum GM Pancake probe
α Ludlum GM Pancake probe
α Eberline AC-3 (Zns) probe

Correction Factor:
100/15 5(cm^2/cm^2)
100/75 cm^2/cm^2)
100/59 cm^2/cm^2)

FU 04 SURVEY FORM (Continued)

Item Surveyed: _____ Page _____ of _____ Date: _____ / _____ / _____

RCT: _____

Signature: _____

Item Survey	Direct Alpha		Direct Beta/Gamma		Removable Alpha		Removable Beta/Gamma		Dose Rate	Comments
	cpm	dpm/100cm^2	cpm	dpm/100cm^2	cpm	dpm/100cm^2	cpm	dpm/100cm^2	micro-R/hr	

MDC (Ratemeter) = 3σ (units cpm)
MDC (Ratemeter) = MDC/Efficiency × probe correction
MDA (Scaler) = $[2.71 + (4.65 \cdot (b^{\circ} \cdot t_S)^{0.5})]/(Eff \cdot t_S)$
t_S = Sample Count Rate
b° Background Count Rate

$$\sigma = [0.25 \times (\Sigma(B_i - B)^2)]^{1/2} \text{(units cpm)}$$
$$i = 1$$
B_i = individual background count reading
B = the mean or average of 5 different background count readings from different areas

Probe type	Correction Factor:
β/γ Ludlum GM Pancake probe	100/15 5(cm^2/cm^2)
α Ludlum GM Pancake probe	100/75 cm^2/cm^2)
α Eberline AC-3 (Zns) probe	100/59 cm^2/cm^2)

FU 04 TAILGATE SAFETY MEETING

OU _____ TA _____ SSHASP No. _____ Date ____ / ____ / ____

Site Work Plan _____

SAFETY TOPICS PRESENTED

SUBJECTS DISCUSSED (Including Change Orders)

_____

_____

_____

HAZARDS: _____

_____

Biological (Site/Operational) _____

_____

Chemical _____

_____

Physical _____

_____

Radiological _____

_____

HAZARD CONTROL MEASURES:

Personal Protective Equipment _____

_____

Engineering/Administrative Control _____

_____

Monitoring(IH/HP) _____

_____

Special Equipment _____

_____

EMERGENCY ACTIONS:

_____

_____

_____

_____

_____

_____

MEETING ATTENDEES

PRINT NAME/ORGANIZATION	Z #	SIGNATURE

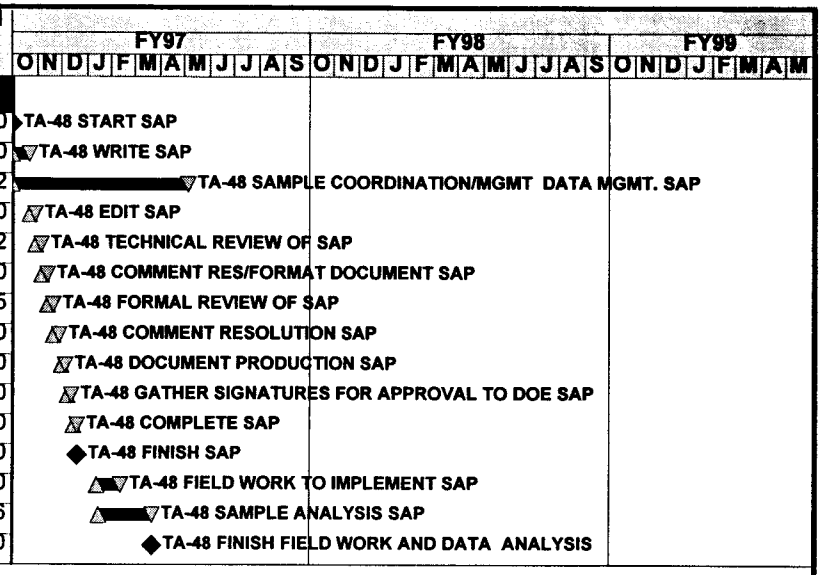
Meeting Conducted By: ______________________ ______________________

(Print Name) (Title) (Signature)

Attachment IV

Schedule and Cost

Activity ID	Activity description	Orig dur	Early Start	Early Finish	Budgeted cost
[redacted]					
A4023400M1	TA-48 START SAP	0	01OCT96*		0.00
A402340001	TA-48 WRITE SAP	15	01OCT96	22OCT96	29805.60
A403340002	TA-48 SAMPLE COORDINATION/MGMT DATA MGMT.	146	01OCT96	05MAY97	31816.52
A402340002	TA-48 EDIT SAP	5	23OCT96	29OCT96	2586.80
A402340003	TA-48 TECHNICAL REVIEW OF SAP	5	30OCT96	05NOV96	1765.02
A402340004	TA-48 COMMENT RES/FORMAT DOCUMENT SAP	5	06NOV96	13NOV96	2991.00
A402340005	TA-48 FORMAL REVIEW OF SAP	5	14NOV96	20NOV96	6518.95
A402340006	TA-48 COMMENT RESOLUTION SAP	5	21NOV96	27NOV96	848.80
A402340007	TA-48 DOCUMENT PRODUCTION SAP	5	02DEC96	06DEC96	9342.10
A402340008	TA-48 GATHER SIGNATURES FOR APPROVAL TO	5	09DEC96	13DEC96	522.50
A402340009	TA-48 COMPLETE SAP	4	16DEC96	19DEC96	418.00
A4023400M2	TA-48 FINISH SAP	0		19DEC96	0.00
A403340001	TA-48 FIELD WORK TO IMPLEMENT SAP	20	15JAN97	11FEB97	39165.70
A403340003	TA-48 SAMPLE ANALYSIS SAP	45	17JAN97	21MAR97	95688.36
A4033400M1	TA-48 FINISH FIELD WORK AND DATA ANALYSIS	0		21MAR97	0.00



Project Start	01OCT89
Project Finish	01JUL97
Data Date	01OCT96
Plot Date	13DEC96

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Early Bar
Progress Bar
Critical Activity

Sheet 1 of 1

LOS ALAMOS NATIONAL LABORATORY

TA-48 SAP and Field Work

Attachment 4