Department of Energy
Albuquerque Operations Office
Los Alamos Area Office
Los Alamos, New Mexico 87544

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. James P. Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, New Mexico 87505

Dear Mr. Bearzi:

Subject: Response to Request for Information Pursuant to the New Mexico Hazardous Waste Act and the Resource Conservation and Recovery Act, Los Alamos National Laboratory (LANL), EPA ID NM0890010515

The purpose of this letter is for the Department of Energy (DOE) and the University of California (UC) to provide supplemental information in response to the New Mexico Environment Department's (NMED) Request for Information (RI, Mr. James Bearzi, Hazardous Waste Bureau, dated February 12, 2001) pertaining to the Los Alamos National Laboratory, EPA ID NM0890010515. This information is part of DOE/UC's response to Request No. 18, as specified in the March 1, 2001 letter. A brief summary of this response is provided below. The complete response and its supporting documentation are enclosed with this letter.

Summary of Response to Request No. 18

As stated in the DOE/UC March 1, 2001 response, the data requested by NMED in Request No.18 falls into three categories: (1) data not previously submitted to NMED as part of published investigation reports; (2) electronic data supporting previous reports or as-yet unpublished investigation reports that were not previously submitted to NMED; and (3) field data, including logbooks, core logs, sample collection logs, field screening data, field survey/project scoping data, mobile laboratory data, etc. Categories 1, 2, and 3 data are being submitted today in response to this request, as discussed in the enclosed response.

15932

The Category 1 data included in this submittal consist of the documents listed in Appendix A. The Category 2 data included in this submittal consist of both the electronic (on CD-ROM) and hard copy formats requested in Part 2 of Attachment A to Request No. 18 for the sites listed in Table A-1. Data sets for 48 of the 108 potential release sites (PRSs) listed in Part 1 of Attachment A to Request No. 18 are provided herein as Appendix C (electronic data) and Appendix D (hard copy data).

These Category 2 data sets have undergone routine quality checks and are certified in accordance with DOE/UC's Hazardous Waste Facility Permit requirements. Today's submittal supersedes in part the non-certified Category 2 data submitted on March 16, 2001. The enclosed response lists the specific PRSs for which data are being provided today, and indicates which electronic and hard copy data files submitted to NMED on March 16, 2001 are superseded by today's submittal.

Category 3 data are being submitted today as listed in Appendix B. In accordance with Instructions 4 and 5, page 3 of NMED's February 12, 2001 letter, as amended in NMED's March 13, 2001 letter, DOE and UC are submitting two copies of documents responsive to the modified definition of Category 3 data (i.e., borehole logs, well construction details/schematics, and pilot testing reports) that were provided in NMED's March 23, 2001 letter.

The listing of the persons responsible for the production of the data used to answer all portions of the response was included in the March 1, 2001 submittal, as required by Request Nos. 20 and 21 of your February 12, 2001 letter. No additional personnel were involved with today's submittal. A certification for the Category 2 data is enclosed as required by 20.4.1 NMAC, Subpart IX, §270.11(d)(1).

Additional information will be provided to NMED as it becomes available, in accordance with the schedule in our March 1, 2001 response. If you have questions concerning this submittal, please contact Gene Turner of my staff at (505) 667-5794 or Jack Ellvinger, UC/LANL, at (505) 667-0633.

Sincerely,

Joseph C. Vozella
Assistant Area Manager
Office of Environment

LAAME:3GT-013

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See page 3

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Response to Request for Information
Pursuant to the New Mexico Hazardous Waste Act
and the Resource Conservation and Recovery Act
Los Alamos National Laboratory
EPA ID No. NM0890010515

Introduction

The following information is the June 1, 2001, portion of the response by Los Alamos National Laboratory (LANL) to a Request for Information (RI) sent by the New Mexico Environment Department (NMED) on February 12, 2001. The full title of the RI is "Request for Information Pursuant to the New Mexico Hazardous Waste Act and the Resource Conservation and Recovery Act, Los Alamos National Laboratory, EPA ID No. 0890010515," received by LANL on February 16, 2001. The RI asked for additional information regarding corrective action requirements in conjunction with the renewal of the LANL Resource Conservation and Recovery Act Hazardous Waste Facility Permit, originally issued on November 8, 1989.

This portion of the response includes information submitted in follow-up to the initial LANL response submitted on March 1, 2001, and subsequent responses. This response includes several tables and appendices providing supplemental information for Request No. 18 of the RI, as discussed in the following paragraphs.

18. For each Site listed in Part 1 of Attachment A, please submit all analytical data in LANL's possession that has not been previously submitted to NMED. Include data that was obtained under a RCRA Facility Investigation for the Site and for which an RFI Report has not been submitted to NMED. Submit the data in compliance with the format and content requirements set forth in Part 2 of Attachment A.

As stated in the Laboratory's March 1, 2001 letter, for the 108 PRSs listed in Attachment A, Part 1 of NMED's letter, data responsive to Request No. 18 falls into three general categories (defined here for purposes of this response only).

- **Category 1** data are data reported in documents previously published (by the Laboratory and others) that have not been previously submitted to the NMED. Some of these data might also be included in Category 2 (defined below), while other data may not. By nature, Category 1 data consist of hard copy records (i.e., published documents). Category 1 documents are listed in Appendix A. Two copies of each document are enclosed.

- **Category 2** data are electronic data currently contained in (or planned to be included in) the database housed in the Laboratory's Facility for Information Management, Analysis, and Display (FIMAD). This includes both data in

published reports that have not been previously submitted to NMED (i.e., Category 1 data) and data not yet published in reports. Category 2 data, therefore, consist of both electronic and hard copy records. Today's submittal includes Category 2 data.

- **Category 3** data are data not contained in FIMAD, but housed elsewhere in the form of field data records, core logs, geophysical logs, field logbook entries, sample collection logs, screening data, field survey/project scoping data, mobile laboratory data, field screening samples, etc. (i.e., data described in Attachment A, Part 2 [page 3] of NMED's letter as "other applicable data results"). In accordance with Instructions 4 and 5 on page 3 of NMED's February 12, 2001, letter (as amended in NMED's March 13, 2001 letter), LANL is submitting two copies of documents responsive to the modified definition of Category 3 data (i.e., borehole logs, well construction details/schematics, and pilot testing reports). Category 3 data, therefore, consist primarily of hard copy (and, occasionally, electronic) records. Today's submittal includes Category 3 data, as listed in Appendix B.

Category 2 data included in this submittal consist of both the electronic (on CD-ROM) and hard copy formats requested in Part 2 of Attachment A to Request No. 18 for the sites listed in Table A-1. Data sets for 48 of the 108 PRSs listed in Part 1 of Attachment A to Request No. 18 are provided herein as Appendix C (electronic data) and Appendix D (hard copy data).

Table A-1
List of Sites Included in Category 2 Data Submittal

ER PRS Number	NMED Attachment A SWMU Number	NMED Attachment A PRS Name
16-008(a)-99	16-008(a)	90's Line
16-003(o)	16-003(o)	Fish Ladder
49-001(a)-00	49-001(a-g)	MDA-AB
06-007(a)-99	06-007(a)-99	MDA-F
09-013	09-013	MDA-M
08-006(a)	08-006(a)	MDA-Q
21-016(a)-99	21-016(a)-99	MDA-T
21-018(a)-99	21-018(a)-99	MDA-V

The Category 2 data sets being submitted today have undergone the Laboratory's routine quality checks and are certified in accordance with the Laboratory's Hazardous Waste Facility Permit requirements. Today's submittal supercedes in part the non-certified Category 2 data submitted to the NMED on March 16, 2001. The previously submitted electronic data files that are being replaced by today's submittal are listed in Table A-2.

Table A-2
March 16, 2001, Electronic Data Files Superceded by Today's Submittal

Excel File Name
06-007(a)_INORGANIC
06-007(a)_ORGANIC
06-007(a)_RAD
09-013_
09-013_INORGANIC
09-013_ORGANIC
09-013_OTHER
09-013_RAD
16-003(o)_INORGANIC
16-003(o)_ORGANIC
21-007_
21-007_INORGANIC_12647
21-007_INORGANIC_12661
21-007_INORGANIC_12664
21-007_INORGANIC_12667
21-007_INORGANIC_12678
21-007_INORGANIC_12691
21-007_INORGANIC_12695
21-007_INORGANIC_12700
21-007_INORGANIC_12721
21-007_INORGANIC_12724
21-007_INORGANIC_12738
21-007_INORGANIC_12741
21-007_INORGANIC_12752
21-007_INORGANIC_12758
21-007_INORGANIC_12996
21-007_INORGANIC_13002
21-007_INORGANIC_13007
21-007_INORGANIC_13013
21-007_INORGANIC_13030
21-007_INORGANIC_13040
21-007_INORGANIC_13047
21-007_INORGANIC_13053
21-007_INORGANIC_13058
21-007_INORGANIC_13070
21-007_INORGANIC_13076
21-007_INORGANIC_13080
21-007_INORGANIC_13091
21-007_INORGANIC_13093
21-007_INORGANIC_13125
21-007_INORGANIC_13148

Excel File Name
21-007_INORGANIC_13156
21-007_INORGANIC_13163
21-007_INORGANIC_13293
21-007_INORGANIC_15238
21-007_INORGANIC_15240
21-007_INORGANIC_15246
21-007_ORGANIC_SVOA_12648
21-007_ORGANIC_SVOA_12662
21-007_ORGANIC_SVOA_12673
21-007_ORGANIC_SVOA_12679
21-007_ORGANIC_SVOA_12692
21-007_ORGANIC_SVOA_12701
21-007_ORGANIC_SVOA_12703
21-007_ORGANIC_SVOA_12714
21-007_ORGANIC_SVOA_12722
21-007_ORGANIC_SVOA_12725
21-007_ORGANIC_SVOA_12739
21-007_ORGANIC_SVOA_12742
21-007_ORGANIC_SVOA_12753
21-007_ORGANIC_SVOA_12995
21-007_ORGANIC_SVOA_13008
21-007_ORGANIC_SVOA_13014
21-007_ORGANIC_SVOA_13019
21-007_ORGANIC_SVOA_13031
21-007_ORGANIC_SVOA_13046
21-007_ORGANIC_SVOA_13059
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21-007_ORGANIC_SVOA_13092
21-007_ORGANIC_SVOA_13095
21-007_ORGANIC_SVOA_13126
21-007_ORGANIC_SVOA_13149
21-007_ORGANIC_SVOA_13157
21-007_ORGANIC_SVOA_13294
21-007_ORGANIC_SVOA_15187
21-007_ORGANIC_SVOA_15193
21-007_ORGANIC_SVOA_15231
21-007_ORGANIC_VOA
21-007_OTHER
21-007_RAD
21-016(a)_INORGANIC
21-016(a)_ORGANIC_SEMI
21-016(a)_ORGANIC_SEMIGCMS
21-016(a)_ORGANIC_SEMIN
21-016(a)_ORGANIC_VOAGCMSN
21-016(a)_RAD
21-018(a)_

Excel File Name
21-018(a)_INORGANIC
21-018(a)_ORGANIC
21-018(a)_OTHER
21-018(a)_RAD
49-001(a)_INORGANIC
49-001(a)_RAD
49-001(b)_
49-001(b)_INORGANIC
49-001(b)_ORGANIC
49-001(b)_OTHER
49-001(b)_RAD
49-001(c)_
49-001(c)_INORGANIC
49-001(c)_RAD
49-001(d)_
49-001(d)_INORGANIC
49-001(d)_RAD
49-001(e)_INORGANIC
49-001(e)_RAD
49-001(f)_INORGANIC
49-001(f)_RAD

Table A-3 lists the page numbers in the previously submitted hardcopy data submittal that are being superceded by today's hardcopy submittal.

Table A-3
March 16, 2001, Hardcopy Submittal Pages Superceded by Today's Submittal

Attachment A PRS Name	Page Numbers
Fish Ladder	2500 through 2568
MDA-AB	2944 through 3141
MDA-F	4960 through 5000
MDA-M	5237 through 5649
MDA-T	6092 through 8386
MDA-V	8746 through 9236

The following considerations apply to today's Category 2 data submittal.

- The Location ID and Sample ID list for each PRS has been verified by checking hardcopy records and maps.

- Analytical data for samples that represent environmental media that has subsequently been removed in a remedial action have been identified and are provided in a separate Excel file for each site, as applicable.

- Analytical data for samples collected solely for the purposes of waste characterization, health and safety, field screening, background characterization, and quality control have been identified and are provided in separate Excel files for each site.

- Screening-level analytical data, including that reported by mobile laboratories, have been identified and are provide in a separate Excel file for each site, as applicable.

- The focused data validation qualifier (Item No. 18 on page 3, Part 2 of Attachment A) has been provided in each data set. The focused data validation qualifier is assigned as part of the quality assurance process based on an evaluation of the analytical laboratory-provided qualifier and ER Project routine validation qualifier.

Category 3 data are being submitted today for PRSs listed in Attachment A, Part 2 of NMED's February 12, 2001, letter that are overseen by the LANL Environmental Restoration Project's Material Disposal Areas Focus Area and the RCRA Corrective Actions Focus Area, Firing Sites Team. In accordance with Instructions 4 and 5 on page 3 of NMED's February 12, 2001, letter (as amended in NMED's March 13, 2001 letter), LANL is submitting two copies of documents responsive to the modified definition of Category 3 data (i.e., borehole logs, well construction details/schematics, and pilot testing reports). Appendix B is a list of the Category 3 documents being submitted today.

CERTIFICATION

CATEGORY 1 AND 2 DOCUMENTS SUBMITTED IN THE JUNE 1, 2001, RESPONSE TO REQUEST FOR INFORMATION PURSUANT TO THE NEW MEXICO HAZARDOUS WASTE ACT AND THE RESOURCE CONSERVATION AND RECOVERY ACT, LOS ALAMOS NATIONAL LABORATORY EPA ID No. 0890010515

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate 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 violations.

Dennis J. Erickson
Division Director for Environment, Safety, and Health Division
Los Alamos National Laboratory
Operator

May 31, 2001
Date Signed

Joseph C. Vozella
Assistant Area Manager, Los Alamos Area Office
U.S. Department of Energy
Albuquerque Operations
Owner/Operator

5/31/01
Date Signed

APPENDIX A

CATEGORY 1 HARDCOPY DOCUMENTS

Hardcopies were provided to
the New Mexico Environment Department as a separate package.

Appendix A
Category 1 Hardcopy Documents

PRS	Title/Subject	Date of Document	LA-UR # or Reference #	ER ID #	Request Number	Due Date to NMED	Special Notes/Comments	Contact Person
21-016(a)-99	RFI Report for Potential Release Sites 21-016(a-c), 21-011(c), 21-028(a), C-21-009, C-21-012	Nov-96	LA-UR-96-4508	69781	18	6/1/01		John Hopkins

APPENDIX B

CATEGORY 3 HARDCOPY INFORMATION

Hardcopies were provided to
the New Mexico Environment Department as a separate package.

Appendix B
Category 3 Hardcopy Information

PRS No.	ER ID #	Request Number
39-001(b) MDA Y	70013	18
33-002(a)-99 MDA-K	70014	18
36-001 MDA-AA	70015	18
39-008	70016	18
39-004(a-e)	70017	18
33-008(e)	70018	18
33-003(b) MDA-D	70019	18
15-008(a)	70020	18
15-006(d)	70021	18
15-006(c)	70022	18
15-006(a)	70023	18
15-004(f)	70024	18
15-007(b) MDA Z	70025	18
15-007(a) MDA N	70026	18
21-016(a)-99	69789	18
21-018	69764	18

APPENDIX C

CATEGORY 2 ELECTRONIC DATA

Electronic copies were provided to
the New Mexico Environment Department.

APPENDIX D

CATEGORY 2 HARDCOPY DATA

Hardcopies were provided to
the New Mexico Environment Department as a separate package.

RFI Report for Potential Release Sites

21-016(a–c)
21-011(c)
21-028(a)
C-21-009
C-21-012

Material Disposal AreaT

Field Unit 1

Environmental Restoration Project

November 1996

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-96-4508

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1.0 INTRODUCTION

This report presents the results of a portion of the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at Material Disposal Area T (MDA T) and its drainage area at Technical Area (TA) 21 of Los Alamos National Laboratory (LANL). Included in this report are data from the surface investigation, the approach used to assess and analyze these data, conclusions drawn from these data, and recommendations for further surface investigations at MDA T.

The history of operations at MDA T, data from previous investigations, and the sampling and analysis plan for surface and subsurface investigations are presented in Section 16.3 of the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689).

The investigations at MDA T address seven potential release sites (PRSs), which were defined in the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689). Four of these sites (PRSs 21-016[a, b, and c] and PRS 21-011[c]) are Hazardous and Solid Waste Amendments (HSWA) solid waste management units (SWMUs) listed in Module VIII of LANL's RCRA operating permit. Three of these sites, PRS 21-028(a) and areas of concern (AOCs) C-21-009 and C-21-012, are not HSWA SWMUs.

1.1 General Site History

TA-21 is located on Delta Prime (DP) Mesa, immediately east-southeast of the Los Alamos townsite and on the northern boundary of LANL (Fig. 1.1-1 and Fig. 1.1-2). TA-21 was used primarily for plutonium research, metal production, and related activities from 1945 to 1978. Additional background information is presented in Chapter 3 of the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689).

MDA T is located midway along DP Mesa (Fig. 1.1-3) and measures approximately 2.21 acres. Contributors to surface contamination at MDA T include spills of radioactively contaminated cement paste that were pumped into asphalt-lined disposal shafts and retrievable corrugated metal pipes. At the locations where the radioactively contaminated cement paste was spilled, two AOCs (C-21-009 and C-21-012) have been identified. Spilled material may also have run into the drainages below MDA T. A satellite container storage area, SWMU 21-028(a), may also have contributed to surface contamination at MDA T, but its exact location is unknown. In addition, activities at facilities surrounding MDA T, the old waste facility (Building 35 built in 1952) to the south, and the new waste facility (Building 257 built in 1967) to the east, may have

original surface

contributed to surface contamination at MDA T. The drainage from the new waste treatment facility was a national pollutant discharge elimination system (NPDES) permitted outfall (SWMU 21-011[k]) but it may also have contributed to surface contamination in the drainage below MDA T. Recent interviews with LANL staff involved with operating the waste treatment operations at building TA-21-257 indicate that there was at least one instance when the effluent that was intended to be discharged to the outfall at 21-011(k) was directed to bed 4 of MDA T and overflowed across the north perimeter road and into DP Canyon. It is probable that MDA T drainage would affect the outfall at SWMU 21-011(k).

Major contributors to subsurface contamination at MDA T include (1) four absorption beds (SWMU 21-016[a]) used in the disposal of liquid wastes from TA-21 activities, (2) the retrievable waste storage area located between absorption beds 1 and 3 from which all waste had been removed by 1986 (SWMU 21-016[b]), (3) the disposal shafts (SWMU 21-016[c]) located between absorption beds 2 and 4, and (4) a distribution box (SWMU 21-011[c]) located between absorption beds 1 and 2. There is some confusion about the identity of SWMU 21-016(b), which has been assigned to the retrievable waste storage area and to a caisson in the northwest corner of absorption bed 1. According to the 21-016 SWMU report, dated October 31, 1990, "A pit, TA-21-186 (SWMU 21-016[b]), was built in 1959 of redwood and it was about 6 ft by 10 ft by 30 ft deep. The pit was located between two rows of adsorption beds. This pit, referred to as the 'Snake Pit', was used for monitoring purposes and did not contain waste. From 1974 to 1982, transuranic wastes were mixed with cement and pumped into corrugated metal pipes into the pit. There were 175 corrugated metal pipes (2.5 ft in diameter, 20 ft long) in the pit, which was located between adsorption beds 1 and 3. In 1984 to 1986, the pipes were transported to TA-54 with the intention of shipping them to the WIPP site near Carlsbad, NM." The SWMU report also states, "A 30-ft deep caisson (the 'Snake Pit') was dug to obtain horizontal cores in 1961..." (LANL 1990, 0145). It is clear by the descriptions in the SWMU report that, although the physical description of the caisson is given, the retrievable waste storage area is actually the SWMU because "...transuranic wastes were mixed with cement and pumped into corrugated metal pipes into the pit."

In 1987, the surface of MDA T was regraded to slope into DP Canyon and to control run-on and run-off. The regraded surface was capped with 6–12 in. of topsoil and reseeded.

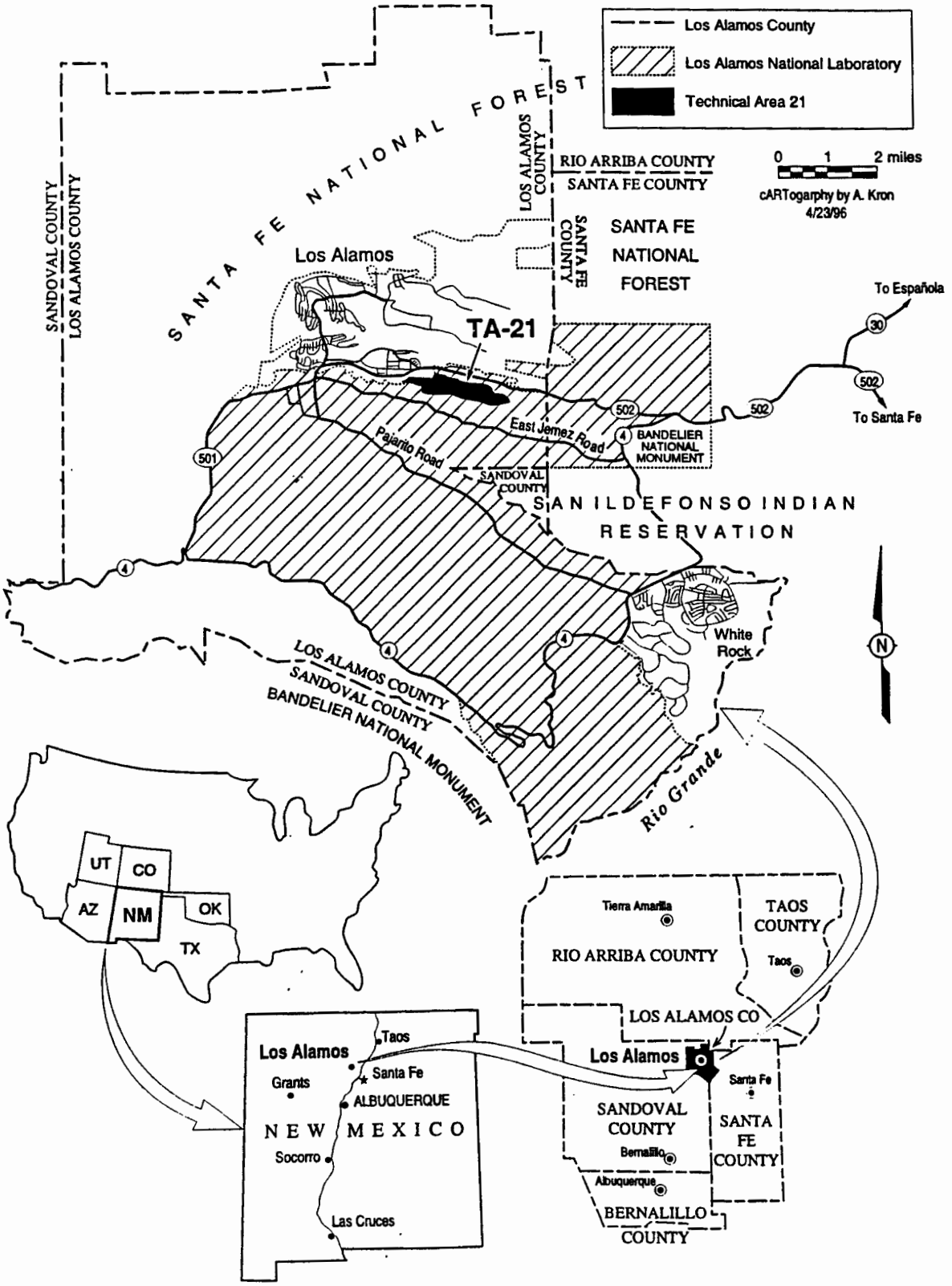

Fig. 1.1. Location map of TA-0 within Los Alamos National Laboratory, Los Alamos County,New Mexico.

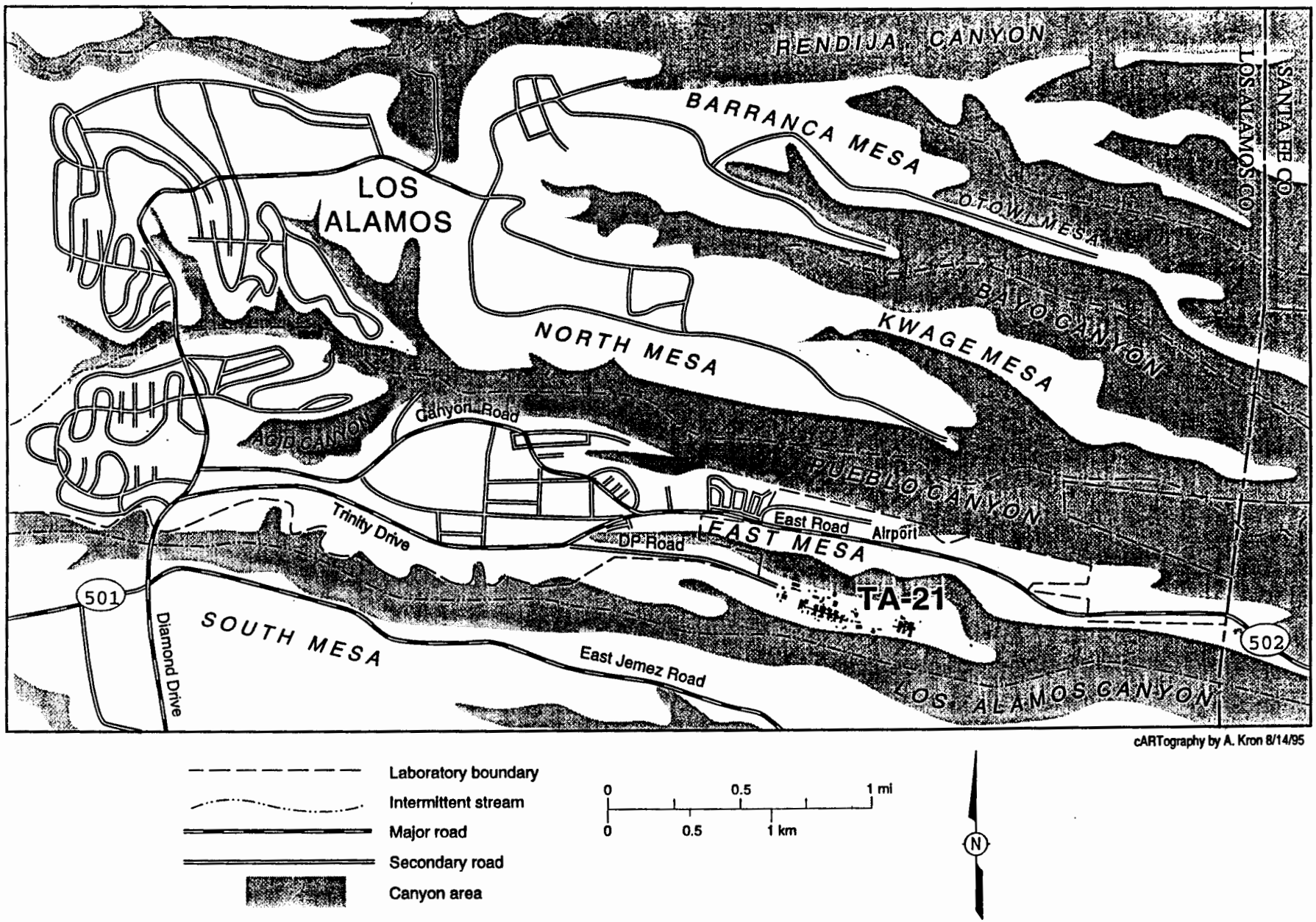

Fig. 1.1-2. General Location of TA-21 (DP Site).

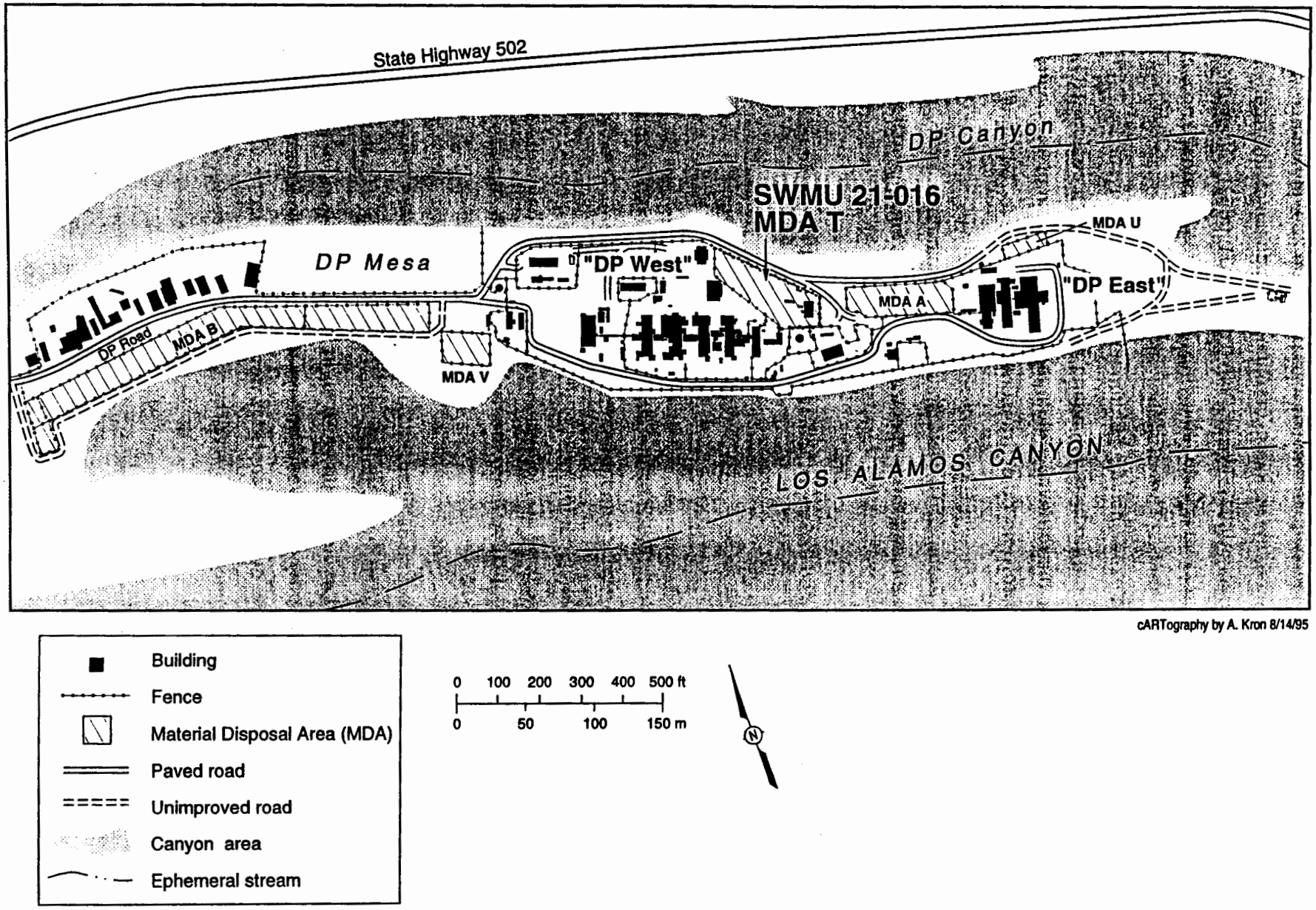

Fig. 1.1-3. Location of MDA T at TA-21.

The absorption beds at MDA T received americium-241, plutonium-238, plutonium-239/240, tritium, natural uranium, and possibly enriched uranium. For additional information, see Section 16.3.1 of the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689). Other chemicals received by the absorption beds may have included metals, carbonates, citrates, acids, bases, organic compounds, and solvents. The disposal shafts contained americium-241, plutonium-238 and plutonium-239/240 (including plutonium in several bathyspheres buried at various depths), and mixed fission products (including strontium-90 and cesium-137). The corrugated metal pipes stored in the retrievable storage area also contained americium-241, plutonium-238, plutonium-239/240, and other transuranic radionuclides, but they were all removed in 1984 and 1986. The chemicals stored at the satellite container storage area included alcohol, acetone, and Freon™. The two spills of contaminated cement paste that occurred in 1976 and 1978 and caused the respective locations to become AOCs included americium-241.

Additional information is presented in Subsection 16.3 of the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689).

1.2 RFI Overview

As stated in Sections 16.1.4 and 16.3.2 of the TA-21 Operable Unit RFI Work Plan, the objectives of the Phase I MDA T surface and drainage investigation were (1) to determine the nature and extent of contamination of surface soil both within the fence and beyond the fence to the canyon edge north of MDA T, and (2) to evaluate the possibility that contaminants may have migrated from the surface of MDA T into the drainage channels leading to DP Canyon (LANL 1991, 0689).

Planned soil sampling activities are detailed in Sections 16.1.4 and 16.3.4 of the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689). At MDA T, sampling was planned for soil depths of 6 in. on the mesa and at depths up to 18 in. in the drainages. Based on historical TA-21 operations and results of previous investigations, analyses of radioactive contaminants were deemed of greatest concern, but other analyses were also planned to provide a complete understanding of surface contamination at MDA T. The following activities were planned for the 1993 field season at MDA T.

1. Conduct a land survey of MDA T on a 65.6 x 65.6-ft grid.

2. Conduct a radioactivity survey of MDA T.

3. Collect

   - 40 samples from the top 6 in. of soil on the surveyed grid,

   - ten samples off the grid (five within the fenced area and five in the area to the north) to determine whether the sampling pattern accurately represents the area, and

   - up to ten contingency samples (from areas where the radiation survey identified elevated radioactivity) to characterize the extent to which contamination may have migrated.

4. Collect field radiological screening samples.

5. Analyze all samples for radionuclides, metals, and semivolatile organic compounds (SVOCs).

6. Analyze contingency samples for volatile organic compounds (VOCs), if needed.

To help investigators assess the effects of operations at and near MDA T in the MDA T drainage area, four activities were planned during the 1994 field season. These activities are listed below.

1. Identify drainage channels and local sediment storage sites based on geomorphic maps completed in 1992 and reported in the Phase Report 1A, RCRA Facility Investigation for OU TA-21 (LANL 1993, 1076).

2. Collect samples from depths of 0 to 6 in., 6 to 12 in., and 12 to 18 in. at each of five locations in the drainage channels.

3. Collect field radiological screening samples.

4. Analyze all samples for radionuclides, metals, and SVOCs.

To define the source term and the lateral and vertical extent of contamination, an initial subsurface investigation at MDA T will include vertical and angled boreholes. Migration of contaminants that has occurred since 1978 beneath absorption bed 1 will be evaluated by drilling a hole close to a previous borehole. This subsurface investigation is detailed in Section 16.3.4.2 of the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689); results will be assessed in a separate RFI report. In addition, subsequent surface and subsurface investigations are planned to begin after all initial investigations have been completed and reported.

1.3 Field Activities

Field activities were conducted at MDA T in July 1993. A geodetic survey of MDA T was performed to establish the radiological survey grid and to mark locations of soil samples. Thirty-three locations on a 65.6 x 65.6-ft grid and seventeen locations off the grid were marked.

A radiological survey of MDA T was conducted using the following instruments: a FIDLER G-5 sodium iodide scintillation detector that identifies low-energy gamma radiation, a Ludlum 44-10 sodium iodide detector that identifies gamma radiation, a Ludlum 19 sodium iodide microμ meter that also identifies gamma radiation, a Ludlum 44-9 pancake GM detector that identifies beta and gamma radiation, and a Ludlum 43-1 zinc sulfide detector that identifies alpha radiation. Part of the survey was conducted according to LANL-ER-SOP-06.23, R0, "Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector."

The field crew collected 33 samples on the surveyed grid, 17 samples off the grid, and 3 field duplicates from the top 6 in. of soil at MDA T by following LANL-ER-SOP-06.09, R0, "Spade and Scoop Method for Collection of Soil Samples." Samples were handled according to LANL-ER-SOP-01.02, R0, "Sample Containers and Preservation," and LANL-ER-SOP-01.03, R0, "Handling, Packaging, and Shipping of Samples." All samples were tracked according to LANL-ER-SOP-01.04, R1, "Sample Control and Field Documentation."

The field crew screened samples for radiation to ensure worker health and safety. The mobile radiological analytical laboratory (MRAL) screened soil samples for gross alpha, beta, and gamma radiation to ensure that radiological criteria for sample transport and for sample acceptance by analytical laboratories were not exceeded. Samples were also analyzed in the MRAL for cesium-137.

Field activities at the MDA T drainage took place in August 1994. A field crew collected 15 samples and 2 field duplicates from the top 12 in. of sediment by following the instructions in LANL-ER-SOP-06.09, R0, "Spade and Scoop Method for Collection of Soil Samples." Samples were handled according to LANL-ER-SOP-01.02, R0, "Sample Containers and Preservation," and LANL-ER-SOP-01.03, R1, "Handling, Packaging, and Shipping of Samples"; they were tracked according to LANL-ER-SOP-01.04, R2, "Sample Control and Field Documentation."

At the MDA T drainage, the field crew screened soil samples for radiation to ensure worker health and safety. Part of the screening was conducted according to LANL-ER-SOP-10.07, R0, "Field Monitoring for Surface and Volume Radioactivity Levels." The MRAL screened soil samples for gross alpha, beta, and gamma radiation to ensure that radiological criteria for sample transport and for sample acceptance by analytical laboratories were not exceeded.

1.4 Deviations

Field activities at MDA T and its drainage deviated from the planned approach when the sampling grid was changed. Because the number of samples required in the TA-21 Operable Unit RFI Work Plan was based on an incorrectly scaled map, there were more sampling locations than the expected number (LANL 1991, 0689). The originally planned grid contained fewer sample locations than the actual 65.6 x 65.6-ft grid when it was marked in the field. Although the originally planned total of 50 samples was collected, several planned sample locations at the northwest corner (near Building 21-286) and southeast corner (near Building 21-257) of the planned grid were omitted. In addition, it appears that the actual sampling grid was shifted slightly to the east, and several locations that should have been sampled on the western edge of MDA T were omitted. Because the planned sampling grid was intended to cover MDA T fully and to extend beyond MDA T in three directions, this deviation may prevent a complete assessment of contamination within and beyond MDA T.

Another deviation occurred when drainage samples were collected at finer intervals than the 0- to 6-in., 6- to 12-in., and 12- to 18-in. intervals called for in the work plan. Samples were collected instead at 0- to 3-in., 3- to 6-in., and 6- to 12-in. intervals. This change was made because a geomorphic study at TA-21 indicated that sediments deeper than 12 in. would have been deposited in the drainages before 1940.

2.0 ENVIRONMENTAL SETTING

The environmental setting of the Laboratory is described in Section 2.4 of the Installation Work Plan (IWP) for Environmental Restoration (LANL 1995, 1164). A detailed discussion of the environmental setting for TA-21, including climate, geology, hydrology, and a conceptual hydrogeologic model for the area and its surroundings, is presented in the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689). A summary is presented in the following sections.

2.1 Climate

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

2.2 Geology

2.2. Geologic Setting

A detailed discussion of the geology of the Los Alamos area can be found in Section 2.5.1.3 of the IWP (LANL 1995, 1164). Reports of geological studies at TA-21 are presented in "Earth Science Investigations for Environmental Restoration—Los Alamos National Laboratory Technical Area 21" (Broxton and Eller 1995, 1162). A summary of that material, emphasizing conditions relevant to MDA T is presented below.

TA-21 is located on DP Mesa at an elevation of 7 120–7 150 ft. The area is bounded on the north by DP Canyon and on the south by Los Alamos Canyon. All PRSs are mesa-top sites. Bedrock underlying the site is cooling unit 3 of the Upper (Tshirege) Member of the Bandelier Tuff (Fig. 2.2-1), comprised of fallout and ash flow deposits of silicic volcanic rock erupted 1.5–1.2 million years ago. Cooling unit 3 is a cliff-forming, nonwelded to partially welded unit. At this location, the Bandelier Tuff is approximately 710 ft thick.

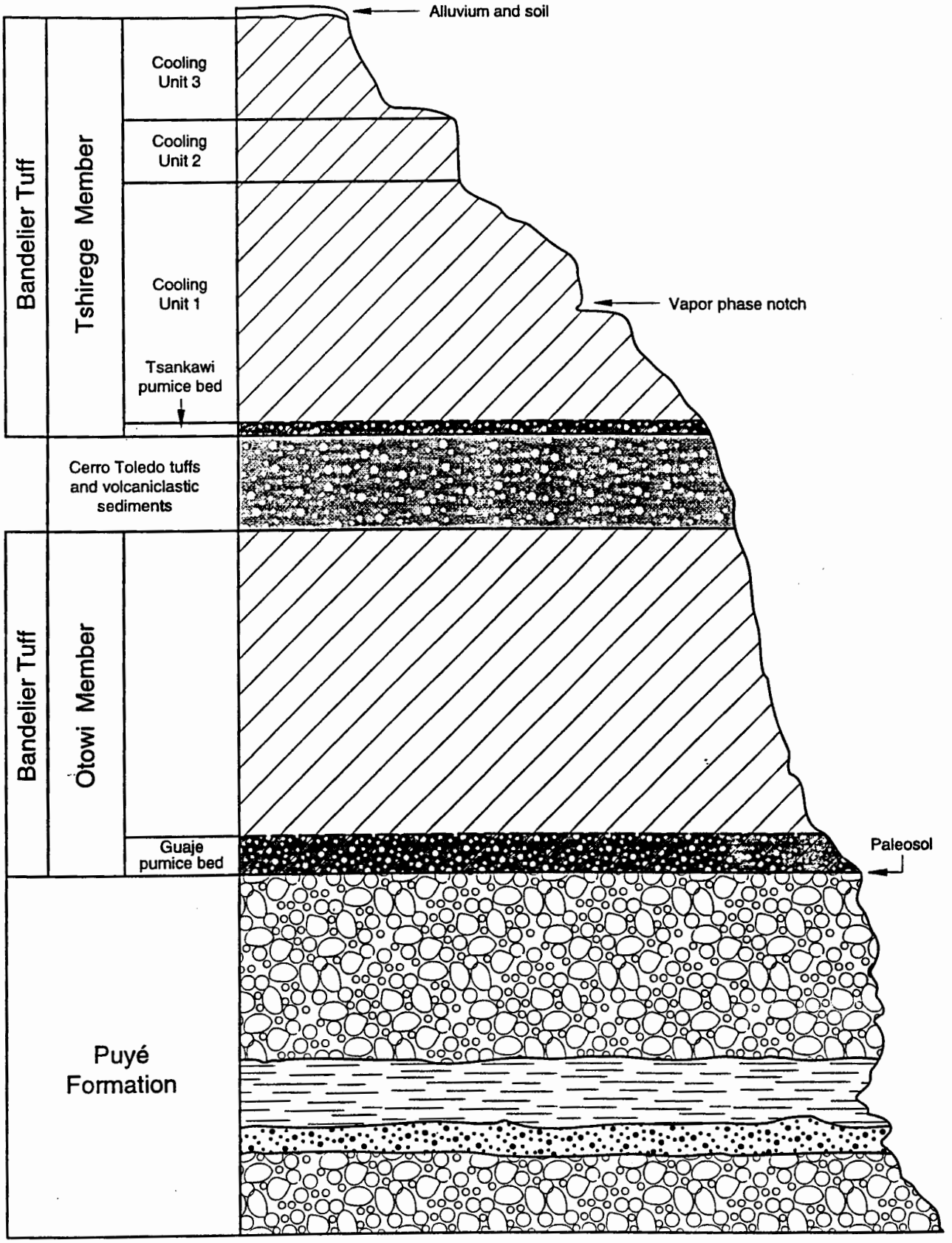

Fig. 2.2-1. Generalized Stratigraphy at TA-21.

Bandelier Tuff is overlain by 0–20 ft of alluvium, which consists of poorly sorted, clay-rich sand and gravel. Alluvium is generally thickest near the center of the mesa and thin to absent at mesa edges. Much of the alluvium consists of angular to subrounded lithic clasts of Tshicoma volcanic rocks, and of crystals of feldspar, quartz, and biotite and other ferromagnesian minerals derived from the Tshicoma Formation. In addition, the alluvium contains clasts of pumice and tuff probably derived from units of the Bandelier Tuff, the Cerro Toledo tuffs, and possibly from the El Cajete Tuff.

Bandelier Tuff is underlain by sedimentary rocks of the Puyé Formation, which consists of fine-to coarse-grained fanglomerates interbedded locally with axial river gravels and lacustrine siltstone and clay. Material comprising the fanglomerates is derived mainly from the Tschicoma Formation to the west.

2.2.2 Soils

A detailed discussion of the soils in the Los Alamos area can be found in Section 2.5.1.3 of the IWP (LANL 1995, 1164). A summary of that material specific to TA-21 is presented below. At undisturbed areas at TA-21, the soil is composed of moderate to well developed soils on Bandelier Tuff and alluvium. Soils belong to either the Hackroy or Nyjack soil series (Nyhan et al. 1978, 0161). The Hackroy series consists of very shallow to shallow, well-drained soils that have an A-Bt-R profile. Soil textures range from sandy loam to clay. The Nyjack series consists of moderately deep, well-drained soils that have an A-Bt-C-R profile. Texture ranges from gravely, sandy loam to clay loam. In the TA-21 area, the R horizon is highly fractured Bandelier Tuff that shows signs of incipient weathering, and usually has clay-rich soil matrix along bedrock fractures.

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

2.3 Hydrology

2.3.1 Surface water

Surface flow occurs as sheetflow during precipitation events, mainly summer thunderstorms. Sheetflow may transport sediments from the mesa surface to adjacent canyons.

2.3.2 Groundwater

The main aquifer beneath the former TA-21 is at an elevation of approximately 5 900 ft (determined in Test Well 2, Pueblo Canyon, and in Otowi 4, Los Alamos Canyon), chiefly within sediments of the Puyé and Tesuque Formations (LANL 1995, 1293; Broxton and Eller 1995, 1162). Thus, for mesa-top sites at TA-21, more than 1 200 ft of tuff and volcaniclastic sediments separate the surface from the main aquifer. In addition to the main aquifer, perched aquifers exist at TA-21. Shallow alluvial aquifers are present in sediments of both Los Alamos Canyon and in DP Canyon, a side canyon that merges with Los Alamos Canyon east of TA-21. These aquifers were intercepted by drill holes LADP 3, LAUZ-1, and LAUZ-2 (Broxton and Eller 1995, 1162). Another perched aquifer, encountered in drill hole LADP-3, is present in the Guaje pumice bed at the base of the Bandelier Tuff, approximately 325 ft below the floor of Los Alamos Canyon (Broxton and Eller 1995, 1162). Unpublished information from drill cores at the former TA-10 show that the top of the Puyé Formation is a weakly to moderately developed paleosol (old soil profile) containing a significant amount of clay. The clay content of the paleosol apparently reduces the permeability enough for water, if available, to perch on top of the Puyé Formation, within the overlying Guaje Pumice Bed (Fig. 2.2-1). That is, the paleosol at the top of the Puyé acts as an aquitard. From borehole LADP-4, the aquifer at the base of the Bandelier tuff is known not to be present in DP Canyon, approximately 1 300 north of LADP-3, and therefore probably does not underlie TA-21. The perched aquifer continues up the canyon at least 3 280 ft, based on well LAOI(A)-1.1, but the lateral continuity of the aquifer in other directions beyond TA-21 is not known at present.

A perennial spring (DP Spring), located on the north side of lower DP Canyon 3 280 ft east-northeast of LADP-4 (Broxton and Eller 1995, 1162), discharges at a rate of 1–4 gal. per minute (LANL 1995, 1293). Possibly the source of water that emerges at DP Spring is from alluvial groundwater in DP Canyon, or, alternatively, from a water body perched within the Bandelier Tuff (between units 1g and 1v) beneath DP Mesa (Broxton and Eller 1995, 1162). However, no perched zone with the Bandelier Tuff was encountered in LADP-4 to support the latter possibility. Study of DP Spring is ongoing.

2.4 Biological Surveys

Comprehensive plant and animal inventories are required by the Federal Endangered Species Act of 1973; the New Mexico Wildlife Conservation Act; Executive Order 11990, Protection of Wetlands; Executive Order 11988, Floodplain Management; 10 CFR 1022; Compliance with

Floodplain/Wetlands Environmental Review Requirements (DOE 1979, 0633); and DOE Order 5400.1, General Environmental Protection Program (DOE 1988, 0075). The required inventories have been performed for the area surrounding this site and the habitat description will be included in the ecological RFI report prepared for the ecological exposure unit in which MDA T is located.

The mesa top where MDA T is located has heavy commercial development and urban disturbance from past TA-21 operations and roadwork. The habitat in this area is described in detail in the biological survey of TA-1 and TA-21 (Bennett 1992, 01-0008).

The preurban natural overstory for the eastern portion of the mesa was a pinion-juniper woodland. The understory currently includes grasses and forbs commonly found in disturbed soils (western wheat grass, Canada bluegrass, bottlebrush squirreltail, cheat grass, sand dropseed, summer cypress, prickly lettuce, and horseweed). There are no threatened or endangered species in the immediate vicinity of this site. Drainages flow north from MDA T and into DP Canyon. DP Canyon receives drainage from many sites along the canyon rim, from its origin in the townsite to its confluence with lower Los Alamos Canyon.

2.5 Cultural Surveys

The National Historic Preservation Act requires a cultural resource survey. However, a survey was not conducted in the area of MDA T because the site is a developed, urban area and a survey would not be relevant.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSES

The decision approach used for MDA T involves a series of quantitative steps that occur after the field investigation, chemical analysis, and data reporting are complete. These steps begin with routine data validation and continue with more focused data validation, if necessary. Routine validation involves validating each data item against specific targets and adding qualifier flags to the data to signify a potential deficiency. Focused validation consists of analyzing quality assurance/quality control (QA/QC) data for their potential impact on the succeeding data assessment steps (i.e., comparing site data to background concentration data, verifying the identities of detected organic chemicals, comparing site data to screening action levels [SALs] for human health impacts, and performing human health risk assessments

when necessary). The following sections provide overviews of the methods used to complete these quantitative steps. Further details can be found in the guidance document, Technical Approach to RFI Reports (LANL in preparation, 1281).

3.1 Sample Analysis

All samples requiring chemical analysis and documentation are submitted to the sample management office (SMO) and/or the mobile chemistry analytical laboratory (MCAL) for analysis.

3.1.1 Analytical Methods

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

3.1.2 Data Validation

Data verification and validation procedures are used to determine whether data packages have been generated according to specifications and contain the information necessary to determine data sufficient for decision-making.

Data verification is a check of data deliverables against a set of stated requirements to ensure that what has been ordered has been delivered. All analytical data generated in support of the ER Project are verified.

Data validation is the process of determining whether individual results (a datum) can be reliably used to support the decision-making process. During the process, validators determine whether data should be qualified or used with caution because of the potential impact of noted flaws or the failure to achieve analytical precision or bias constraints.

Routine validation is the comparison of quality indicators (such as surrogate recovery, measurements of method blanks, holding times, and differences between replicate measurements) with clearly defined limits to determine whether limitations may need to be placed on the use of the data. Routine validation is most suitable for routine analyses and for those nonroutine analyses for which clearly defined limits have been established.

The focused data validation process addresses those characteristics of the data (e.g., precision and bias) that directly affect the decisions to be based on the data. The same data set may undergo different focused validations for different decisions.

3.2 Background Comparisons

Once the data validation process is complete and the site data are finalized, the next step in the process is to compare site data with available background data. The results of a focused data validation should exclude from consideration for background comparison any contaminant that is identified as an artifact of laboratory or field contamination, analytical interference, or improper analyte identification or quantitation. The purpose of this decision step is to determine if chemicals that have natural or anthropogenic background distributions should be retained as COPCs or eliminated from further consideration. Background data are available from two sources: (1) soil samples collected throughout Los Alamos County for which chemical analyses were performed for certain inorganic (metal) chemicals and naturally occurring radioactive chemicals (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266); and, (2) background concentrations of radioactive chemicals associated with global fallout from atmospheric nuclear testing (e.g., plutonium, cesium, strontium, and tritium) reported in LANL Environmental Surveillance reports (Purtymun et al. 1987, 0211; ESG 1988, 0408; ESG 1989, 0308; Environmental Protection Group 1990, 0497; Environmental Protection Group 1992, 0740).

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

Details of statistical methods used to generate UTLs from the background data sets and suggestions for statistical methods for comparing site and background concentration distributions are presented in the guidance document, Statistical Comparisons to Background, Part I (Environmental Restoration Project Assessments Council 1995, 1295). Further statistical comparisons between site and background data might be performed when UTLs are exceeded.

If a chemical has a reported concentration that exceeds its UTL, or fails other statistical background comparison tests (i.e., the site data are statistically greater than background data), then that chemical is carried forward through the screening assessment process. If a chemical

does not have a reported concentration that exceeds the UTL, then that chemical is removed from further consideration.

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

3.3 Evaluation of Organic Constituents

Background data are not available for organic chemicals. The preliminary evaluation of organic chemicals considers detected chemicals and chemicals that were analyzed for but not detected in any sample. The purpose of this decision step is to determine if organic chemicals should be retained as COPCs or eliminated from further consideration based on detection status. Detection status is determined by the analytical laboratory on a sample-by-sample, analyte-by-analyte basis. Estimated quantitation limits (EQLs) have been established for each analyte as reporting limits when the analyte is not detected. It should be noted that the EQLs reported for individual samples are dependent on a number of factors and may vary from sample to sample and from analysis to analysis. Therefore, the sample-specific EQL for a chemical must be used in this comparison.

If a chemical has a reported concentration that exceeds its reporting limits, then that chemical is generally carried forward through the screening assessment process. If a chemical does not have a reported concentration that exceeds its reporting limits, then that chemical is generally removed from further consideration. Exceptions to these general rules may be made if site-specific process knowledge so indicates. A chemical that is detected may be removed from further consideration if it can be determined that its presence is not due to Laboratory operations, and a chemical that is not detected in any sample may be carried through the decision process if the chemical can be expected to be present at the site based on historical operations.

3.4 Human Health

3.4.1 Risk Due to Background

Background risks can result from inorganics that are naturally occurring at a site. Calculation of background risks using the same methodology as site risk estimates provides a frame of reference for risk levels calculated at a site. This information provides a basis for determining

risk-based remediation goals, which in some circumstances may be set at target risks comparable with background rather than default values (i.e., cancer risk of 1E-6 or hazard index of 1). Background risks can also affect decisions at sites that have constituents for which there are thresholds of toxicity. For some inorganics, background intakes may be near a toxicity threshold such that incremental intakes associated with contamination may be unacceptable.

Background risks calculated here use the same exposure assumptions by which SALs are calculated. SALs are based on health-protective assumptions for a residential scenario (EPA 1995, 1307). For soil exposure, the pathways include incidental soil ingestion, inhalation of resuspended dust, and dermal contact with soil. Background soil data represent several soil horizons from geographically diverse locations. Background risks are estimated for both a median concentration and the UTL from the entire background data set to present the range of potential risk associated with different soil constituent concentrations found in and around Los Alamos (Longmire et al. 1995, 1142). The background risks based on the LANL SAL residential exposure model are provided in Table 3.4.1-1.

Risks due to background are presented for both noncarcinogenic and carcinogenic outcomes. The potential for adverse noncarcinogenic health effects is estimated by a hazard quotient. Intakes leading to a hazard quotient up to 1 are not associated with adverse health effects. None of the median background concentrations result in hazard quotients greater than 1. The hazard quotient of the UTL concentration for manganese exceeds 1 (1.9). However, given the unlikely occurrence of this concentration, the conservative assumptions in the exposure assessment, the margin of safety in the reference dose, and the exceedance of less than a factor of 2, this intake estimate is not expected to be associated with adverse health effects.

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

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

TABLE 3.4.1-1

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

SOIL INORGANIC	BACKGROUND SOIL CONCENTRATION[b] (mg/kg)		HAZARD QUOTIENT		LIFETIME CANCER RISK	
	Median	UTL	Median	UTL	Median	UTL
Aluminum	10 000	38 700	0.13	0.5	nc[c]	nc
Antimony	0.6	1.0	0.019	0.032	nc	nc
Arsenic	4.0	7.82	0.18	0.36	1.1E-5	2.1E-5
Barium	130	315	0.025	0.059	nc	nc
Beryllium	0.895	1.95	0.0027	0.0059	6.4E-6	1.4E-5
Cadmium[d]	0.20	2.76	0.0053	0.071	1.4E-10	1.9E-9
Chromium[e]	7.2	16.1	0.00009	0.0002	nc	nc
Cobalt	6.0	19.2	0.0013	0.0042	nc	nc
Copper	5.75	30.7	0.0021	0.011	nc	nc
Lead[f]	12	23.3	0.03	0.058	nc	nc
Manganese	320	714	0.84	1.9	nc	nc
Mercury	0.05	0.1	0.0022	0.0043	nc	nc
Nickel	7.0	15.2	0.0047	0.01	nc	nc
Selenium	0.3	1.7	0.00078	0.0045	nc	nc
Thallium	0.2	1.0	0.033	0.16	nc	nc
Uranium	0.9	1.87	0.0039	0.0081	nc	nc
Vanadium	21	41.9	0.039	0.078	nc	nc
Zinc	30.7	50.8	0.0013	0.0022	nc	nc

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

3.4.2 Screening Assessment

The purpose of this decision step is to determine if chemicals should be retained as COPCs or eliminated from further consideration based on comparisons with SALs. This is the last step in the screening assessment process for human health concerns. If COPCs remain after this step, then further action may be proposed. If no COPCs remain after this step, then no further action

(NFA) may be proposed based on human health concerns. SALs are medium-specific concentrations that are calculated using chemical-specific toxicity information and conservative, default exposure assumptions. For those chemicals for which SALs are available, each observed concentration datum is compared with the chemical's SAL. If a chemical has a reported concentration greater than its SAL, then that chemical is retained as a COPC pending further analysis. If a chemical does not have a reported concentration greater than its SAL, then that chemical is generally removed from further consideration. If more than one chemical is present at the site, this decision is deferred pending the results of a multiple chemical evaluation (described below). The decision to identify a chemical as a COPC when a SAL is not available is made on a case-by-case basis, taking into account the availability of process knowledge and toxicological information.

It is possible that COPCs should be retained because of the combined adverse health effects of several chemicals. This possibility is evaluated in a multiple chemical evaluation, in which the reported concentration for each chemical is divided by its respective SAL, and the resulting normalized values are incorporated into a simple additive model. If the sum of the normalized values (i.e., the total normalized value) is less than 1, then the chemicals are removed from further consideration. If the total normalized value is greater than 1, then chemicals having an individual normalized value greater than or equal to 0.1 are retained as COPCs pending further evaluation.

Those chemicals that exceed background concentration thresholds (certain inorganics and radionuclides) or fail other background comparison tests, or exceed reporting limits (organics), and are less than the SAL (all analytes), are divided into three classes: noncarcinogens, chemical carcinogens, and radionuclides. Additive effects are assumed within each class, but each class is evaluated separately. For further information on multiple chemical evaluations, see Technical Approach to RFI Reports (LANL in preparation, 1281).

3.4.3 Risk Assessment

No human health risk assessment was performed for MDA T.

3.5 Ecological

Los Alamos National Laboratory is developing a new approach for ecological risk assessment in cooperation with EPA Region 6 and the NMED. Further discussion of ecological risk assessment methodology will be deferred until the Ecological Exposure Unit methodology that is being developed has been approved by the regulators.

4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

All samples were submitted with chain-of-custody documentation to the sample coordination facility (SCF) or to the MRAL for analysis. Selected samples were analyzed for target analyte list (TAL) metals by electrothermal atomic absorption performed according to SW-846 method 7041, cold vapor atomic absorption performed according to SW-846 method 7471, inductively coupled plasma mass spectroscopy performed according to SW-846 method 6020, or inductively coupled plasma emission spectroscopy performed according to SW-846 method 6010. TAL metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, strontium, thallium, vanadium, and zinc.

For SVOC analyses the method chosen was gas chromatography/mass spectrometry performed according to SW-846 method 8270 (also known as solvent extraction/direct injection).

For radionuclide analyses, several methods were chosen.

- Isotopic plutonium, isotopic uranium, and americium-241 were determined by alpha spectroscopy.
- Total uranium was determined by kinetic phosphorescence analysis.
- Strontium-90 was determined by gas flow proportional counting.
- Tritium was determined by liquid scintillation.
- Remaining radionuclides were determined by gamma spectroscopy.

The following analyses were conducted in the MRAL:

- percent soil moisture analyses for which a Denver Instruments IR100 Moisture Analyzer was used,
- tritium analyses by liquid scintillation counting,
- gross alpha and gross beta analyses by gas flow proportional counting, and
- gross gamma and cesium-137 analyses by scintillation counting with a Bicron 5 x 7-in. sodium iodide well counter.

Data validation was performed on all data from the analytical laboratories. Ten percent of the data were validated at the highest level, level 3. All other data were validated at a level 1 or 2.

(Data validation levels are defined in Health and Environmental Chemistry Quality Assurance Program Plan [Gladney and Gautier 1991, 0410]). When data validated at level 1 or 2 triggered specific questions, a level 3 validation was performed. Validation was performed according to guidelines from the LANL ER Program guidance document, Generic Quality Assurance Project Plan for RCRA Facility Investigations (LANL 1991, 0412).

4.1.1 Metals Analyses

Seventy soil samples were analyzed for TAL metals under four separate requests: 15241, 15245, 15246, and 19223. Only samples included under request 15246 did not present any QC problems.

For request 15245, all lead results from soil samples are qualified as estimated detected quantity, or J, and lead results from water samples are qualified as estimated undetected quantity, or UJ, for a potential low bias indicated by the negative values found for the laboratory blanks analyzed. All zinc results are qualified J for a false positive recovery in the QC blind sample. All other data are acceptable as reported.

For request 19223, all results for antimony in soil samples and selenium in water samples are qualified UJ for low matrix spike recoveries (37% and 63%, respectively). All manganese results are qualified J or UJ for poor agreement between the duplicate samples. Soil samples included under request 19223 were analyzed well beyond the 28-day holding time for mercury. Although all mercury results in FIMAD are qualified by the laboratory as rejected, or R, because the holding time was exceeded, the results for mercury are considered acceptable for the following reasons:

1. The holding time is based on unpreserved water samples; all the samples in question were solid (collected from the top 6 in. of soil).

2. Surface soil samples are less likely to undergo biotransformation from elemental mercury to organomercury compounds than water samples because of the nature of the soil samples.

3. The samples had been kept refrigerated until they were analyzed.

4. The site was decommissioned more than ten years ago; therefore, any mercury biotransformation that occurred in the soil after samples were collected would be insignificant when compared with the mercury biotransformation that occurred in the soil before samples were collected.

It is reasonable to assume that the missed holding times do not have a substantial effect on the data. Because mercury holding times were exceeded, all the mercury data are qualified J or UJ (depending on the individual value) and are used with the understanding that the results are possibly biased low. All other data are acceptable as reported.

4.1.2 Organics Analyses

One trip blank sample was analyzed for VOCs under request 18603. There were no QC problems with the request.

Seventy soil samples were analyzed for SVOCs under requests 15200, 15201, 15218, 15219, 15231, 18600, and 18603. There were minor QC problems with requests 15200, 15201, and 15219 that did not result in data qualification. The data qualified in requests 15218, 15231, 18600, and 18603 are discussed below.

For request 15218, sample AAA4005 had high internal standard recovery (above the +100% criterion). All results for this sample are qualified UJ. All other data are acceptable as reported.

For request 15231, there were recoveries of approximately 10% in the QC blind sample for 2,4-dimethylphenol and benzoic acid. Therefore, these analytes are qualified J or UJ in the samples associated with this request. All other data are acceptable as reported.

For request 18600, all results for the phenol compounds are qualified UJ because the matrix spike, blank, and QC blind sample indicated poor recovery of the phenol compounds. In addition, 2,4-dimethylphenol results are qualified R because of a false negative result in the QC blind sample. All other data are acceptable as reported.

Several samples under request 18603 were re-extracted 7 to 14 days past the 14-day extraction holding time. Because these samples were originally extracted within the appropriate holding time and the original analyses did not indicate the presence of any compounds, the data are not qualified. The polycyclic aromatic hydrocarbon (PAH) compounds are qualified J or UJ because of low recoveries in the QC blind samples. Benzo(b)fluoranthene, hexachloroethane, 2-methylphenol, and o- and p-dichlorobenzene results are qualified R because the QC blind recoveries are less than 10%. All other data are acceptable as reported.

4.1.3 Radiochemical Analyses

Analyses were requested for the following number of soil samples: percent moisture, 73 samples; tritium, 73 samples; strontium-90, 76 samples; actinium-227, 56 samples; cesium-137, 76 samples; americium-241, 76 samples; isotopic plutonium, 76 samples; and isotopic or total uranium, 76 samples. These samples were included under six separate request numbers: 15269, 15271, 15273, 15282, 19149, and 19490. For requests 15273 and 15282, all the QC parameters were within control limits, and all the data are valid without qualification. Detected QC values are considered within control limits when they are within ±20% of the actual QC value. For requests 15269 and 15271, there were false positive recoveries of tritium in the QC blind samples. Therefore, the results are qualified J for a possible high bias. All other data for these two requests are acceptable as reported.

Several QC parameters of samples included under request 19149 were outside control limits. All gamma spectroscopy data are qualified J because the QC blind, laboratory control, and duplicate samples showed results outside control limits. The isotopic plutonium results are qualified J because of low tracer and low QC blind sample results. In addition, all strontium-90 results are qualified J because of low carrier recoveries, low matrix spike results, and high QC blind sample results. All other data are acceptable as reported.

For request 19490, gamma spectroscopy results are the only ones that are not qualified. All the other analytical results for this request are qualified J or UJ for a possible low bias indicated by the QC blind samples. In addition, the matrix spike and laboratory control sample for strontium-90 indicated a possible high bias. Because these results contradict the QC blind sample results and because the QC blind sample results were not precise, the data are qualified.

5.0 SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 MDA T PRSs

MDA T is composed of seven PRSs:

- C-21-009 and C-21-012 are the locations of radioactively contaminated cement paste spills.
- SWMU 21-028(a) was a satellite container storage area.
- SWMU 21-016(a) is the former location of four absorption beds used in the disposal of liquid wastes from TA-21 activities.

- SWMU 21-016(b) is the retrievable waste storage area located between absorption beds 1 and 3 from which all waste had been removed by 1986.
- SWMU 21-016(c) is made up of the disposal shafts located between absorption beds 2 and 4.
- SWMU 21-011(c) is a distribution box located between absorption beds 1 and 2.

5.1.1 History

Major contributors to surface contamination at MDA T include spills of radioactively contaminated cement paste that was pumped into (1) asphalt-lined disposal shafts and (2) retrievable corrugated metal pipes. At the locations where the radioactively contaminated cement paste was spilled, two areas of concern (C-21-009 and C-21-012) have been identified. Spilled material may also have run into the drainages below MDA T. A satellite container storage area, SWMU 21-028(a) may also have contributed to surface contamination at MDA T, but its exact location is unknown. In addition, activities at facilities surrounding MDA T, the old waste facility (Building 35 built in 1952) to the south, and the new waste facility (Building 257 built in 1967) to the east, may have contributed to surface contamination at MDA T. The drainage from the new waste treatment facility was into a national pollutant discharge elimination system (NPDES) permitted outfall (SWMU 21-011[k]) but it may also have contributed to surface contamination in the drainage below MDA T. It is probable that MDA T drainage would affect the outfall at SWMU 21-011(k).

Major contributors to subsurface contamination at MDA T include four absorption beds (SWMU 21-016[a]) used in the disposal of liquid wastes from TA-21 activities, the retrievable waste storage area located between absorption beds 1 and 3 from which all waste had been removed by 1986 (SWMU 21-016[b]), the disposal shafts (SWMU 21-016[c]) located between absorption beds 2 and 4, and a distribution box (SWMU 21-011[c]) located between absorption beds 1 and 2. There is some confusion about the identity of SWMU 21-016(b), which has been assigned to the retrievable waste storage area and to a caisson in the northwest corner of absorption bed 1. According to the 21-016 SWMU report, dated October 31, 1990, "A pit, TA-21-186 (SWMU 21-016[b]), was built in 1959 of redwood and it was about 6 ft by 10 ft by 30 ft deep. The pit was located between two rows of adsorption beds. This pit, referred to as the 'Snake Pit', was used for monitoring purposes and did not contain waste. From 1974 to 1982, transuranic wastes were mixed with cement and pumped into corrugated metal pipes into the pit. There were 175 corrugated metal pipes (2.5 ft in diameter, 20 ft long) in the pit, which was located between adsorption beds 1 and 3. In 1984 to 1986, the pipes were transported to

TA-54 with the intention of shipping them to the WIPP site near Carlsbad, NM." The SWMU report also states, "A 30-ft deep caisson (the 'Snake Pit') was dug to obtain horizontal cores in 1961..." (LANL 1990, 0145). It is clear by the descriptions in the SWMU report that, although the physical description of the caisson is given, the retrievable waste storage area is actually the SWMU because "...transuranic wastes were mixed with cement and pumped into corrugated metal pipes into the pit."

The absorption beds at MDA T received americium-241, plutonium-238, plutonium-239/240, tritium, natural uranium, and possibly enriched uranium. For additional information, see Section 16.3.1 of the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689). Other chemicals received by the absorption beds may have included metals, carbonates, citrates, acids, bases, organic compounds, and solvents. The disposal shafts contained americium-241, plutonium-238 and plutonium-239/240 (including plutonium in several bathyspheres buried at various depths), and mixed fission products (including strontium-90 and cesium-137). The corrugated metal pipes stored in the retrievable storage area also contained americium-241, plutonium-238, plutonium-239/240, or other transuranic radionuclides, but they were all removed in 1984 and 1986. The chemicals stored at the satellite container storage area included alcohol, acetone, and Freon™. The two spills of contaminated cement paste that occurred in 1976 and 1978 causing the respective locations to become AOCs included americium-241.

Additional information is presented in Subsection 16.3 of the TA-21 Operable Unit RFI Work Plan (LANL 1991, 0689).

5.1.2 Description

In 1987, the surface of MDA T was regraded to slope into DP Canyon. The regraded surface was capped with 6–12 in. of topsoil and reseeded.

5.1.3 Previous Investigations

In 1984, environmental surveillance data were collected at 29 locations at or near MDA T (but not in drainages; see Fig. 16.3-4 of the TA-21 Operable Unit RFI Work Plan [LANL 1991, 0689]) on a 65.6 x 65.6-ft grid at depths of 0 to 1, 1 to 10, and 10 to 30 cm. A total of 101 samples were analyzed for tritium, 75 samples for uranium, 63 samples for plutonium-238, and 66 samples for plutonium-239.

In 1986, data were collected on a 65.6 x 65.6-ft grid at 108 sample locations at a depth of 0 to 1 cm. Seventy-five sample locations were inside the fenced area of MDA T, 16 were between the

fence and the North Perimeter Road, and 16 were across the road on the edge of DP Canyon (where MDA T drainages begin). A total of 72 samples were analyzed for americium-241, 73 samples for cesium-137, 69 samples for plutonium-238, and 71 samples for plutonium-239 (Figs. 16.3-7, 16.3-8, 16.3-9, and 16.3-10 of the TA-21 OU RFI Work Plan [LANL 1991, 0689]).

Data were obtained from the 1992 baseline characterization samples collected at nodes of the 131 x 131 ft grid (TA-21 OU RFI, Phase Report 1B) for seven sample locations in DP Canyon, downgradient of MDA T in the MDA T drainages. Samples were collected from 0-to 1-in. and 0-to 6-in. depths.

The data described in this section have not been integrated with the Phase I data pending evaluation of data quality for risk assessment purposes.

5.1.4 Field Investigation

Field Surveys. Results of the radiological survey of MDA T indicate that although radiation levels were greater than the upper limit of background at several locations, only one location had significantly elevated radiation levels. Sample location 21-1639 showed gamma radiation at levels about ten times background using two instruments, a Ludlum 44-10 gamma radiation detector and Ludlum 19 gamma survey meter. At this location, other instruments showed background radiation, suggesting that analytical data for this location should be carefully reviewed.

Field Screening at MDA T. Results of soil samples screening in the field and in the MRAL are summarized separately below. Sampling locations are shown in Fig. 5.1.4-1 and summarized in Table 5.1.4-1.

Several samples that were screened in the field slightly exceeded the upper limits of background for alpha and beta/gamma radiation. Of these, only sample AAA3979 from location 21-1639 (which during field surveying showed levels of gamma radiation at about ten times background) showed significantly increased levels of beta/gamma radiation (approximately five times background levels) during field screening.

Results of soil sample screening for alpha and beta radiation by the MRAL were inconclusive. Four samples showed increased gamma radiation: sample AAA3976 had 23.4 $\pm$ 4.4 pCi/g, sample AAA3979 had 343.2 $\pm$ 4.4 pCi/g, sample AAA3991 had 15.60 $\pm$ 4.4 pCi/g, and sample AAA3992 had 19.60 $\pm$ 4.4 pCi/g of gamma radiation. Results of fixed laboratory analyses for these samples are further discussed in Section 5.1.7.

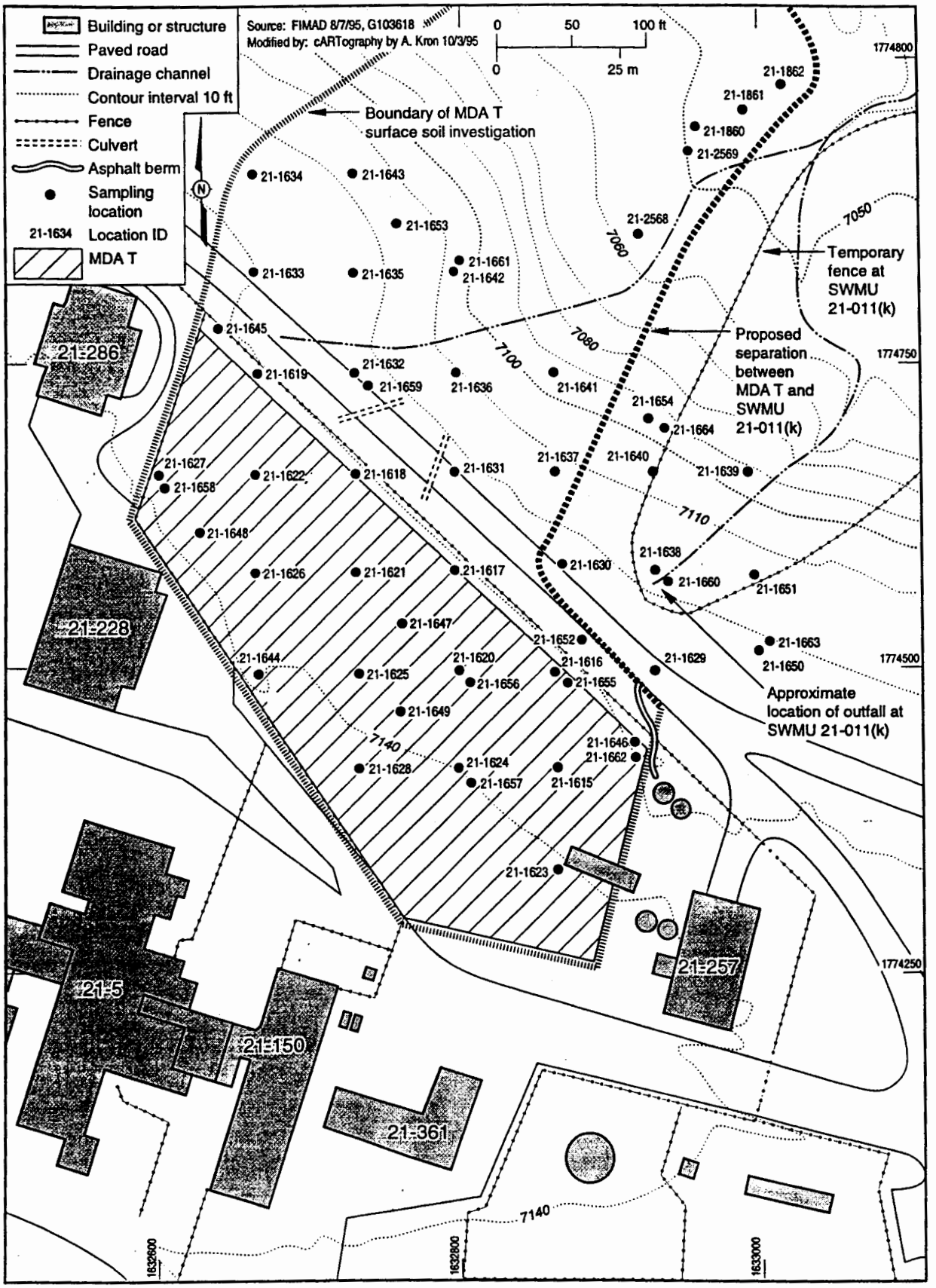

Fig. 5.1.4-1. Sampling locations at MDA T.

Results of soil sample screening for cesium-137 by the MRAL identified ten soil samples with cesium-137 concentrations greater than the screening action level of 5.1 pCi/g (Table 5.1.4-2).

TABLE 5.1.4-2

FIELD SCREENING RESULTS FOR CESIUM-137

SAMPLE ID	CESIUM-137 (pCi/g)
SAL	5.1
AAA3979	331.89 ± 15.62
AAA3980	16.49 ± 3.16
AAA3982 (AAA3981)[a]	5.8 ± 1.66 (3.56 ± 1.32)
AAA3991	19.09 ± 2.14
AAA3992	23.94 ± 2.39
AAA3995	5.48 ± 1.7
AAA4004	5.44 ± 1.51
AAA4005	5.48 ± 1.6
AAA4007	10.29 ± 1.64
AAA4008	5.45 ± 1.64

[a] Sample in parentheses represents a duplicate sample.

Results of fixed laboratory analyses for these samples are further discussed in Section 5.1.6.

Field Screening at the MDA T Drainage. Results from drainage area soil samples screened for alpha and beta/gamma radiation by the field crew showed that radiation levels in many samples exceeded the upper limit of background; however, no samples had significantly elevated radiation levels. Results of soil sample screening for radiation by the MRAL showed no indication of increased alpha, beta, or gamma radiation.

5.1.5 Background Comparisons

5.1.5.1 Inorganics

Four metals were detected above LANL-wide UTLs, as shown in Table 5.1.5-1. One metal, lithium, has no UTL. Other metals were not detected at levels above LANL-wide UTLs and, therefore, are not considered COPCs.

At all locations, analyses for metals included all required contract laboratory analytes except mercury. Mercury was analyzed in 17 samples at only five locations, all in the MDA T drainage area where radionuclide and PAH concentration exceeded their SALs. Mercury was not measured above the EQL of 0.02 mg/kg in any sample. Because mercury was not found at the same place as other chemicals and has not been identified as a process-linked chemical at MDA T, additional mercury sampling at other locations in MDA T is unwarranted.

TABLE 5.1.5-1

METALS WITH SOIL CONCENTRATIONS GREATER THAN BACKGROUND UTLs AT MDA T AND DRAINAGES

ANALYTE	LOCATION ID	SAMPLE ID	DEPTH (in.)	BACKGROUND UTL (mg/kg)	SAL (mg/kg)	SAMPLE VALUE (mg/kg)
Calcium	21-1628	AAA3966	0–6	6120	NA[a]	7 900
Lead	21-1861	AAA7513	0–3	39	400	61.3
Nickel	21-1664	AAA4008	0–6	15.2	1 500	19.4
Zinc	21-1645	AAA3986	0–6	50.8	23 000	132
Zinc	21-1658	AAA4002	0–6	50.8	23 000	111
Zinc	21-2568	AAB7277	6–12	50.8	23 000	82.4
Zinc	21-1658	AAA4001	0–6	50.8	23 000	75.8
Zinc	21-2568	AAB7275	0–3	50.8	23 000	68.1
Zinc	21-2568	AAB7275	0–3	50.8	23 000	66.4
Zinc	21-2568	AAB7276	3–6	50.8	23 000	66
Zinc	21-1644	AAA3985	0–6	50.8	23 000	65.2
Zinc	21-1862	AAA7517	3–6	50.8	23 000	64.9
Zinc	21-1862	AAA7516	0–3	50.8	23 000	62.1
Zinc	21-2568	AAA7549	0–3	50.8	23 000	60.7
Zinc	21-1860	AAA7512	6–12	50.8	23 000	58.7
Zinc	21-1861	AAA7514	3–6	50.8	23 000	56.8
Zinc	21-1861	AAA7514	3–6	50.8	23 000	56.3

[a] NA = Not available.

5.1.5.2 Radionuclides

The primary analytes associated with activities at MDA T are plutonium isotopes and americium-241. The primary analytes associated with activities at the old (Building 35, SWMU 21-010[a-h]) and new (Building 256, SWMU 21-011[a-j]) waste treatment facilities near MDA T are plutonium-238 and -239, uranium-234, -235, and -238, americium-241, strontium-90, cesium-137, and tritium. The same analytes, in addition to thorium-228, -230, and -232, are associated with the new waste treatment facility's drainage area (SWMU 21-011[k]).

Isotopic analyses were performed on samples from MDA T and its drainages, including analyses for the isotopes identified from historical knowledge of waste disposal and process operations listed above. Either TA-21 baseline or LANL-wide background UTLs are available for all of these critical radionuclides, as well as for radium-226 and potassium-40.

Eight radionuclides exceeded their TA-21 UTLs in at least one sample (Table 5.1.5-2). These radionuclides are compared with their SALs in Section 5.1.6.

TABLE 5.1.5-2

RADIONUCLIDES WITH SOIL CONCENTRATIONS GREATER THAN BACKGROUND FOR MDA T AND DRAINAGES

ANALYTE	LOCATION ID	SAMPLE ID	DEPTH (in.)	BACKGROUND UTL (pCi/g)	SAL (pCi/g)	SAMPLE VALUE (pCi/g)
Americium-241	21-1619	AAA3954	0–6	0.818	22	9.751
Americium-241	21-1623	AAA3961	0–6	0.818	22	3.406
Americium-241	21-1627	AAA3965	0–6	0.818	22	1.31
Americium-241	21-1629	AAA3967	0–6	0.818	22	3.077
Americium-241	21-1629	AAA3967	0–6	0.818	22	3.119
Americium-241	21-1630	AAA3968	0–6	0.818	22	1.349
Americium-241	21-1636	AAA3974	0–6	0.818	22	2.962
Americium-241	21-1638	AAA3976	0–6	0.818	22	1.361
Americium-241	21-1639	AAA3979	0–6	0.818	22	1.098
Americium-241	21-1640	AAA3980	0–6	0.818	22	1.444
Americium-241	21-1641	AAA3981	0–6	0.818	22	2.958
Americium-241	21-1641	AAA3982	0–6	0.818	22	1.567
Americium-241	21-1642	AAA3983	0–6	0.818	22	1.321
Americium-241	21-1644	AAA3985	0–6	0.818	22	12.333
Americium-241	21-1645	AAA3986	0–6	0.818	22	0.89
Americium-241	21-1646	AAA3987	0–6	0.818	22	26.395
Americium-241	21-1648	AAA3989	0–6	0.818	22	1.56
Americium-241	21-1650	AAA3991	0–6	0.818	22	3.196
Americium-241	21-1651	AAA3992	0–6	0.818	22	7.464
Americium-241	21-1652	AAA3993	0–6	0.818	22	2.042
Americium-241	21-1658	AAA4001	0–6	0.818	22	2.831
Americium-241	21-1658	AAA4002	0–6	0.818	22	2.881
Americium-241	21-1660	AAA4004	0–6	0.818	22	1.936
Americium-241	21-1661	AAA4005	0–6	0.818	22	1.03
Americium-241	21-1662	AAA4006	0–6	0.818	22	3.212
Americium-241	21-1663	AAA4007	0–6	0.818	22	3.908
Americium-241	21-1860	AAA7510	0–3	0.818	22	5.626
Americium-241	21-1860	AAA7511	3–6	0.818	22	5.641
Americium-241	21-1860	AAA7512	6–12	0.818	22	6.348
Americium-241	21-1861	AAA7513	0–3	0.818	22	2.657
Americium-241	21-1861	AAA7514	3–6	0.818	22	4.246
Americium-241	21-1861	AAA7514	3–6	0.818	22	4.549
Americium-241	21-1861	AAA7515	6–12	0.818	22	1.62
Americium-241	21-1861	AAA7515	6–12	0.818	22	1.85

TABLE 5.1.5-2 (CONTINUED)

RADIONUCLIDES WITH SOIL CONCENTRATIONS GREATER THAN BACKGROUND FOR MDA T AND DRAINAGES

ANALYTE	LOCATION ID	SAMPLE ID	DEPTH (in.)	BACKGROUND UTL (pCi/g)	SAL (pCi/g)	SAMPLE VALUE (pCi/g)
Americium-241	21-1862	AAA7516	0–3	0.818	22	4.87
Americium-241	21-1862	AAA7517	3–6	0.818	22	3.781
Americium-241	21-1862	AAA7518	6–12	0.818	22	1.5
Americium-241	21-1862	AAB7300	6–12	0.818	22	1.508
Americium-241	21-2568	AAA7549	0–3	0.818	22	3.908
Americium-241	21-2568	AAB7275	0–3	0.818	22	5.061
Americium-241	21-2568	AAB7275	0–3	0.818	22	5.129
Americium-241	21-2568	AAB7276	3–6	0.818	22	4.201
Americium-241	21-2568	AAB7276	3–6	0.818	22	4.224
Americium-241	21-2568	AAB7277	6–12	0.818	22	7.404
Americium-241	21-2569	AAB7278	0–3	0.818	22	1.101
Americium-241	21-2569	AAB7279	3–6	0.818	22	2.576
Americium-241	21-2569	AAB7280	6–12	0.818	22	3.459
Cesium-137	21-1629	AAA3967	0–6	1.4[a]	5.1	2.23
Cesium-137	21-1638	AAA3976	0–6	1.4[a]	5.1	31.15
Cesium-137	21-1639	AAA3979	0–6	1.4[a]	5.1	431.42
Cesium-137	21-1640	AAA3980	0–6	1.4[a]	5.1	5.41
Cesium-137	21-1641	AAA3981	0–6	1.4[a]	5.1	1.52
Cesium-137	21-1646	AAA3987	0–6	1.4[a]	5.1	1.51
Cesium-137	21-1650	AAA3991	0–6	1.4[a]	5.1	22.33
Cesium-137	21-1651	AAA3992	0–6	1.4[a]	5.1	31.18
Cesium-137	21-1660	AAA4004	0–6	1.4[a]	5.1	7.87
Cesium-137	21-1663	AAA4007	0–6	1.4[a]	5.1	8.23
Cesium-137	21-1664	AAA4008	0–6	1.4[a]	5.1	1.96
Plutonium-238	21-1619	AAA3954	0–6	0.447	27	0.535
Plutonium-238	21-1627	AAA3965	0–6	0.447	27	3.639
Plutonium-238	21-1636	AAA3974	0–6	0.447	27	1.82
Plutonium-238	21-1641	AAA3981	0–6	0.447	27	0.49
Plutonium-238	21-1641	AAA3982	0–6	0.447	27	0.819
Plutonium-238	21-1644	AAA3985	0–6	0.447	27	1.307
Plutonium-238	21-1646	AAA3987	0–6	0.447	27	6.851
Plutonium-238	21-1658	AAA4001	0–6	0.447	27	6.625
Plutonium-238	21-1658	AAA4002	0–6	0.447	27	6.532
Plutonium-238	21-1662	AAA4006	0–6	0.447	27	0.511

TABLE 5.1.5-2 (CONTINUED)

RADIONUCLIDES WITH SOIL CONCENTRATIONS GREATER THAN BACKGROUND FOR MDA T AND DRAINAGES

ANALYTE	LOCATION ID	SAMPLE ID	DEPTH (in.)	BACKGROUND UTL (pCi/g)	SAL (pCi/g)	SAMPLE VALUE (pCi/g)
Plutonium-238	21-1860	AAA7510	0–3	0.447	27	3.983
Plutonium-238	21-1860	AAA7511	3–6	0.447	27	2.629
Plutonium-238	21-1860	AAA7512	6–12	0.447	27	1.059
Plutonium-238	21-1861	AAA7513	0–3	0.447	27	1.101
Plutonium-238	21-1861	AAA7514	3–6	0.447	27	1.973
Plutonium-238	21-1861	AAA7514	3–6	0.447	27	2.078
Plutonium-238	21-1862	AAA7516	0–3	0.447	27	4.053
Plutonium-238	21-1862	AAA7517	3–6	0.447	27	3.277
Plutonium-238	21-1862	AAA7518	6–12	0.447	27	0.6322
Plutonium-238	21-2568	AAB7275	0–3	0.447	27	2.767
Plutonium-238	21-2568	AAB7275	0–3	0.447	27	3.307
Plutonium-238	21-2568	AAB7276	3–6	0.447	27	3.345
Plutonium-238	21-2568	AAB7277	6–12	0.447	27	2.452
Plutonium-238	21-2569	AAB7278	0–3	0.447	27	1.848
Plutonium-238	21-2569	AAB7279	3–6	0.447	27	1.516
Plutonium-238	21-2569	AAB7280	6–12	0.447	27	2.454
Plutonium-238	21-1862	AAB7300	6–12	0.447	27	0.5082
Plutonium-239	21-1642	AAA3983	0–6	15.5	24	28.512
Plutonium-239	21-1644	AAA3985	0–6	15.5	24	19.237
Plutonium-239	21-1646	AAA3987	0–6	15.5	24	201.254
Plutonium-239	21-1651	AAA3992	0–6	15.5	24	20.549
Plutonium-239	21-1663	AAA4007	0–6	15.5	24	47.935
Potassium-40[a,b]	21-1860	AAA7510	0–3	28.6	12	30.15
Potassium-40[a,b]	21-1860	AAA7512	6–12	28.6	12	29.67
Potassium-40[a,b]	21-2568	AAB7275	0–3	28.6	12	30.36
Potassium-40[a,b]	21-2568	AAB7275	0–3	28.6	12	31.83
Potassium-40[a,b]	21-2568	AAB7276	3–6	28.6	12	32.29
Potassium-40[a,b]	21-2568	AAB7277	6–12	28.6	12	30.02
Potassium-40[a,b]	21-2569	AAB7278	0–3	28.6	12	29.17
Potassium-40[a,b]	21-2569	AAB7279	3–6	28.6	12	32.03
Strontium-90	21-1638	AAA3976	0–6	0.766	4.4	12.34
Strontium-90	21-1639	AAA3979	0–6	0.766	4.4	239.7
Strontium-90	21-1640	AAA3980	0–6	0.766	4.4	2.78
Strontium-90	21-1650	AAA3991	0–6	0.766	4.4	5.57

TABLE 5.1.5-2 (CONTINUED)

RADIONUCLIDES WITH SOIL CONCENTRATIONS
GREATER THAN BACKGROUND FOR MDA T AND DRAINAGES

ANALYTE	LOCATION ID	SAMPLE ID	DEPTH (in.)	BACKGROUND UTL (pCi/g)	SAL (pCi/g)	SAMPLE VALUE (pCi/g)
Strontium-90	21-1651	AAA3992	0–6	0.766	4.4	12.4
Strontium-90	21-1660	AAA4004	0–6	0.766	4.4	2.59
Strontium-90	21-1663	AAA4007	0–6	0.766	4.4	1.96
Strontium-90	21-1664	AAA4008	0–6	0.766	4.4	0.78
Thorium-228[b]	21-1860	AAA7510	0–3	1.98	1.7	3.646
Thorium-228[b]	21-1861	AAA7515	6–12	1.98	1.7	3.141
Uranium-235	21-1652	AAA3993	0–6	0.164	10	0.38
Uranium-235	21-1860	AAA7510	0–3	0.164	10	0.1965

[a] These UTLs come from LANL-wide data (Longmire et al. 1995, 1142 and 1266) because background data for these radionuclides was not collected for TA-21 baseline purposes.
[b] For potassium-40 and thorium-228, the SAL is less than the TA-21 UTL; therefore these chemicals are identified as a COPC

Background values for organic compounds are not currently available for LANL. As a preliminary screening, results of analyses for organic compounds were compared with EQLs. Data on organic compounds that were detected above the EQLs in samples collected at MDA T and its drainages are shown in Table 5.1.6-1. In these samples, ten PAHs were detected. In addition, bis(2-ethylhexyl)phthalate was detected at a low concentration in one sample.

TABLE 5.1.5-3

ORGANIC ANALYTES WITH SOIL CONCENTRATIONS
GREATER THAN ESTIMATED QUANTITATION LIMITS FOR MDA T AND DRAINAGES

ANALYTE	LOCATION ID	SAMPLE ID	DEPTH (in.)	SAL (mg/kg)	SAMPLE VALUE (mg/kg)
Benzo[a]anthracene	21-1862	AAA7516	0–3	0.61	0.4
Benzo[a]anthracene	21-2568	AAB7277	6–12	0.61	0.61
Benzo[a]pyrene	21-1862	AAA7516	0–3	0.061	0.48
Benzo[a]pyrene	21-2568	AAB7277	6–12	0.061	0.67
Benzo[b]fluoranthene	21-1862	AAA7516	0–3	0.61	0.52
Benzo[b]fluoranthene	21-2568	AAB7277	6–12	0.61	0.61
Benzo[g,h,i]perylene	21-2568	AAB7277	6–12	NA[a]	0.4
Benzo[k]fluoranthene	21-2568	AAB7277	6–12	6.1	0.61
Bis(2-ethylhexyl)phthalate	21-1659	AAA4003	0–6	32	0.44
Chrysene	21-1862	AAA7516	0–3	24	0.48
Chrysene	21-2568	AAB7277	6–12	24	0.83
Fluoranthene	21-2569	AAB7278	0–3	2 600	0.59
Fluoranthene	21-1860	AAA7511	3–6	2 600	0.71
Fluoranthene	21-1862	AAA7516	0–3	2 600	0.95
Fluoranthene	21-2568	AAB7277	6–12	2 600	2.5
Indeno[1,2,3-cd]pyrene	21-2568	AAB7277	6–12	0.61	0.43
Phenanthrene	21-1860	AAA7511	3–6	NA	0.62
Phenanthrene	21-1862	AAA7516	0–3	NA	0.64
Phenanthrene	21-2568	AAB7277	6–12	NA	1.3
Pyrene	21-2569	AAB7278	0–3	2 000	0.44
Pyrene	21-1860	AAA7511	3–6	2 000	0.75
Pyrene	21-1862	AAA7516	0–3	2 000	0.86
Pyrene	21-2568	AAB7277	6–12	2 000	1.8

[a] NA = Not available.

5.1.6 Human Health Assessment

5.1.6.1 Screening Assessment

Radionuclides, metals, and SVOCs that were not eliminated in the background threshold or EQL comparisons are evaluated in this section. In addition, COPCs with no SAL, or with an EQL greater than their SALs, that were not eliminated in the background comparison are evaluated.

Among the radionuclides detected at MDA T and its drainages, actinium-227, lead-210, lead-212, lead-214, radium-224, thallium-208, and thorium-234 have neither a UTL nor a SAL. Of these radionuclides, lead-212, lead-214, radium-224, thallium-208, and thorium-234 have half-lives of less than one month. These radionuclides cannot be associated with historical releases at MDA T because radioactive decay would long ago have reduced their concentrations below measurable levels. Only longer-lived radionuclides (half-lives greater than 0.5 yr) associated with activities at MDA T or nearby waste treatment facilities are evaluated in this report.

Actinium-227 and lead-210 are not associated with activities at MDA-T or nearby waste treatment facilities but are daughter products of uranium isotopes. It is likely that these radionuclides were detected solely because of the presence of their parents. Dose contributions from daughter products, including actinium-227 and lead-210, are incorporated in dose conversion factors for the uranium isotopes. Actinium-227 and lead-210 are therefore not independently evaluated.

SALs are not available for the organic compounds phenanthrene and benzo(g,h,i)perylene, which were detected at MDA T and its drainages. Phenanthrene was identified in three samples at three different locations at a maximum value of 1.3 mg/kg. Because of its similar structure, pyrene is often used as a toxicity surrogate for phenanthrene. The soil SAL for pyrene is 2 400 mg/kg, indicating that the measured concentrations of phenanthrene are unlikely to pose a threat to human health. Benzo(g,h,i)perylene, a noncarcinogenic PAH, was identified in one sample at 0.4 mg/kg. Carcinogenic PAHs have soil SALs approximately equal to the measured concentration of benzo(g,h,i)perylene. Because noncarcinogens typically have higher SALs than carcinogens and because benzo(g,h,i)perylene was found in only one of fifty-five samples, benzo(g,h,i)perylene is unlikely to represent a human health threat at MDA T and its drainages.

Lithium, which has no UTL or soil SAL, was identified at concentrations up to 15 mg/kg in MDA T soil samples. There is no evidence that lithium has ever been associated with processes at MDA T or nearby waste treatment facilities, and the normal daily intake from plant- and animal-based foods (approximately 2 mg/day) greatly exceeds potential intake associated with incidental ingestion of soil from MDA T and its drainages. Therefore, lithium is not recommended for further evaluation.

COPCs with one or more sample values exceeding a SAL are identified in Table 5.1.6-1 and are discussed in detail below. Sample locations corresponding to these data are shown in Fig. 5.1.6-1.

Among the radionuclide COPCs, americium-241, strontium-90, and plutonium-239 were identified at concentrations exceeding SALs based on analyses from a fixed-base laboratory. Cesium-137 was also identified above its SAL based on fixed-base and mobile laboratory analyses; however, only cesium-137 data from fixed-base laboratory analyses are presented in Table 5.1.6-1 because of the lower confidence associated with the mobile laboratory data (mobile laboratory data for cesium-137 are discussed in Section 4.0). Samples identified by field survey or screening as having the greatest increase in radiation levels are included among the samples in which radionuclide COPCs were identified at concentrations exceeding SALs.

Among the organic COPCs, benzo(a)pyrene, benzo(a)anthracene, and benzo(a)fluoranthene were identified at concentrations exceeding their SALs.

The results of the multiple chemical evaluation on chemicals detected at levels greater than their UTLs or EQLs but less than their SALs are provided in Table 5.1.6-2. Radionuclides, carcinogenic chemicals, and noncarcinogenic chemicals are evaluated separately to determine if additive effects of the analytes within these groups could present a health threat. No chemicals or radionuclides were identified as COPCs in the multiple chemical evaluation.

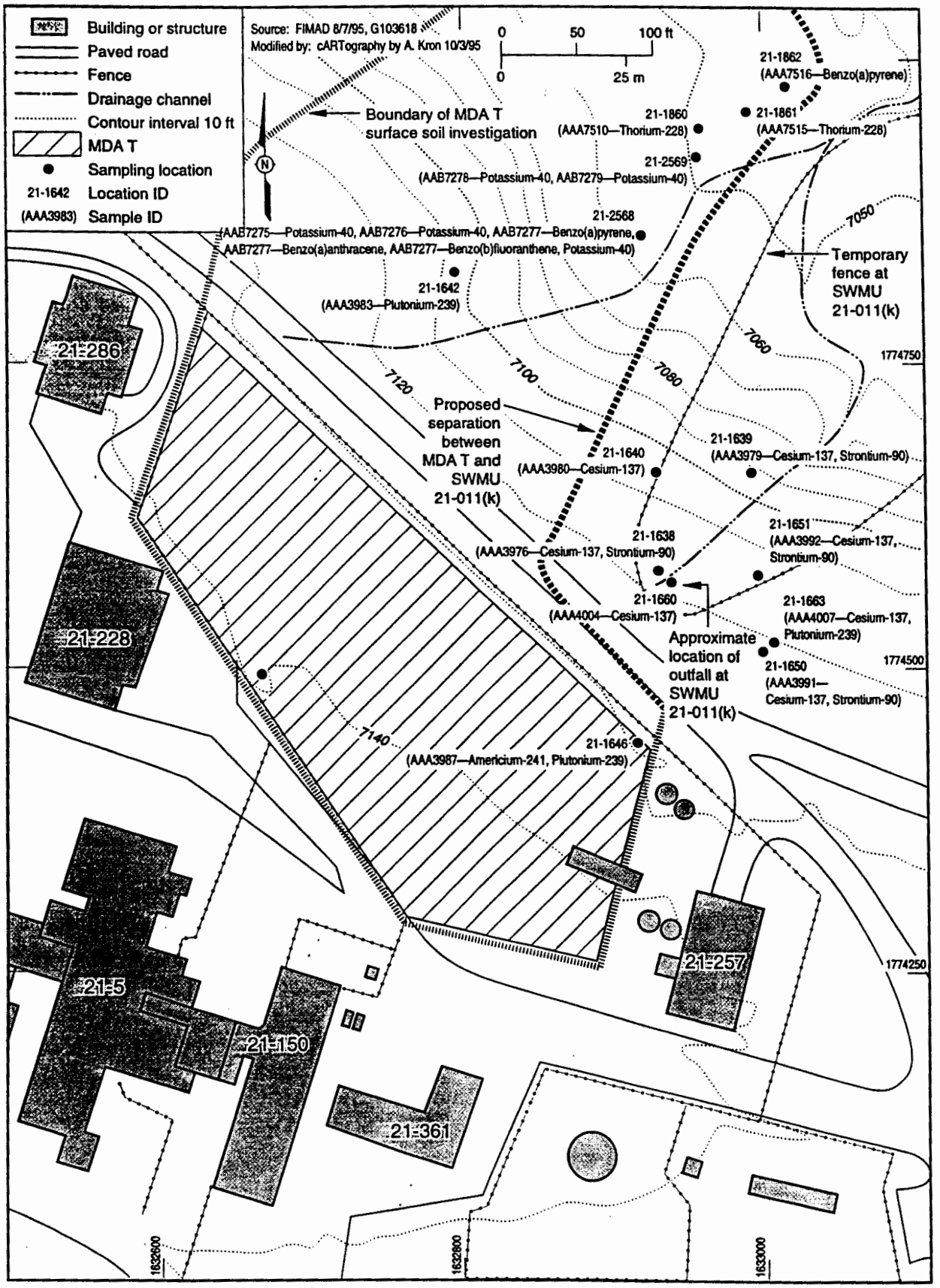

Fig. 5.1.6-1. Locations of detected organic chemicals and radionuclides that exceed SAL at MDA T.

TABLE 5.1.6-2

RESULTS OF THE MULTIPLE CHEMICAL EVALUATION FOR MDA T AND DRAINAGES

ANALYTE	LOCATION ID	SAMPLE ID	MAXIMUM SAMPLE VALUE (mg/kg or pCi/g)	SOIL SAL (mg/kg or pCi/g)	NORMALIZED VALUE
RADIONUCLIDES					
Plutonium-238	21-1646	AAA3987	6.85	27	0.25
Uranium-235	21-1652	AAA3993	0.38	10	0.038
Additive Total					0.29
NONCARCINOGENS					
Fluoranthene	21-2568	AAB7277	2.5	2 600	0.00096
Lead	21-1861	AAA7513	61.3	400	0.15
Nickel	21-1664	AAA4008	19.4	1 500	0.013
Pyrene	21-2568	AAB7277	1.8	2 000	0.0090
Zinc	21-1645	AAA3986	132	23 000	0.0057
Additive Total					0.15
CARCINOGENS					
Benzo(k)-fluoranthene	21-2568	AAB7277	0.61	6.1	0.10
Bis(2-ethylhexyl) phthalate	21-1659	AAA4003	0.44	32	0.014
Indeno [1,2,3-cd] pyrene	21-2568	AAB7277	0.43	0.61	0.70
Additive Total					0.81

Only one sample location associated with MDA T was identified as having COPCs that failed the screening assessment: plutonium-239 and americium-241 at location 21-1646. Sample location 21-1646 is near the northeastern edge of MDA T on the perimeter of the MDA T cap, where an asphalt berm collects and directs surface water toward SWMU 21-011(k), which comprises the drainages associated with the new waste treatment facility (Building 257). The americium-241 and plutonium-239 found at location 21-1646 may be the result of runoff from the area of Building 257 or may be the result of spills of americium-contaminated cement paste (C-21-009 and C-21-012). This sample point was the only location where americium-241 was observed to be greater than the SAL, although it was greater than the TA-21 UTL at almost all

MDA T drainage sample locations. Concentrations of americium-241 decrease with distance from the absorption beds in MDA T. But the farthest downgradient activity levels are not consistent with the TA-21 process area background, therefore, the extent of americium-241 contamination in the MDA T drainage has not been defined. Additional investigation of the extent of americium-241 contamination will be deferred to the DP Canyon investigation scheduled to begin in January 1997. This investigation will address contaminant contributions from all TA-21 PRSs to DP Canyon.

In the MDA T drainage area, strontium-90 and cesium-137 were two of the radionuclides identified as COPCs in the screening assessment. Evaluation of the data from the MDA T drainage is complicated by the probable impact of contamination associated with the new industrial waste treatment plant (Building 257, SWMU 21-011[a-j]) and its drainage area (SWMU 21-011[k]) on the eastern boundary of MDA T and its drainage. Because the MDA T drainages and SWMU 21-011(k) overlap along the canyon adjacent to the eastern portion of the MDA T drainage, and because this area contains most of the COPCs identified in the screening assessment, it is necessary to define the bounds of the investigations for the MDA T drainage and SWMU 21-011(k).

SWMU 21-011(k) has high concentrations of cesium-137 and strontium-90 in soils. A temporary fence surrounds the area of greatest cesium-137 contamination at SWMU 21-011(k) (identified by a field radiation survey described in the TA-21 RFI phase report [LANL 1994, 1260]). The western boundary of the fence approaches the crest separating the main drainage for MDA T (into which two road culverts drain) from the drainage channels affected by discharges into SWMU 21-011(k). All MDA T drainage samples showing cesium-137 and strontium-90 at levels above background are east of the drainage divide (except the sample from location 21-1641). Although it is possible for surface water from the eastern portion of MDA T and its drainage to flow into SWMU 21-011(k), surface water from the new waste treatment facility (Building 257) and its drainage (SWMU 21-011[k]) cannot flow into the main MDA T drainage west of the divide.

Based on the cesium-137 and strontium-90 data, the area east of the divide contains contamination uniquely associated with SWMU 21-011(k). Therefore, samples from this area and from the area east of the MDA T drainage in general should be evaluated as part of SWMU 21-011(k) rather than as part of MDA T and its drainage. The suggested boundary is identified in Fig. 5.1.4-1 and Fig. 5.1.6-1.

Using this boundary, the drainages accepting runoff from the area of sample location 21-1646, where plutonium-239 and americium-241 were found at levels greater than SALs, will be evaluated under the investigation for SWMU 21-011(k). However, there are a number of smaller drainages near the rim of DP Canyon that are associated only with MDA T and that may not have been sampled during the Phase I investigation. Therefore, although extent is defined, additional data may be required to estimate the extent and concentration of americium-241 in surface soil in MDA T drainages. The investigation to assess extent and concentration of americium-241 will be deferred to the DP Canyon investigation scheduled to begin in January 1997.

Plutonium-239 was identified at a concentration slightly above its SAL at location 21-1642 along the upper wall of DP Canyon on the eastern edge of the main MDA T drainage. No other sample in the main MDA T drainages contained plutonium-239 at a concentration exceeding its SAL or TA-21 UTL, although plutonium-239 SALs, as with cesium-137 and strontium-90 SALs, were exceeded in the eastern portion of the drainage and can be attributed to SWMU 21-011(k). Although it is likely that plutonium-239 has migrated into DP Canyon, widespread sediment contamination at levels greater than the SAL is unlikely in the canyon based on the assumption that concentration decreases with distance from MDA T. As for americium-241, additional data may be required to estimate the concentration of plutonium-239 at MDA T and its drainages.

Thorium-228 was greater than the TA-21 UTL (and the SAL) at both locations (21-1860 and 21-1861) where it was analyzed. These locations are in the level area at the base of the main MDA T drainage channel. Thorium-228 is a short-lived decay product of the primordial radionuclide thorium-232, and the two have approximately equal activity in the environment. The thorium-228 data were obtained by gamma spectroscopy, which does not allow accurate quantitation of this radioisotope. In addition, thorium-228 is not known to be associated with process activities specific to MDA T. It is likely, therefore, that these thorium-228 data reflect analytical uncertainty rather than actual site contamination. However, a definitive determination of whether anthropogenic thorium is present a MDA T and drainages cannot be made without additional sampling.

Potassium-40 was analyzed in samples from the MDA T drainages. Eight samples from three sample locations in the level area at the base of the main MDA T drainage channel showed potassium-40 concentrations exceeding the LANL-wide UTL. A statistical comparison of the MDA T drainage potassium-40 data and the LANL background data suggest that the MDA T drainage values are elevated above the LANL-wide UTL. Nevertheless, there are no known activities associated with MDA T that could have contributed potassium-40 to the environment.

In addition, environmental surveillance data (Purtyman et al. 1987, 0211; ESG 1988, 0408; ESG 1989, 0308; Environmental Protection Group 1990, 0497; Environmental Protection Group 1992, 0740) collected at several locations on the Pajarito plateau reveals other examples of locally elevated potassium. In particular, data collected at monitoring points near the EG&G building and Tsankawi have median values of approximately 33 000 parts per million potassium. Given the natural abundance of potassium-40 (0.0118%) and its specific activity (6.99×10^6 pCi/g), these data indicate a median potassium-40 concentration of 27 pCi/g, which is similar to the median value of approximately 30 pCi/g observed in the MDA T drainage data.

Three PAHs, benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene, were identified above SALs in the screening assessment at two sampling locations (21-2568 and 21-1862) in the level area at the base of the main MDA T drainage channel. Because PAHs are not associated with process activities at TA-21, the most likely source for these COPCs is surface runoff collected from North Perimeter Road and asphalt areas of TA-21 and discharged into the drainage through the two culverts shown in Fig. 5.1.6-1. Locations 21-2568 and 21-1862 are separated by three sample points where PAHs were also detected but at concentrations below SALs. It is possible that additional PAH sampling in DP Canyon beyond location 21-1862, which is the location furthest from MDA T, will reveal PAHs at detectable concentrations. However, such sampling is not recommended for PAHs because their source in the drainage channel is probably independent of activities at MDA T.

5.1.6.2 Risk Assessment

No human health risk assessment was performed for this PRS because additional data are needed to complete a human health risk assessment.

5.1.7 Ecological Assessment

MDA T is a mesa-top site in a developed, disturbed area. The site provides limited habitat for biota, and it does not contain sensitive habitats and threatened or endangered species. Therefore, there is no immediate ecological risk at MDA T. However, runoff from the site does reach DP Canyon, which is a receptor of runoff from many other sites along its course. Moreover, multiple contaminants can have a cumulative impact on DP Canyon, which contains several sensitive habitats.

5.1.8 Extent of Contamination

Extent of contamination will be assessed when results of the Phase II investigation to be conducted in 1996 are available.

5.1.9 Conclusions and Recommendations

Data from field and laboratory analyses support the following conclusions and recommendations.

- Deviations from the TA-21 work plan, especially the change in sampling grid, may have affected LANL's ability to determine extent and nature of contamination in the southwest and southeast corners of MDA T.

- Three PAHs, benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene, were measured at two sample locations in surface soil at concentrations exceeding SALs. These compounds are unlikely to be associated with activities at MDA T or nearby waste treatment facilities.

- Thorium-228 measured above its SAL and is unlikely to reflect site contamination associated with activities at MDA T or nearby waste treatment facilities.

- Cesium-137 and strontium-90, as well as plutonium-239, were measured above their SALs in drainages that may have been affected by SWMU 21-011(k). These measurements should be assessed with other data from SWMU 21-011(k) and the drainages associated solely with SWMU 21-011(k).

- Plutonium-239 was measured above its SAL at only one point in the upper area of the main MDA T drainage and at only one point at MDA T (along the perimeter of the cap where americium-241 was also detected above its SAL). It is likely that these MDA T values are associated either with other SWMUs or represent original MDA T soil at the margin of the cap. Because data indicate the MDA T cap is intact, plutonium-239 and americium-241 migration with surface water runoff or airborne dust from MDA T is not a concern.

- The measured concentrations of COPCs in MDA T drainages are well within a factor of 10 of SAL values, and access to MDA T is currently restricted. Therefore, COPCs in surface soils at MDA T and its drainages do not represent an acute health risk to the occasional visitor to this area.

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Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 39-001(b) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit MDA - Y

Date Due to NMED: June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)													X	
Well Construction Details												X		
Pilot Testing Reports (not prev. submitted)												X		

Signature: Nancy Riebe

Name (print): Nancy Riebe

Date: 5/17/2001

MDA-4

MDA Y

LOS ALAMOS NATIONAL LABORATORY E RATION PROGRAM

SAMPLE MANAGEMENT FACILITY NMED CORE SAMPLE LOG

Borehole ID: ASC-11 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. to: 30 ft.
Date/Time Start: 8/2/94, 1646
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Page: 1 of: 3
End: 8/3/94

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
2.5	75	Surface AAB0411	HNu-ND Rad-105	0.5-2.5 1	Light brown sandy silt.	Surface sample-0-0.5 feet.
5	56		HNu-70 5-open Rad-105	2.5-5 2	Same as above, more sand.	
7.5	56		HNu-20 ND-open Rad-	5-7.5 3	Fine to medium silty sand.	
10	56	AAB0412	HNu-1 ND-open Rad-101	7.5-10 4	Medium brown, medium to coarse silty sand.	Sample 9.2-10 feet. Angle in shallowing-pull augers, reset rig.
12.5	0			10-12.5 5	No recovery.	
15	56		HNu-ND Rad-97	12.5-15 6	Medium to coarse silty sand.	
17.5	56		HNu-ND Rad-89	15-17.5 7	Same as above, damp.	
20	60	AAB0413	HNu-ND Rad-88	17.5-20 8	Coarse silty sand with 10% pebbles.	Sample 19.4-20 feet.
22.5	60		HNu-ND Rad-77	20-22.5 9	Coarse silty sand, damp, no pebbles.	
25	48		HNu-ND Rad-80	22.5-25 10	Medium silty sand with occasional pebbles, damp.	
27.5	60		HNu-ND Rad-88	25-27.5 11	Medium to coarse silty sand with cobbles.	
30	100	AAB0414	HNu-ND Rad-84	27.5-30 12	Upper 1"-Coarse to medium silty sand. Middle 1"-Silty clay. Lower 5'-Fine to medium silty sand, moist, tan brown.	Sample 29-30 feet. Had to offset hole-Pull augers, change bit, redrilled at 45° angle.

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-11 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/11/94, 0900
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/15/94, 1215

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
30 – 32.5	100		HNu-ND Rad-98	30-32.5 13	Dark brown clayey silt.	Re-entry with new augers on 8-11-94.
32.5 – 35	100		HNu-ND Rad-103	32.5-35 14	Clayey silt with pumice.	
35 – 37.5	100		HNu-ND Rad-103	35-37.5 15	Dark brown silt.	
37.5 – 40	100	AAB0415 Dup: AAB0416	HNu-ND Rad-97	37.5-40 16	Dark brown silt with some clay.	Sample 38.6-40 feet.
40 – 42.5	100		HNu-ND Rad-110	40-42.5 17	Dark brown clayey silt.	
42.5 – 45	100		HNu-ND Rad-114	42.5-45 18	42.5-43.5-Dark brown clayey silt. 43.5-45-Dark brown silty sand.	
45 – 47.5	100		HNu-ND Rad-89	45-47.5 19	45-45.5-Silty sand. 45.5-47-Clayey silt. 47-47.5-Clayey silty sand.	
47.5 – 50	100	AAB0417	HNu-ND Rad-103	47.5-50 20	Graded material from gravel to fine sand, rounded pink pumice clasts with silty matrix.	Sample 49.3-50 feet.
50 – 52.5	100		HNu-ND Rad-108	50-52.5 21	50-51.5-Medium brown coarse to fine silty sand with pebbles. 51.5-52.5-Gray fine sand with pebbles.	
52.5 – 55	84		HNu-ND Rad-89	52.5-55 22	52.9-53.5-Sandy silt. 53.5-54.1-Medium fine sand. 54.1-54.2-Very fine sand. 54.2-55-Sandy clayey silt with cobbles, tuff, dacite, and sanidine crystals.	

Prepared By: Kenneth A. Shisler Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-11 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/11/94, 0900
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/15/94, 1215

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
55	68		HNu-ND Rad-100	55-57.5 23	55.8-56.6-Medium clayey sand. 56.6-56.8-Dacite cobble zone. 56.8-57.1-Pink tuff layer. 57.1-57.5-Dark brown, dense sandy clay with pebbles.	
57.5	100	AAB0418	HNu-ND Rad-76	57.5-60 24	57.5-59-Grades from sandy clay to medium clayey sand. 59-60-Red brown medium sand, decreasing clay content with depth.	Sample 59.4-60 feet.
60	96		HNu-ND Rad-82	60-62.5 25	60.1-61.5-Red brown, sandy clay matrix conglomerate with large cobbles. 61.5-61.8-Dark brown, extremely weathered ash flow/ pebbles. 61.8-62.1-Light brown pumice. 62.1-62.15-Fe stained layer. 62.15-62.17-Magnetite (?). 62.17-62.5-Dark brown, weathered ash flow.	
62.5	100		HNu-ND Rad-90	62.5-65 26	62.5-64.1-Ash flow. 64.1-64.8-Interlayered silt and magnetite (?) Fe based mineral, Fe staining prominent. 64.8-65-Pumice flow.	
65	100		HNu-ND Rad-107	65-67.5 27	Gray brown, very fine sand with occasional white pumice clasts.	
67.5	100	AAB0419	HNu-ND Rad-98	67.5-70 28	Same as above.	Sample 69.2-70 feet.
70	100		HNu-ND Rad-94	70-72.5 29	Fine to medium buff sand with pumice and pebbles.	
72.5	100		HNu-ND Rad-86	72.5-75 30	Same as above.	
75	100		HNu-ND Rad-107	75-77.5 31	75-75.7-Fine sand with pumice. 75.7-76.3-Sugary coarse sand with pebbles. 76.3-77.5-Fine to medium sand with pebbles and tuff clasts.	
77.5	100	AAB0420	HNu-ND Rad-83	77.5-80 32	77.5-79-Sugary, loose tuff. 79-80-Interlayered dense, fine sand and coarse sugary loose tuff.	Sample 79-80 feet.
80					TOTAL DEPTH: 80 FEET	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94

Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-12 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/8/94, 1120
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/10/94, 1100

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
2.5	70	Surface AAB0422	HNu-ND Rad-89	0.5-2.5 1	Medium brown sandy silty with pebbles and roots.	Surface sample-0-0.5 feet.
5	60		HNu-ND Rad-108	2.5-5 2	3.5-4.6-Light brown coarse sand with pebbles. 4.6-5-Dense, dark brown, damp, sandy silt.	
7.5	100		HNu-ND Rad-105	5-7.5 3	Damp, coarse quartz sand with silt, loose.	
10	100	AAB0423	HNu-ND Rad-86	7.5-10 4	Medium to coarse quartz sand with pebbles and cobbles, damp.	Sample 9-10 feet.
12.5	80		HNu-ND Rad-98	10-12.5 5	Same as above.	
15	88		HNu-ND Rad-98	12.5-15 6	12.8-14.5-Medium coarse sand, damp. 14.5-15-Sandy silty, damp.	
17.5	92		HNu-ND Rad-113	15-17.5 7	Damp, medium to coarse sand.	
20	100	AAB0424	HNu-ND Rad-87	17.5-20 8	Same as above.	Sample 19-20 feet.
22.5	100		HNu-ND Rad-98	20-22.5 9	20-21.2-Same as above. 21.2-22.5-Dark brown clayey silt.	
25	100		HNu-ND Rad-98	22.5-25 10	Dark brown clayey silt with layers of silty clay.	
27.5	100		HNu-ND Rad-124	25-27.5 11	Same as above.	
30	100	AAB0425	HNu-ND Rad-91	27.5-30 12	Wet, dark brown clayey silty with sand and some pebbles.	Sample 28-30 feet.

Prepared By: Kenneth A. Shields Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-12 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/8/94, 1120
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/10/94, 1100

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
30 – 32.5	100		HNu-ND Rad-87	30-32.5 13	Dark brown, clayey sandy silt.	
32.5 – 35	100		HNu-ND Rad-88	32.5-35 14	Dark brown, sandy silty clay.	
35 – 37.5	100		HNu-ND Rad-101	35-37.5 15	Same as above with cobbles.	
37.5 – 40	100	AAB0426	HNu-ND Rad-106	37.5-40 16	Dark brown silty sand with cobbles.	Sample 38.8-40 feet.
40 – 43.5	86		HNu-ND Rad-97	40-43.5 17	40.5-41.3-Dense silt with cobbles. 41.3-42-Medium, silty sand with pebbles. 42-43.5-Dense, sandy silt with cobbles-conglomerate.	
43.5 – 45	100		HNu-ND Rad-92	43.5-45 18	Sandy clay silt with cobbles, obsidian, and weathered tuff layer.	
45 – 47.5	100		HNu-ND Rad-84	45-47.5 19	Sandy clay silt with relic mineralization, sanidine crystals and angular pebbles.	
47.5 – 50	100	AAB0427	HNu-ND Rad-97	47.5-50 20	Same as above, wet with cobbles.	Sample 48.8-50 feet.
50 – 51.5	100		HNu-ND Rad-99	50-51.5 21	Same as above, coarser grain.	Drilled with center bit to 52.5 feet.
52.5 – 55	96		HNu-ND Rad-109	52.5-55 22	Red brown, silty sand with cobbles.	
55 – 57.5	100		HNu-ND Rad-92	55-55.6 23	Clay silty sand with angular pebbles.	Drilled with center bit from 55.6 to 57.5 feet.
57.5 – 60	100	AAB0428	HNu-ND Rad-97	57.5-60 24	Medium brown, dense silt with pumice clast, iron staining with pebbles and fine sand layer.	Sample 59.1-60 feet.

Prepared By: Kenneth A. Shields Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-12 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/8/94, 1120
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/10/94, 1100

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
60 – 62.5	100		HNu-ND Rad-101	60-62.5 25	Medium brown, fine sand with occasional pumice clast, some Fe staining.	
62.5 – 65	100		HNu-ND Rad-117	62.5-65 26	Same as above.	
65 – 67.5	100		HNu-ND Rad-119	65-67.5 27	Fine sand with pebbles and cobbles.	
67.5 – 70	100	AAB0429	HNu-ND Rad-117	67.5-70 28	Medium brown, fine sand with occasional pumice clast and Fe staining.	Sample 69-70 feet.
70 – 75	0				Cobbles at 70 feet. No recovery.	Drilled with center bit from 70 feet to 75 feet.
75 – 77.5	100		HNu-ND Rad-92	75-77.5 29	Medium to fine sand with angular pebbles and cobble fragments.	
77.5 – 80	64	AAB0430	HNu-ND Rad-104	77.5-80 30	Medium quartz sand with pebbles and cobbles.	Sample 79.3-80 feet.
80					TOTAL DEPTH: 80 FEET	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-13 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/31/94, 1000
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sample

End: 9/1/94, 1500

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
2.5	65	Surface AAB0433	HNu-ND Rad-95	0.5-2.5 1	0.0-0.5- Medium brown silty sand. 1.2-2.0-Dark brown, coarse silty sand. 2.0-2.5-Dark brown silt, damp.	Surface sample-0-0.5 feet.
5	68		HNu-ND Rad-119	2.5-5 2	Dark brown, slightly damp, clayey silt with pumice.	
7.5	80		HNu-ND Rad-99	5-7.5 3	Same as above.	
10	80	AAB0434	HNu-ND Rad-96	7.5-10 4	Dark brown, damp, clayey silt with tuff cobbles.	Sample 8-10 feet.
12.5	72		HNu-ND Rad-103	10-12.5 5	Dark to medium brown, dry, coarse sand.	
15	60		HNu-ND Rad-92	12.5-15 6	Dark to medium brown, slightly damp, coarse sand with pumice pebbles.	
17.5	80		HNu-ND Rad-89	15-17.5 7	15.5-17-Medium brown coarse sand with pumice pebbles. 17-17.5-Medium brown clayey silt.	
20	88	AAB0435 Dup: AAB0436	HNu-ND Rad-100	17.5-20 8	Medium to dark brown, medium to coarse sand, slightly damp, with pumice.	Sample 17.8-20 feet.
22.5	92		HNu-ND Rad-93	20-22.5 9	Same as above, but damper.	
25	60		HNu-ND Rad-96	22.5-25 10	23.5-24.5-Medium brown, coarse sand with pumice pebbles, damp. 24.5-25-Dark brown, damp clay with some sand.	
27.5	64		HNu-ND Rad-92	25-27.5 11	25.9-27-Medium brown, damp, clayey sand with pumice pebbles. 27-27.5- Coarse clayey sand with pumice.	
30	92	AAB0437	HNu-ND Rad-98	27.5-30 12	Medium brown, coarse sand with pumice pebbles, slightly damp.	Sample 27.7-30 feet.

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-13 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/31/94, 1000 End: 9/1/94, 1500
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
30	100		HNu-ND Rad-106	30-32.5 13	30-30.9-Medium brown, damp, coarse sand. 30.9-31.8-Medium brown clay with pumice. 31.8-32.5-Medium brown sandy clay.	
32.5	92		HNu-ND Rad-107	32.5-35 14	32.7-33-Dark to medium brown sandy clay. 33-34.5-Pumice layer. 34.5-35-Medium brown coarse sand.	
35	100		HNu-ND Rad-111	35-37.5 15	35-36.9-Medium brown, coarse sand with pumice pebbles. 36.9-37.5-Medium brown, silty clay with two pumice layers and charcoal.	
37.5	100	AAB0438	HNu-ND Rad-91	37.5-40 16	Medium brown, damp, clayey silt with pumice and charcoal grading into damp, medium brown, fine sand with clay.	Sample 37.5-40 feet.
40	100		HNu-ND Rad-127	40-42.5 17	40-41-Medium brown, damp, fine sand. 41-41.5-Light brown pumice with medium brown fine sand. 41.5-42.5-Medium brown, damp, silty sand.	
42.5	100		HNu-ND Rad-95	42.5-45 18	Dark to medium brown,damp, silty sand with pumice pebbles and charcoal.	
45	100		HNu-ND Rad-103	45-47.5 19	45-46-Same as above. 46-47.5-Pumice with coarse sand.	
47.5	100	AAB0439	HNu-ND Rad-123	47.5-50 20	47.5-48.3-Dark brown, clayey sandy silt. 48.3-49.3-Medium brown, medium to coarse sand with Fe staining. 49.3-50-Gray brown fine sand.	Sample 47.5-50 feet.
50	100		HNu-ND Rad-100	50-52.5 21	50-50.4-Dark brown fine sand. 50.4-51.1-Dark brown fine to coarse sand and pebbles. 51.1-52-Dark brown fine to coarse sand and pumice with pebbles. 52-52.5-Gray fine sand.	
52.5						

Prepared By: Kenneth A. Shiley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-13 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/31/94, 1000
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 9/1/94, 1500

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
52.5	100		HNu-ND Rad-113	52.5-55 22	52.5-53-Damp, grayish brown, fine sand. 53-54.5-Light to medium brown, coarse sand with pumice cobbles. 54.5-55-Medium brown, medium sand with cobbles.	
55	100		HNu-ND Rad-95	55-57.5 23	55-56.7-Medium brown, medium sand with Fe staining with pumice cobbles, damp. 56.7-57.5-Grayish brown fine sand with cobbles.	
57.5	92	AAB0440	HNu-ND Rad-94	57.5-60 24	57.7-58-Damp, reddish brown, coarse sand with pumice pebbles. 58-58.6-Damp fine gray sand. 58.6-58.8-Coarse gray brown sand. 58.8-59.4-Fine gray sand. 59.4-59.7-Purple brown tuff. 59.7-60-Damp, reddish brown coarse sand.	Sample 57.7-60 feet.
60	100		HNu-ND Rad-107	60-62.5 25	60-61.1-Reddish brown, damp, coarse sand. 61.1-61.6-Light brown, fine sand with pumice, with a black metallic layer at top and bottom. 61.6-62.5-Light brown, fine sand with pumice pebbles.	
62.5	100		HNu-ND Rad-93	62.5-65 26	62.5-64-Light brown pumice. 64-64.3-Light brown, fine pumice with tuff cobbles. 64.3-65-Light brown pumice.	
65	100		HNu-ND Rad-91	65-67.5 27	Light brown pumice with fine sand, damp.	
67.5						

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-13 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/31/94, 1000 End: 9/1/94, 1500
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
67.5	100	AAB0441 MDA-V	HNu-ND Rad-91	67.5-70 28	67.5-69.6-Same as above. 69.6-70-Light brown, coarse to medium sand with pumice, damp.	Sample 67.5-70 feet.
70	100		HNu-ND Rad-95	70-72.5 29	Sugary texture, light brown pumice, damp.	
72.5	100		HNu-ND Rad-97	72.5-75 30	72.5-74.7-Damp, light reddish brown, fine sand with pumice. 74.7-75-Damp, light brown, coarse sand with dacite and pumice pebbles.	
75	96		HNu-ND Rad-96	75-77.5 31	75.1-75.2-Medium brown, very damp, fine sand. 75.2-75.7-Light brown, coarse sand with dacite cobbles, damp. 75.7-76.2-Reddish brown, fine sand, damp. 76.2-76.9-Grayish brown coarse sand with pumice, damp. 76.9-77.1-Reddish brown fine sand, damp. 77.1-77.5-Light grayish brown, coarse sand with pumice and dacite cobbles, damp.	
77.5	100	AAB0442	HNu-ND Rad-101	77.5-80 32	77.5-79.7-Light brown, coarse sand with dacite cobbles. 79.7-80-Light brown, medium sand with pumice.	Sample 77.5-80 feet.
80					TOTAL DEPTH: 80 FEET	

Prepared By: Kenneth A. Shields Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-14 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/16/94
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/17/94

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
2.5	70	Surface AAB0444	HNu-ND Rad-100	0.5-2.5 1	Sandy silty loam, damp at 2.1 feet.	Surface sample-0-0.5 feet.
5	76		HNu-ND Rad-99	2.5-5 2	Medium to coarse sand with some silt, damp.	
7.5	76		HNu-ND Rad-83	5-7.5 3	Medium to coarse sand with tuff cobbles.	
10	76	AAB0445	HNu-ND Rad-95	7.5-10 4	Very coarse sand with pebbles.	Sample 9.3-10 feet.
12.5	80		HNu-ND Rad-104	10-12.5 5	10.5-11.5-Same as above. 11.5-12.5-Fine to medium silty sand.	
15	96		HNu-ND Rad-114	12.5-15 6	12.6-14-Medium to coarse silty sand with cobbles. 14-15-Coarse sandy silt.	
17.5	76		HNu-ND Rad-110	15-17.5 7	Fine to medium sand with silt.	
20	96	AAB0446	HNu-ND Rad-96	17.5-20 8	Medium sand with silt, pebbles, and cobbles (tuff and dacite)	Sample 19.2-20 feet.
22.5	100		HNu-ND Rad-89	20-22.5 9	Fine to coarse sand.	
25	100		HNu-ND Rad-109	22.5-25 10	Medium to coarse sand.	
27.5	96		HNu-ND Rad-99	25-27.5 11	Sandy silty clay.	
30	100	AAB0447	HNu-ND Rad-102	27.5-30 12	Sandy silty clay with cobbles.	Sample 29-30 feet.

Prepared By: Kenneth A. Shisler Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-14 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/16/94
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/17/94

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
30	100		HNu-ND Rad-110	30-32.5 13	Fine sandy silty clay to silty clayey sand.	
32.5	96		HNu-ND Rad-112	32.5-35 14	Silty clayey fine sand.	
35	96		HNu-ND Rad-104	35-37.5 15	Silty fine sand.	
37.5	96	AAB0448	HNu- Rad-	37.5-40 16	Dense, fine silty sand.	Sample 39-40 feet.
40	100		HNu-ND Rad-105	40-42.5 17	Dark brown, clayey sandy silt.	
42.5	100		HNu-ND Rad-97	42.5-45 18	Same as above, with sanidine crystals.	
45	100		HNu-ND Rad-92	45-47.5 19	45-45.5-Medium silty sand. 45.5-47.5-Clayey silt with some sand.	
47.5	100	AAB0449	HNu-ND Rad-115	47.5-50 20	47.5-48.3-Silty medium sand. 48.3-50-Dark brown, silty fine sand.	Sample 49-50 feet.
50	100		HNu-ND Rad-101	50-52.5 21	50-50.3-Silty fine sand. 50.3-51.5-Silty fine to medium sand. 51.5-52.5-Coarse sand with fine sand layers.	
52.5	76		HNu-ND Rad-117	52.5-55 22	53.1-54.5-Silty fine to medium sand. 54.5-55-Purple brown weathered tuff.	
55	100		HNu-ND Rad-111	55-57.5 23	55-56-Fine to medium red brown clayey silty sand. 56-56.3-Sandy clay with black staining. 56.3-57.5-Extremely weathered tuff-clay with relic minerals.	
57.5						

Prepared By: Kenneth A. Shiler Jr. Date: 10/28/94

Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-14 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/16/94
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/17/94

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
57.5	100	AAB0450	HNu-ND Rad-103	57.5-60 24	Purple brown weathered tuff to fine sandy clay with relic mineralization, prevalent Fe staining.	Sample 58.6-60 feet.
60	80		HNu-ND Rad-88	60-62.5 25	60.5-62-Color change to orange brown (Fe stain). 62-62.5-Interlayered purple brown and pink weathered tuff with large cobble.	
62.5	100		HNu-ND Rad-80	62.5-65 26	Pink tuff weathered to sandy silty clay, Fe stained to 64.4 feet.	
65	96	AAB0573	HNu-ND Rad-96	65-67.5 27	65.1-66.1-Saturated layer of coarse sand with silty clay, manganese nodule formation at 65.5 feet. 661.-67.5-Light brown tuff, weathered to silt with pumice clasts.	Sample 65.1-66 feet.
67.5	84	AAB0451	HNu-ND Rad-111	67.5-70 28	Tuff weathered to orange brown silt with sand, cobbles and pumice.	Sample 69.3-70 feet.
70	96		HNu-ND Rad-100	70-72.5 29	Medium brown fine sand with cobbles and pebbles.	
72.5	100		HNu-ND Rad-96	72.5-75 30	72.5-74-Sugary texture uncon-solidated tuff. 74-75-Fine sand texture tuff with cobbles.	
75	100		HNu-ND Rad-108	75-77.5 31	75-77.4-Fine sand with pebbles and cobbles, pumice. 77.4-77.5-Sugary texture.	
77.5	96	AAB0452	HNu-ND Rad-89	77.5-80 32	77.6-77.9-Mauve tuff layer. 77.9-80-Sugary unconsolidated tuff with pebbles and cobbles.	Sample 77.9-80 feet.
80					TOTAL DEPTH: 80 FEET	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-15 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/19/9, 0900 End: 8/23/94, 1050
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
2.5	65	Surface AAB0455	HNu-ND Rad-104	0.5-2.5 1	1.2-1.9 ft. - Sandy silty loam 1.9-2.5 ft. - Damp, dense silt with pumice.	Surface sample-0-0.5 feet.
5	40		HNu-ND Rad-88	2.5-5 2	Very coarse sand and pebbles, damp	
7.5	28		HNu-ND Rad-97	5-7.5 3	Very coarse sand, some fine, damp.	
10	32	AAB0456	HNu-ND Rad-102	7.5-10 4	Medium to very coarse sand.	Sample 9.4-10 feet.
12.5	84		HNu-ND Rad-87	10-12.5 5	Same as above.	
15	100		HNu-ND Rad-104	12.5-15 6	Same as above.	
17.5	100		HNu-ND Rad-97	15-17.5 7	15-16.1 ft. - Same as above. 16.1-17.5 ft.-Fine silty sand interlayered with coarse silty sand.	
20	92	AAB0457	HNu-ND Rad-94	17.5-20 8	17.7-19-Fine to medium sand 19-19.6-Very coarse sand to fine gravel. 19.6-20-Dense silt	Sample 19.6-20 feet.
22.5	100		HNu-ND Rad-108	20-22.5 9	20-20.8-Silt with cobbles 20.8-20.-Medium sand 20.9-21.6-Fine sandy silt 21.6-22.5- Silty fine gravel.	
25	100		HNu-ND Rad-108	22.5-25 10	22.5-23.7-Medium, sugary texture, unconsolidated tuff with cobbles. 23.7-25-Coarse, sugary texture, unconsolidated tuff with cobbles and cemented clasts.	
27.5	100		HNu-ND Rad-102	25-27.5 11	25-26.5-Coarse sand with silt and pebbles, sanidine crystals. 26.5-27.5-Medium brown dense clayey silt with pebbles.	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-15 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/19/9, 0900 End: 8/23/94, 1050
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
27.5	100	AAB0458	HNu-ND Rad-110	27.5-30 12	Dark brown, sandy silty clay.	Sample 28.3-30 feet.
30	100		HNu-ND Rad-106	30-32.5 13	Same as above with varying amounts of sand and clay.	
32.5	100		HNu-ND Rad-92	32.5-35 14	Dark brown, sandy silt with some clay.	
35	100		HNu-ND Rad-94	35-37.5 15	Same as above.	
37.5	100	AAB0459	HNu-ND Rad-97	37.5-40 16	Dark brown, silty fine sand with some clay.	Sample 38.6-40 feet.
40	100		HNu-ND Rad-96	40-42.5 17	Clayey silty sand.	
42.5	100		HNu-ND Rad-108	42.5-45 18	Sandy silty clay with tuff cobbles.	
45	100		HNu-ND Rad-106	45-47.5 19	45-46.9-Sandy silt. 46.9-47.5-Silty sand.	
47.5	100	AAB0460	HNu-ND Rad-103	47.5-50 20	Medium sandy silt to dark brown silty very fine sand with pebbles.	Sample 49.3-50 feet.
50	100		HNu-ND Rad-114	50-52.5 21	Fine silty clayey sand.	
52.5	100		HNu-ND Rad-103	52.5-55 22	Purple brown weathered tuff.	
55	100		HNu-ND Rad-102	55-57.5 23	Wet, sandy silty clay . Dacite cobble at 57.5	
57.5						

Prepared By: Kenneth A. Shelby Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID: ASC-15 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/19/94, 0900
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/23/94, 1050

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
57.5	96	AAB0461 Dup: AAB0462	HNu-ND Rad-112	57.5-60 24	Red brown, sandy silty clay with cobbles.	Sample 58.7-60 feet.
60	68		HNu-ND Rad-103	60-62.5 25	Silty clayey sand with purple tuff cobbles and pumice. Orange brown to dark brown staining at 62.5 ft., wet.	
62.5	76		HNu-ND Rad-87	62.5-65 26	63.1-64-Silty clay with cobbles and iron staining. 64-65-Ash flow material with pumice and cobbles, wet and iron staining.	
65	72		HNu-ND Rad-77	65-67.5 27	Pumice with cobbles and pebbles, very wet.	
67.5	64	AAB0463	HNu-ND Rad-83	67.5-70 28	Pumice sand with pebbles and large cobbles, saturated.	Sample 69.1-70 feet.
70	100		HNu-ND Rad-87	70-72.5 29	70-71.4-Coarse dark sand. 71.4-71.5-Layer of black metallic deposition with iron staining. 71.5-72.5-Pumice sand with cobbles, saturated.	
72.5	0			72.5-75 30	No recovery.	
75	0			75-77.5 31	No recovery.	
77.5	100	AAB0464	HNu-ND Rad-98	77.5-80 32	Medium to coarse sand with large cobbles and pebbles, saturated.	Sample 77.5-80 feet.
80					TOTAL DEPTH: 80 FEET	

Prepared By: Kenneth A. Phillips Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID: ASC-16 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/25/94, 1300
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/29/94, 1635

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
	60	Surface AAB0466	HNu-ND Rad-89	0.5-2.5 1	Light brown silt.	Surface sample-0-0.5 feet.
2.5	60		HNu-ND Rad-88	2.5-5 2	Light to medium brown, medium sand with some fines.	
5	92		HNu-3 2 open Rad-113	5-7.5 3	Medium brown coarse sand with pebbles, damp.	
7.5	80	AAB0467	HNu-0.5 Rad-86	7.5-10 4	Medium brown coarse sand with cobbles.	Sample 8-10 feet.
10	100		HNu-ND Rad-94	10-12.5 5	Medium brown coarse sand with some medium sand.	
12.5	100		HNu-ND Rad-110	12.5-15 6	Medium brown coarse sand with pebbles.	
15	80		HNu-ND Rad-106	15-17.5 7	Same as above, slightly damp.	
17.5	84	AAB0468	HNu-ND Rad-92	17.5-20 8	Medium brown, fine to coarse sand with pebbles.	Sample 19.5-20 feet.
20	100		HNu-ND Rad-95	20-22.5 9	Medium brown, medium to coarse sand, slightly damp.	
22.5	100		HNu-ND Rad-106	22.5-25 10	Medium brown, clayey silt, some sand, damp.	
25	100		HNu-ND Rad-108	25-27.5 11	Medium brown, damp, clayey silt with some sand at 25 feet, grades into reddish brown clayey silt.	
27.5	100	AAB0469	HNu-ND Rad-116	27.5-30 12	Medium brown, clayey sand grading into silty sandy conglomerate with gravel and tuff, damp.	Sample 27.5-30 feet.
30						

Prepared By: Kenneth A. Shiley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-16 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/25/94, 1300
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/29/94, 1635

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
30	100		HNu-ND Rad-107	30-32.5 13	30-30.5-Medium brown, coarse sandy conglomerate with pinkish- purple tuff. 30.5-32.5-Fine sand with coarse sand layers, damp.	
32.5	100		HNu-ND Rad-104	32.5-35 14	32.5-33.5-Damp, medium brown, coarse sand. 33.5-34-Light brown, fine sand. 34-34.5-Fine sandy conglome-rate. 34.5-35-Medium brown, coarse sand.	
35	100		HNu-ND Rad-112	35-37.5 15	35-37-Damp, light brown, medium sand grading into coarse sand. 37-37.5-Reddish brown, coarse sand with pebbles, gravel, and some cobbles.	
37.5	100	AAB0470	HNu-ND Rad-92	37.5-40 16	37.5-39.4-Reddish brown, clayey sand with pumice clasts and pebbles. 39.4-40-Orange brown silty clay.	Sample 37.5-40 feet.
40	100		HNu-ND Rad-98	40-42.5 17	40-40.7-Buff ash flow-pumice. 40.7-41.7-Reddish brown pumice. 41.7-42-Brownish purple tuff. 42-42.5-Orange brown silty clay.	
42.5	100		HNu-ND Rad-102	42.5-45 18	42.5-43-Orange brown silty clay. 43-45-Reddish brown, damp, clayey sand.	
45	48		HNu-ND Rad-108	45-46.5 19	45.78-46-Reddish brown, damp, coarse sand. 46-46.3-Purple brown tuff. 46.3-46.5-Reddish brown, damp, coarse sand.	Drilled with center bit from 46.5 to 47.5 feet.
46.5						
47.5	44	AAB0471	HNu-ND Rad-90	47.5-50 20	Light orangish brown, medium sand with pumice, damp.	Sample 48.9-50 feet.
50	80		HNu-ND Rad-98	50-52.5 21	Damp, light orange brown, clayey sand grading into light brown medium sand with some pumice cobbles and Fe stain.	
52.5	0			52.5-55 22	No recovery.	Hit boulder at 52.5 feet - moved rig over 3 feet.
55						

Prepared By: Kenneth A. Shields Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-16 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 8/25/94, 0900
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 8/29/94, 1635

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
55	88		HNu-ND Rad-91	55-57.5 23	Grayish medium brown clay with dacite cobbles grading into light medium brown conglomerate with pumice, damp.	
57.5	100	AAB0472	HNu-ND Rad-99	57.5-60 24	Pumice with angular dacite fragments, damp.	Sample 57.5-60 feet.
60	100		HNu-ND Rad-106	60-62.5 25	Same as above, slightly damper.	
62.5	100		HNu-ND Rad-90	62.5-65 26	62.5-63.5-Gray brown pumice. 63.5-63.7- Iron stained layer with manganese (?) deposition.	
65	100		HNu-ND Rad-95	65-67.5 27	63.7-65-Red brown pumice with Fe stained banding and cobbles.	
67.5	100	AAB0473	HNu-ND Rad-97	67.5-70 28	Medium brown pumice with cobbles at 67.3 feet, saturated. 67.5-68.2-Coarse pumice with pebbles. 68.2-69-Fine sand, Fe stained. 69-70-Light brown fine pumice.	Sample 67.9-70 feet.
70	100		HNu-ND Rad-84	70-72.5 29	70-71.4-Coarse saturated sand. 71.4-72.5-Damp pumice.	
72.5	100		HNu-ND Rad-101	72.5-75 30	72.5-73.2-Coarse sand. 73.2-74-Very fine sand with pumice and dacite clasts. 74-75-Fine sand and pumice.	
75	88		HNu-ND Rad-90	75-77.5 31	75.3-76.5-Coarse to medium sand, pebbles and cobbles. 76.5-77.5-Fine sand with pumice and cobbles.	
77.5	100	AAB0474	HNu-ND Rad-110	77.5-80 32	Fine sand with pumice and pebbles.	Sample 78.5-80 feet.
80					TOTAL DEPTH: 80 FEET	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-17 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 9/12/94, 1000
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 9/12/94, 1900

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
2.5	65	Surface AAB0477	HNu-ND Rad-110	0.5-2.5 1	0-0.5-Brown sandy silty loam. 1.2-1.8-Dark brown, silty fine sand. 1.8-2.5-Dark brown, silty clayey fine sand.	Surface sample-0-0.5 feet.
5	80		HNu-ND Rad-92	2.5-5 2	Dark brown, silty fine sand with pebbles.	
7.5	96		HNu-ND Rad-98	5-7.5 3	Dark brown, silty fine sand grading into dark brown silty clayey fine sand with pebbles.	
10	72	AAB0478	HNu-ND Rad-87	7.5-10 4	Dark brown silty clayey fine sand with pink tuff pebbles.	Sample 8.2-10 feet.
12.5	88		HNu-ND Rad-82	10-12.5 5	10.3-12.3-Same as above. 12.3-12.5-Dark brown, silty medium sand with pink tuff pebbles.	
15	96		HNu-ND Rad-93	12.5-15 6	12.6-14-Dark to medium brown coarse sand. 14-14.2-Dark brown, clayey silty fine sand. 14.2-15-Dark to medium brown coarse sand.	
17.5	100		HNu-ND Rad-97	15-17.5 7	Medium brown, sugary texture, coarse sand.	
20	84	AAB0479	HNu-ND Rad-100	17.5-20 8	17.9-19.5-Same as above. 19.5-20-Medium brown silty clayey sand.	Sample 17.9-20 feet.
22.5	96		HNu-ND Rad-101	20-22.5 9	20.1-21.4-Medium brown, silty clayey sand. 21.4-21.5-Tuff gravel layer. 21.5-22-Medium brown, silty clayey sand. 22-22.5-Medium brown, coarse sand with cobbles, damp.	
25	76		HNu-ND Rad-111	22.5-25 10	Medium brown, sugary texture, coarse sand, slightly damp.	
27.5	92		HNu-ND Rad-104	25-27.5 11	Same as above.	
30	88	AAB0480 Dup: AAB0481	HNu-ND Rad-117	27.5-30 12	27.8-29.4-Medium brown, silty fine sand with pumice and tuff cobbles and pebbles. 29.4-30-Medium brown, clayey silty sand, damp.	Sample 27.8-30 feet.

Prepared By: Kenneth A. Shirley Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-17 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 9/12/94, 1000
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 9/12/94,1900

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
30	100		HNu-ND Rad-90	30-32.5 13	30-31.8-Medium brown, coarse sugary texture sand. 31.8-32.3-Medium brown silty sand. 32.3-32.5-Same as 30 feet with cobbles of tuff and pumice.	
32.5	100		HNu-ND Rad-97	32.5-35 14	32.5-33-Medium brown, sugary texture coarse sand. 33-34-Medium brown, silty sand with tuff cobbles. 34-35-Same as 32.5-33 feet.	
35	100		HNu-ND Rad-87	35-37.5 15	35-36-Medium brown, coarse sugary sand. 36-37.5-Medium brown, clayey sand, damp.	
37.5	100	AAB0482	HNu-ND Rad-89	37.5-40 16	Medium brown, clayey sand, some pumice pebbles, some Fe staining, damp.	Sample 37.5-40 feet.
40	100		HNu-ND Rad-96	40-42.5 17	Medium brown, clayey sand with some pumice and dacite pebbles, more damp.	
42.5	100		HNu-ND Rad-82	42.5-45 18	Dark brown, clayey fine sand and weathered pumice, with pebbles, damp.	
45	100		HNu-ND Rad-94	45-47.5 19	45-46.8-Damp weathered pumice. 46.8-46.9-Coarse sugary sand. 46.9-47.2-Weathered pumice. 47.2-47.5-Medium brown, dry, coarse sugary sand.	
47.5	96	AAB0483	HNu-ND Rad-111	47.5-50 20	47.6-47.7-Coarse sugary sand. 47.7-48.6-Medium brown coarse pumice sand. 48.6-49.7-Gray pumice, fine clayey damp sand with Fe stain. 49.7-50-Light brown pumice.	Sample 47.6-50 feet.
50	96		HNu-ND Rad-115	50-52.5 21	50.1-51.5-Purplish brown tuff with brown, coarse pumice sand; Fe staining. 51.5-52.3-Gray, damp, very fine sand with Fe staining. 52.3-52.5-Gray weathered pumice.	
52.5	100		HNu-ND Rad-117	52.5-55 22	52.5-52.7-Wet, brown clayey sand. 52.7-55-Grayish brown, sugary, dry coarse sand with pumice.	
55						

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-17 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 9/12/94, 1000
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 9/12/94, 1900

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
55	100		HNu-ND Rad-93	55-57.5 23	55-55.6-Same as 52.7-55 feet. 55.6-56.1-Gray pumice. 56.1-57.5-Damp, gray, fine pumice sand with Fe staining.	
57.5	96	AAB0484	HNu-ND Rad-107	57.5-60 24	57.6-57.9-Weathered tuff with Fe stain. 57.9-60-Brown, damp, clayey sand with Fe staining.	Sample 57.6-60 feet.
60	80		HNu-ND Rad-90	60-62.5 25	60.5-61.3-Same as 57.9-60 ft. 61.3-61.6-Purplish brown tuff. 61.6-62.5-Very damp, brown, clayey sand with tuff cobbles.	
62.5	100		HNu-ND Rad-99	62.5-65 26	62.5-63.9-Reddish brown, wet, medium pumice sand, Fe stain. 63.9-64.5-Light reddish brown coarse sand with Fe stain. 64.5-65-Fe stained sand.	
65	100		HNu-ND Rad-101	65-67.5 27	65-65.3-Wet, reddish brown, coarse pumice sand. 65.3-67.5-Wet, light brown, coarse pumice sand.	
67.5	100	AAB0485	HNu-ND Rad-120	67.5-70 28	67.5-68.5-Wet, light brown, coarse pumice sand. 68.5-68.7-Dacite cobbles. 68.7-69.2-Fe stained pumice. 69.2-70-Light brown, damp, medium, pumice sand.	Sample 67.5-70 feet.
70	80		HNu-ND Rad-121	70-75 29	71-71.5-Medium brown, wet, pumice sand. 71.5-72.5-Medium brown, damp, coarse pumice sand. 72.5-73-Medium brown, damp, silty medium sand. 73-75-Medium brown, damp, medium to coarse pumice sand.	Run = 5 feet.
75	100		HNu-ND Rad-97	75-77.5 30	Light brown, medium pumice sand with gravel, tuff and pumice cobbles.	
77.5	100	AAB0486	HNu-ND Rad-85	77.5-80 31	Light brown, medium to coarse pumice sand.	Sample 77.5-80 feet.
80					TOTAL DEPTH: 80 FEET	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-18 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 9/14/94, 0900 End: 9/14/94, 1730
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
2.5	60	Surface AAB0488	HNu-ND Rad-95	0.5-2.5 1	0-0.5-Medium brown, silty sandy loam. 1.3-2.5-Medium brown, silty fine sand, some pumice.	Surface sample-0-0.5 feet.
5	100		HNu-ND Rad-115	2.5-5 2	2.5-3.7-Same as above. 3.7-5-Medium brown, coarse sugary sand.	
7.5	52		HNu-ND Rad-102	5-7.5 3	6.2-7.3-Same as 3.7-5 feet. 7.3-7.5-Medium brown, silty sand with pumice clasts.	
10	84	AAB0489	HNu-ND Rad-96	7.5-10 4	7.9-9.8-Medium brown, sugary coarse sand, some pumice. 9.8-10-Medium brown silty sand.	Sample 7.9-10 feet.
12.5	68		HNu-ND Rad-90	10-12.5 5	10.8-12.1-Medium brown, sugary coarse sand. 12.1-12.4-Medium brown, coarse clayey sugary sand. 12.4-12.5-Same as 10.8-12.1 ft.	
15	68		HNu-ND Rad-91	12.5-15 6	Medium brown, sugary, coarse sand with pumice clasts, dry.	
17.5	72		HNu-ND Rad-93	15-17.5 7	Same as above, with sanidine crystals, damp.	
20	72	AAB0490	HNu-ND Rad-108	17.5-20 8	18.2-19.1-Same as above with pumice cobbles. 19.1-20-Medium brown, damp, silty medium sand, some pumice.	Sample 18.2-20 feet.
22.5	72		HNu-ND Rad-80	20-22.5 9	Medium brown, sugary, coarse sand with sanidine crystals and pumice.	
25	80		HNu-ND Rad-90	22.5-25 10	Same as above, more pumice.	
27.5	84		HNu-ND Rad-103	25-27.5 11	Same as above, with gravel layer at 25.6 to 26 feet.	
30	100	AAB0491	HNu-ND Rad-94	27.5-30 12	27.5-29.7-Medium brown, sugary coarse sand with pumice. 29.7-30-Same as above, damp and slightly clayey.	Sample-27.5-30 feet.

Prepared By: Kenneth A. Shisler Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-18 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 9/14/94, 0900
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 9/14/94, 1730

Depth (Feet)	Recovery (Feet/Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
30	92		HNu-ND Rad-80	30-32.5 13	Same as above 29.7 to 30 feet, pumice pebbles and clasts.	
32.5	100		HNu-ND Rad-109	32.5-35 14	Clayey, sugary coarse sand, with pumice, damp.	
35	100		HNu-ND Rad-95	35-37.5 15	35-36.4-Same as above, more damp, with gravel. 36.4-37.5-Medium brown, clayey fine sand with pumice, damp.	
37.5	100	AAB0492	HNu-5 ND open Rad-116	37.5-40 16	Same as 36.4 to 37.5 feet, more pumice.	Sample 37.5-40 feet.
40	96		HNu-ND Rad-117	40-42.5 17	40.1-40.9-Damp, medium brown, medium sand with pumice and sanidine. 40.9-41.1-Pinkish brown pumice. 41.1-42.5-Damp, medium brown, clayey sand.	
42.5	100		HNu-ND Rad-93	42.5-45 18	42.5-42.7-Same as 41.1-42.5 ft. 42.7-43.1-Medium brown, coarse sand, dry. 43.1-44.6-Same as 42.5-47.5 ft. 44.6-45-Damp, medium brown, coarse pumice sand.	
45	88		HNu-ND Rad-112	45-47.5 19		
47.5	100	AAB0493	HNu-ND Rad-107	47.5-50 20	45.3-45.4-Medium brown, damp, coarse sand. 45.4-45.7-Medium brown, clayey sand. 45.7-47.3-Medium to light brown, coarse sand with pumice. 47.3-47.5-Grayish brown, damp, medium sand.	
50	100		HNu-ND Rad-108	50-52.5 21	47.5-47.7-Medium brown, silty medium sand. 47.7-48.3-Damp coarse sand. 48.3-48.5-Medium brown, silty sand. 48.5-50-Medium to grayish brown, coarse sand with pumice cobbles.	Sample-47.5-50 feet.
52.5					50-52.3-Damp, medium to grayish brown, coarse sand with Fe stain and pumice cobbles. 52.3-52.5-Medium brown, clayey sand, very damp.	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-18 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 9/14/94, 0900
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 9/14/94, 1730

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
52.5	100		HNu-ND Rad-99	52.5-55 22	52.5-53.5-Medium brown, coarse pumice sand with clasts. 53.5-55-Medium to light brown, sugary coarse sand with pumice.	
55	100		HNu-ND Rad-109	55-57.5 23	55-55.2-Damp, medium brown clayey sand. 55.2-56.5-Medium brown, coarse sugary sand with pumice. 56.5-56.6-Fe stained coarse sand. 56.6-57.3-Same as 55.2-56.5 ft. 57.3-57.5-Gray, damp, coarse sand.	
57.5	100	AAB0494	HNu-ND Rad-90	57.5-60 24		
60	100		HNu-ND Rad-104	60-62.5 25	57.5-57.7-Tan, clayey sand. 57.7-58-Dark gray clay. 58-58.1-Dark gray silty sand. 58.1-58.3-Dark gray, very damp, coarse sand. 58.3-60-Gray, silty fine to coarse sand.	Sample-57.5-60 feet.
62.5	67		HNu-ND Rad-97	62.5-64 26		
64					60-60.1-Wet coarse gray sand. 60.1-61.4-Dense, gray silty fine sand, damp, Fe stain. 61.4-61.6-Fe stained, damp, medium silty sand. 61.6-61.7-Gray fine silty sand. 61.7-62.4-Grayish brown, medium silty sand. 62.4-62.5-Tuff and pumice sand.	
					63-63.8-Brownish gray, clayey silty coarse sand with pumice and dacite cobbles. 63.8-64-Purplish brown tuff.	Run = 1.5 feet.

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: ASC-18 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 80 ft.
Date/Time Start: 9/14/94, 0900
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 9/14/94, 1730

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Notes
64	0			64-67.5 27	No recovery.	Drilled with center bit from 64 to 67.5 feet.
67.5	100	AAB0495	HNu-ND Rad-80	67.5-70 28	67.5-69.3-Saturated, light to medium brown, coarse pumice sand with gravel, dacite cobbles, Fe staining. 69.3-70-Saturated, light brown coarse pumice sand.	Sample-67.5-70 feet.
70	100		HNu-ND Rad-96	70-72.5 29	Saturated, light to medium brown, coarse pumice sand.	
72.5	100		HNu-ND Rad-89	72.5-75 30	72.5-74.1-Saturated, medium brown, coarse pumice sand with dacite cobbles, Fe stain. 74.1-74.3-Damp, medium brown pumice sand. 74.3-75-Dry, light brown, medium pumice sand.	
75	100		HNu-ND Rad-112	75-77.5 31	75-76.8-Saturated, medium brown, coarse pumice sand with dacite cobbles and gravel. 76.8-77.5-Damp, light brown, medium pumice sand.	
77.5	100	AAB0496	HNu-ND Rad-91	77.5-80 32	77.5-78.5-Saturated, medium brown, coarse pumice sand and gravel with cobbles. 78.5-80-Light brown, damp, silty sand.	Sample-77.5-80 feet.
80					TOTAL DEPTH: 80 FEET	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: UM-3 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 56.5 ft.
Date/Time Start: 7/26/94, 1056
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 7/29/94, 1140

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	0	Surface AAB0510		0.5-2.5 1	No recovery.			Surface sample -0-0.5 feet.
2.5	96	AAB0511	PID-120 ND open Rad-101	2.5-5 2	2.6-4-Fine silty sand, roots, dry. 4-5-Very coarse sand with pebbles and cemented clasts.		SM / SW	Sample 3.9-5 feet. PID-Photovac Microtip
5	60		PID-33 ND open Rad-110	5-7.5 3	Silty, very coarse sand with pebbles, damp at 6.5 feet.		SM	
7.5	64	AAB0512	PID-120 ND open Rad-99	7.5-10 4	Very coarse to fine sand, damp.		SW	Sample 9-10 feet.
10	0			10-12.5 5	No recovery.			
12.5	48	AAB0513	PID-350 ND open Rad-107	12.5-15 6	Very coarse to fine silty sand, dry.		SM	Sample 14-15 feet.
15	40		PID-145 ND open Rad-87	15-17.5 7	Same as above, becoming more silty, some cementation.			
17.5	52	AAB0514	PID-130 ND open Rad-90	17.5-20 8	Very coarse to fine silty sand with pebbles.			Sample 19.2-20 feet.
20	60		PID-14 ND open Rad-	20-22.5 9	Silt with pebbles and tuff cobbles.		ML	
22.5	60	AAB0515	PID-9 ND open Rad-100	22.5-25 10	Same as above with more extremely weathered pink tuff.			Sample 24-25 feet.
25	48		PID-1 ND open Rad-102	25-27.5 11	Dark brown, clayey silt, with extremely weathered tuff.			
27.5	68	AAB0516	PID-4 ND open Rad-91	27.5-30 12	Dark brown, extremely weathered tuff, relict mineralization visible, clayey silt.		Qbt / ML	Sample 29-30 feet.
30								

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: UM-3 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 56.5 ft.
Date/Time Start: 7/26/94, 1056 End: 7/29/94, 1140
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	84		PID-1 ND open Rad-118	30-32.5 13	Extremely weathered tuff, clayey silt, increasing clay and moisture content with depth.		Qbt	
32.5	64	AAB0517	PID-10 ND open Rad-120	32.5-35 14	Same as above.		ML	Sample 34.1-35 feet.
35	44		PID-7 ND open Rad-123	35-37.5 15	Same as above, denser.			
37.5	100	AAB0518	PID-ND Rad-119	37.5-40 16	37.5-38.3-Pink tuff. 38.3-39.7-Brown sandy silt with cobbles. 39.7-39.8-Gray clay layer. 39.8-40-Gray, soft weathered tuff.		Qbt SM CL	Sample 38.8-40 feet.
40	100		PID-1 ND open Rad-117	40-42.5 17				
42.5	100	AAB0519	PID-ND Rad-97	42.5-45 18	40-41.1-Gray, clayey weathered tuff with cobbles and pink tuff clasts, wet. 41.1-41.25-Brown sand, Fe stained, wet. 41.25-41.3-Black clay, wet. 41.3-42.4-Gray clay with relict sand size mineralization, wet. 42.4-42.5-Brown sand, wet.		Qbt SW CL SW	
45					Gray, clayey weathered tuff, saturated, very soft altered relict mineralization.		Qbt	Sample 43.8-45 feet.

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: UM-3 TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0.5 ft. To: 56.5 ft.
Date/Time Start: 7/26/94, 1056
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

End: 7/29/94, 1140

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
45	72		PID-ND Rad-103	45-47.5 19	Conglomerate with Fe staining, dacite cobbles, wet.		GW-GM	
47.5	100	AAB0520	PID-ND Rad-96	47.5-50 20	47.5-49-Brown conglomerate, clayey silt. 49-50-Fine beige sand.		SW	Sample 49.3-50 feet. Rig down on 7/24/94 with starter problem at 50 feet.
50	72		FID-ND Rad-95	50-52.5 21	Extremely weathered tuff becoming Fe stained below 51 feet.		Qbt	FID-Foxboro 128
52.5	100	AAB0521	FID-2 ND open Rad-~~119~~ 72	52.5-54 22	Brown, medium sand with silt, obsidian and rhyolite pebbles and dacite cobbles.		SW-SM	Sample 53.2-54 feet. Hit hard material at 54 ft., run center bit.
54								
55	100		FID-ND Rad-87	55-56.5 23	Sugary texture, coarse grained tuff with large igneous cobble (dacite ?).		Qbt	Center bit stuck, re-auger hole. Reached 54 ft. with center bit, then went 1 foot with center bit to 55 ft. until auger refusal. Drove split spoon sample 1.5 feet (55-56.5 feet).
56.5					TOTAL DEPTH: 56.5 FEET			

Prepared By: Kenneth O. Shirley Jr. Date: 10/28/94

Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: DM-5 (abandoned) TA/OU: 39/1132 Drill Depth From: 0 ft. To: 55 ft. Page: 1 of: 3
Driller: Stewart Brothers Box (s): Date/Time Start: 9/19/94, 0930 End: 9/19/94, 1730
Drilling Equip./Method: CME 750 Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	60		HNu-ND Rad-110	0-2.5 1	Light to medium brown, silty clayey sand with pumice.		SW	
2.5	80		HNu-ND Rad-97	2.5-5 2	Light to medium brown, sugary coarse sand with pumice cobbles, pebbles, gravel, dry.			
5	92		HNu-ND Rad-106	5-7.5 3	5.2-6.2-Medium brown silty fine sand.		SM	
7.5					6.2-7.5-Light brown, sugary coarse sand with pumice.		SW	
	64	AAB8864	HNu-ND Rad-112	7.5-10 4	Medium brown, silty, medium to coarse sand with pumice pebbles, damp.		SM	Sample 8.4-10 feet.
10	56		HNu-ND Rad-83	10-12.5 5	Medium brown, sugary coarse sand.		SW	
12.5	88		HNu-ND Rad-102	12.5-15 6	12.8-14.8-Same as above. 14.8-15-Damp, medium brown, silty medium sand.			
15	84		HNu-ND Rad-108	15-17.5 7	15.4-15.7-Same as 14.8-15 ft.		SM	
17.5	100	AAB8865	HNu-ND Rad-109	17.5-20 8	15.7-17.5-Medium brown, very coarse sand and gravel with pumice, damp.		SW	
20					17.5-18.2-Purplish brown tuff.		Qbt	Sample 17.5-20 feet.
	100		HNu-ND Rad-114	20-22.5 9	18.2-18.7-Medium brown, coarse sand.		SW	
22.5					18.7-20-Medium brown, clayey silt with pumice, damp.		ML	
	100		HNu-ND Rad-120	22.5-25 10	Medium brown, damp, clayey silt with clayey sand at 20.9 ft.		SC	
25					Same as above.		ML	
	100		HNu-ND Rad-99	25-27.5 11	Same as above, wet at 27.2 feet.			
27.5	100	AAB8866	HNu-ND Rad-94	27.5-30 12	Dark brown, wet, silty sand.		SM	Sample 27.5-30 feet.
30								

Prepared By: Kenneth A. Shisler Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: DM-5 (abandoned) TA/OU: 39/1132 Drill Depth From: 0 ft. To: 55 ft. Page: 2 of: 3
Driller: Stewart Brothers Box (s): Date/Time Start: 9/19/94, 0930 End: 9/19/94, 1730
Drilling Equip./Method: CME 750 Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	100		HNu-ND Rad-97	30-32.5 13	30-30.2-Weathered purplish brown tuff. 30.2-32.5-Damp to wet, silty coarse to medium sand, brown.		Qbt	
32.5	100		HNu-ND Rad-95	32.5-35 14	32.5-34-Medium brown, damp, silty sand.		SM	
35	100		HNu-ND Rad-80	35-37.5 15	34-34.1-Weathered purplish tuff. 34.1-34.2-Brown coarse sand. 34.2-35-Medium brown, damp, silty sand.		Qbt SW	
37.5	100	AAB8867	HNu-ND Rad-80	37.5-40 16	35-36.2-Same as 34.2-35 feet. 36.2-36.3-Medium brown coarse sand. 36.3-37-Same as 35-36.2 feet. 37-37.2-Weathered tuff. 37.2-37.5-Coarse sand, pumice.		SM SW SM Qbt SW	
40					37.5-38.5-Medium brown, coarse silty sand, damp. 38.5-39-Medium brown, silty medium sand. 39-39.7-Weathered purplish tuff with pink pumice. 39.7-40-Medium brown, silty medium sand, damp.		SM Qbt SM	Sample 37.5-40 feet.

Prepared By: Kenneth A. Shiley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: DM-5 (abandoned) TA/OU: 39/1132
Driller: Stewart Brothers Box (s):
Drilling Equip./Method: CME 750

Drill Depth From: 0 ft. To: 55 ft. Page: 3 of: 3
Date/Time Start: 9/19/94, 0930 End: 9/19/94, 1730
Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet /Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
40	100		HNu-ND Rad-107	40-42.5 17	40-41.2-Medium brown, damp silty sand.		SM	
42.5	100		HNu-ND Rad-98	42.5-45 18	41.2-42-Medium brown, coarse sand with pumice.		SW	
					42-42.4-Same as 40-41.2 feet.		SM	
45					42.4-42.5-Weathered tuff.		Qbt	
	100		HNu-ND Rad-83	45-47.5 19	Weathered purplish brown tuff with coarse sand; silty clayey sand layer from 43.5-43.6 feet.		SM / Qbt	
47.5								
49	73	AAB8868	HNu-ND Rad-101	47.5-49 20	45-45.9-Medium brown, coarse clayey sand with pumice, very damp.		SC	
50	100		HNu-ND Rad-80	50-52.5 21	45.9-47-Light brown pumice. 47-47.2-Red Fe stained pumice, wet. 47.2-47.3-Manganese (?). 47.3-47.5-Orange-brown coarse pumice.		Qbt	
52.5	100		HNu-ND Rad-111	52.5-55 22				
55					47.9-48.3-Wet, Fe stained pumice. 48.3-49-Wet, light brown, coarse pumice with pebbles.			Sample 47.9-49 feet. Hard drilling at 49 ft. Drilled with center bit from 49 to 50 feet.
					50-51.6-Wet, light brown pumice sand. 51.6-51.7-Fe stained pumice. 51.7-51.8-Manganese (?). 51.8-52.5-Dry, light brown, very fine pumice sand.			
					52.5-53-Wet, medium brown, coarse pumice sand. 53-53.7-Dry, fine pumice sand. 53.7-55-Dry clayey sand.		SC	Dry hole, quit drilling at 55 feet and abandoned hole.
					TOTAL DEPTH: 55 FEET			

Prepared By: Kenneth O. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: DM-6 TA/OU: 39/1132 Drill Depth From: 0 ft. To: 60 ft. Page: 1 of: 3
Driller: Stewart Brothers Box (s): Date/Time Start: 9/21/94, 1000 End: 9/21/94, 1730
Drilling Equip./Method: CME 750 Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet /Feet %)	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	64	HNu-ND Rad-88	0-2.5 1	Silty loam with pebbles.		ML	No laboratory samples collected.
2.5	32	HNu-ND Rad-95	2.5-5 2	Medium to coarse sand.		SW	
5	60	HNu-ND Rad-81	5-7.5 3	Coarse sand with pebbles.			
7.5	72	HNu-ND Rad-93	7.5-10 4	Medium to coarse sand, some silt in porosity.		SW-SM	
10	48	HNu-ND Rad-86	10-12.5 5	Same as above, damp.			
12.5	52	HNu-ND Rad-82	12.5-15 6	Same as above, silt matrix at 14.9 feet.			
15	100	HNu-ND Rad-105	15-17.5 7	15-16.1-Medium to coarse sand with some silt. 16.1-17.5-Buried soil of silty clay with tuff pebbles, wood material and charcoal.			
17.5	100	HNu-ND Rad-116	17.5-20 8			CL	
20	100	HNu-ND Rad-88	20-22.5 9	Sandy silt grading to sandy clayey silt with depth; root material - buried soil. Wet zone at 18.3 feet.		ML	
22.5	88	HNu-ND Rad-120	22.5-25 10	Sandy silt with clay and occasional pebbles.			
25				22.8-24-Coarse silty sand.		SM	
				24-24.7-Clayey silty coarse sand.		SC	
				24.7-25-Fine sandy silt.		SM	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: DM-6 TA/OU: 39/1132 Drill Depth From: 0 ft. To: 60 ft. Page: 2 of: 3
Driller: Stewart Brothers Box (s): Date/Time Start: 9/21/94, 1000 End: 9/21/94, 1730
Drilling Equip./Method: CME 750 Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet /Feet %)	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
25	92	HNu-ND Rad-108	25-27.5 11	25.2-26.2-Silty fine sand.		SM	
				26.2-26.6-Coarse sand with pebbles.		SW	
27.5	76	HNu-ND Rad-84	27.5-30 12	26.6-27.4-Dense silt with tuff cobbles.		ML	
				27.4-27.5-Fine sand.		SW	
30							
31	100	HNu-ND Rad-111	31-32.5 13	28.1-28.5-Sandy silt with clay.		ML	
				28.5-29-Silty sand with large pebbles.		SM	
32.5	100	HNu-ND Rad-104	32.5-35 14	29-29.6-Silty coarse sand with large pebbles.			
				29.6-29.9-Pink tuff.		Qbt	
35				29.9-30-Silty coarse sand with cobbles and pebbles.		SM	
				31-31.1-Light blue igneous cobble zone.			Hit cobbles at 30 feet. Ran center bit from 30 to 31 feet.
				31.1-32.5-Dense, clayey coarse sand with cobbles.		SC	
				32.5-33.1-Sandy clay with cobbles.		CL	
				33.1-33.7-Fine pumice sand. 33.7-35-Medium pumice sand with pebbles.		SW	

Prepared By: Kenneth A. Shirley Jr. Date: 10/28/94 Checked By: Date:

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID: DM-6 TA/OU: 39/1132 Drill Depth From: 0 ft. To: 60 ft. Page: 3 of: 3
Driller: Stewart Brothers Box (s): Date/Time Start: 9/21/94, 1000 End: 9/21/94, 1730
Drilling Equip./Method: CME 750 Sampling Equip./Method: 4.25 ID HSA, 3.5 ID Continuous Core Sampler

Depth (Feet)	Recovery (Feet /Feet %)	Field Screening Results	Sample Interval and Run Number	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
35	96	HNu-ND Rad-118	35-37.5 15	35.1-36.8-Fine to medium pumice sand with pebbles. 36.8-37.5-Dense, medium pumice sand with cobbles,wet.			
37.5	100	HNu-ND Rad-93	37.5-40 16	Medium pumice sand, sugary texture at 39.7 feet.			
40	64	HNu-ND Rad-101	40-42.5 17	Medium to coarse pumice sand.		SW	
42.5	100	HNu-ND Rad-103	42.5-45 18	Same as above.			
45	88	HNu-ND Rad-93	45-47.5 19	45.3-45.6-Black stained coarse pumice sand. 45.6-45.8-Fe stained medium sand. 45.8-46.5-Red-brown medium sand. 46.8-47.5-Light brown pumice sand.			Approximately 1 cm thick cemented Fe stained layer at each end of red brown sand.
47.5	100	HNu-ND Rad-115	47.5-50 20				
50	100	HNu-ND Rad-97	50-52.5 21	Medium to coarse pumice sand with cobbles.			
52.5	100	HNu-ND Rad-109	52.5-55 22	50-51.3-Medium to fine pumice sand. 51.3-52.5-Coarse pumice sand.		SW	
55	100	HNu-ND Rad-90	55-57.5 23	Fine to medium pumice sand.			
57.5	100	HNu-ND Rad-92	57.5-60 24	55-56.8-Medium pumice sand. 56.8-57.5-Becoming coarser.			
60				Medium to coarse pumice sand with pebbles.			
				TOTAL DEPTH: 60 FEET			One composite sample collected from cuttings drums for waste characterization.

Prepared By: Kenneth A. Shisler Jr. Date: 10/28/94 Checked By: Date:

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS #33-002(a)-99 Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit MDA-K

Date Due to NMED: June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)													X	
Well Construction Details												X		
Pilot Testing Reports (not prev. submitted)												X		

Signature: Nancy Riebe

Name (print): Nancy Riebe

Date: 5/17/2001

MDA K

NMED

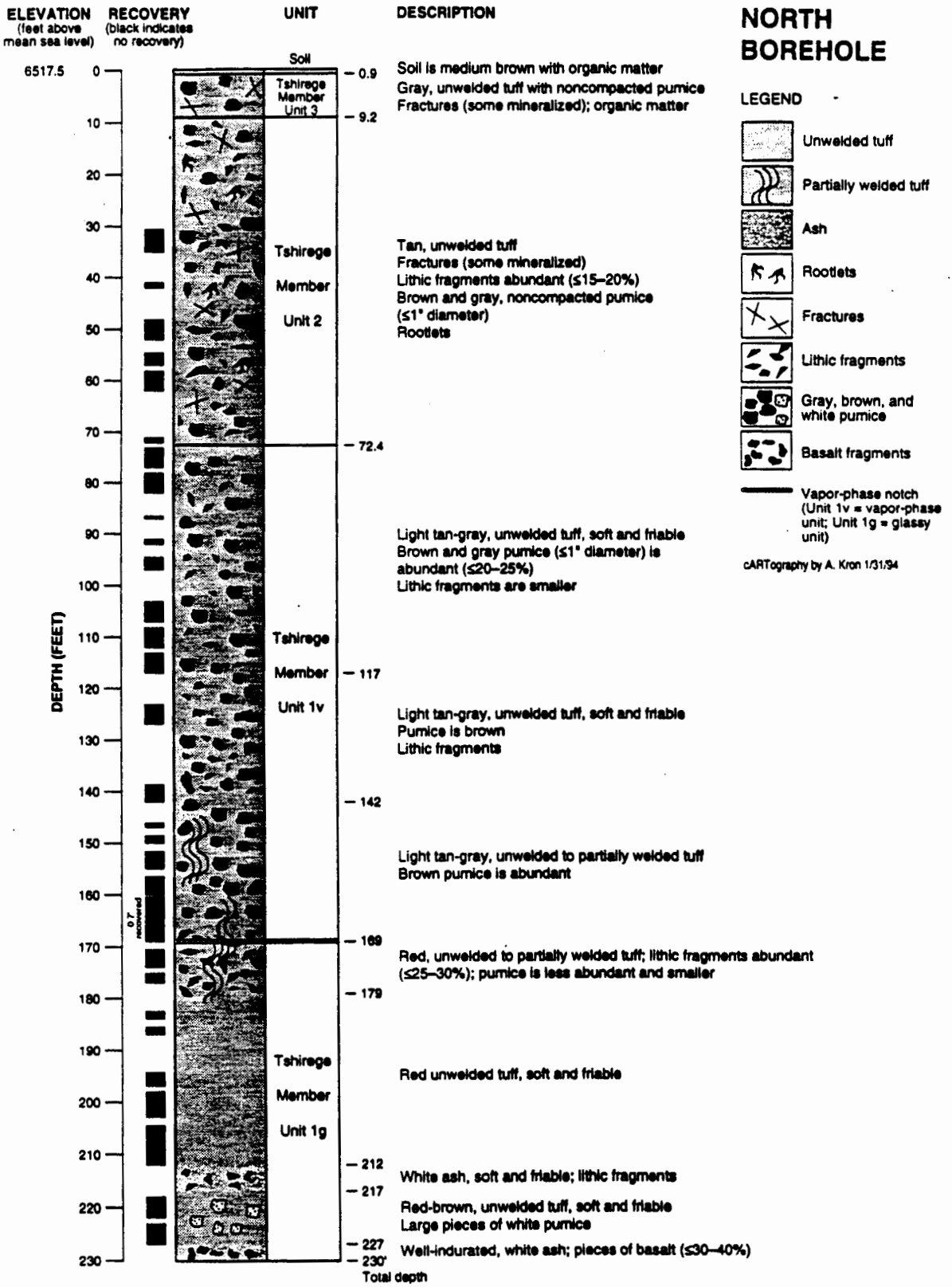


Figure 7. Geologic Log of Borehole #1.

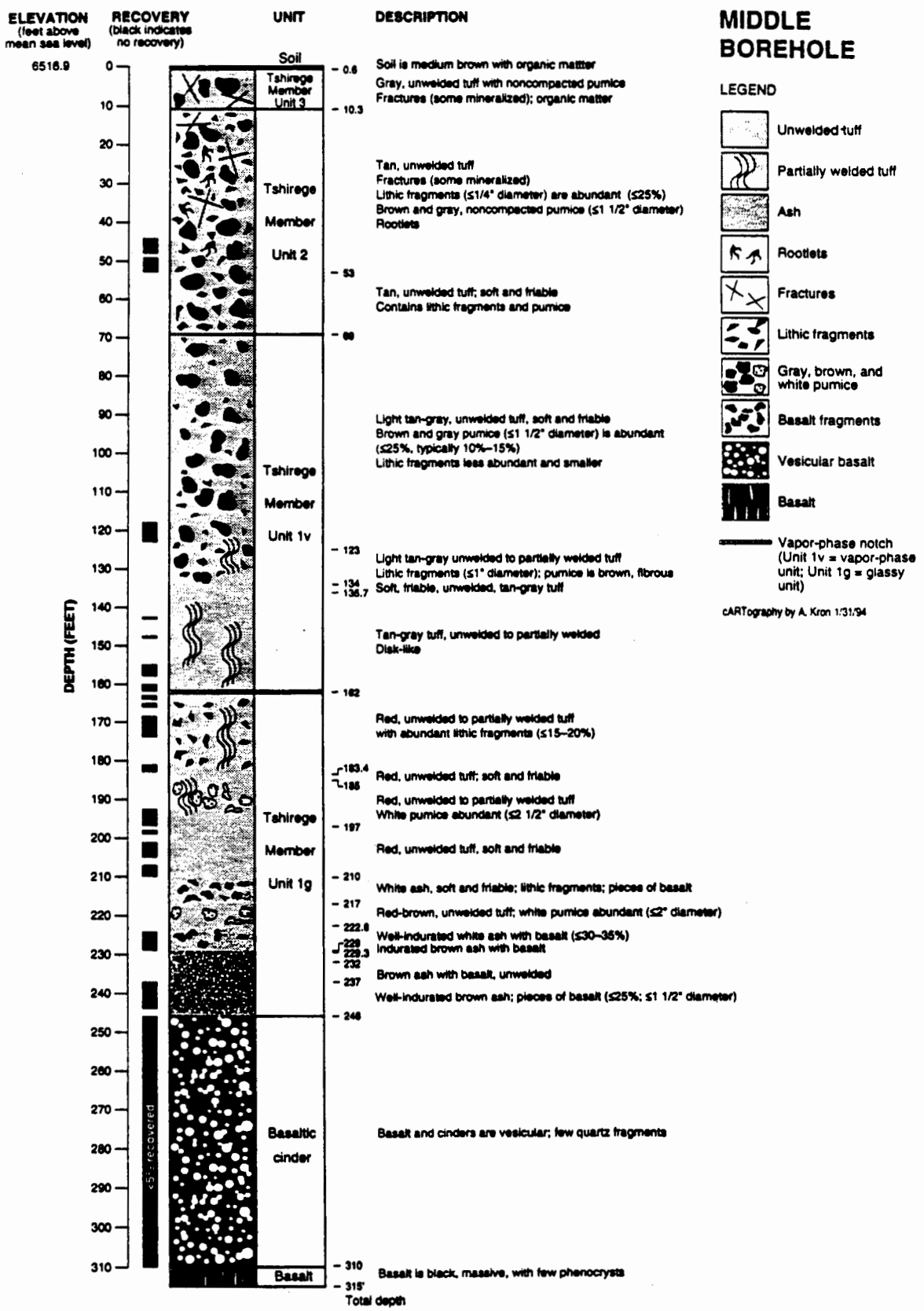


Figure 8. Geologic Log of Borehole #2.

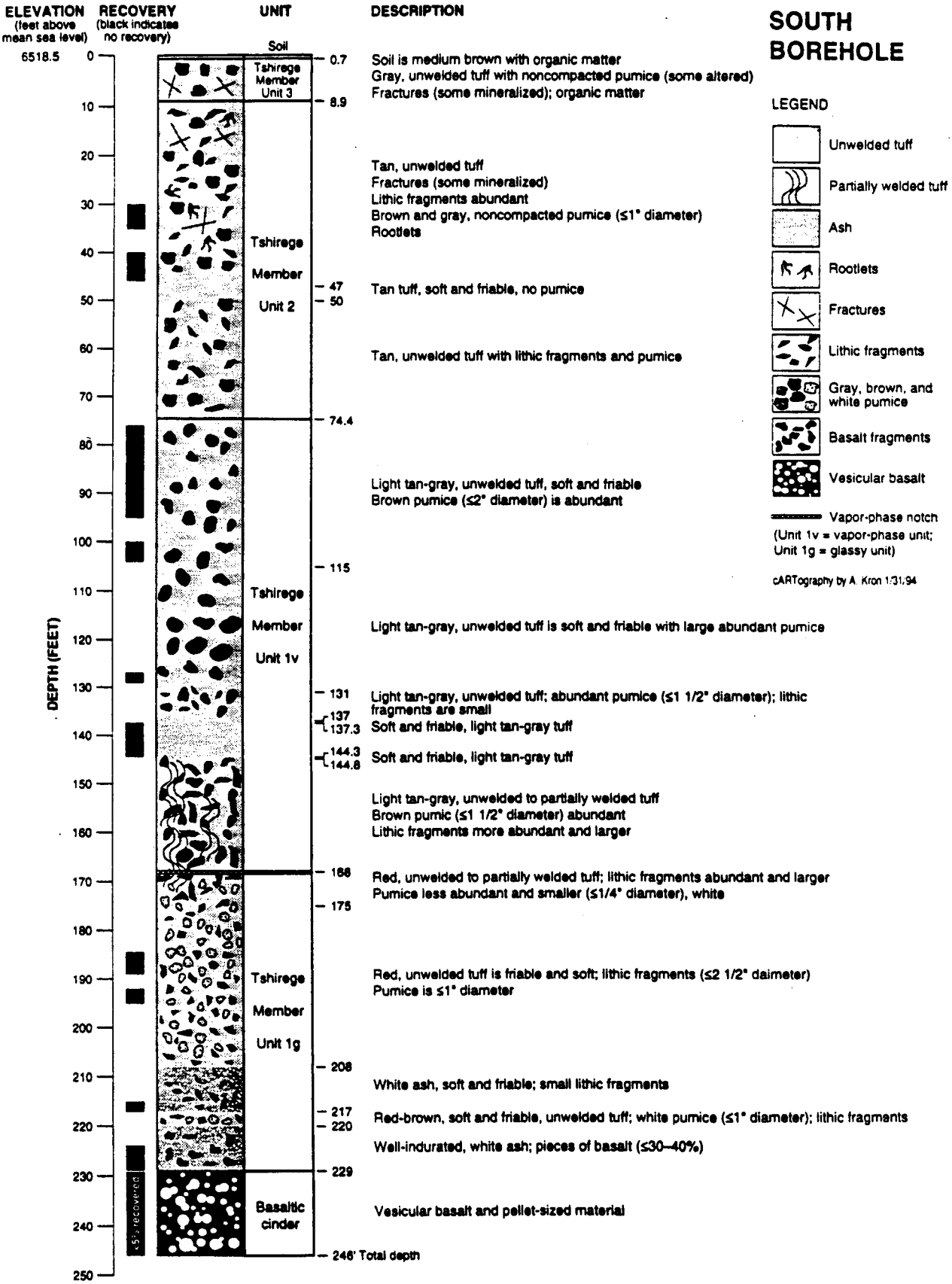


Figure 9. Geologic Log of Borehole #3.

Borehole 33-1652—PRS 33-002(a)

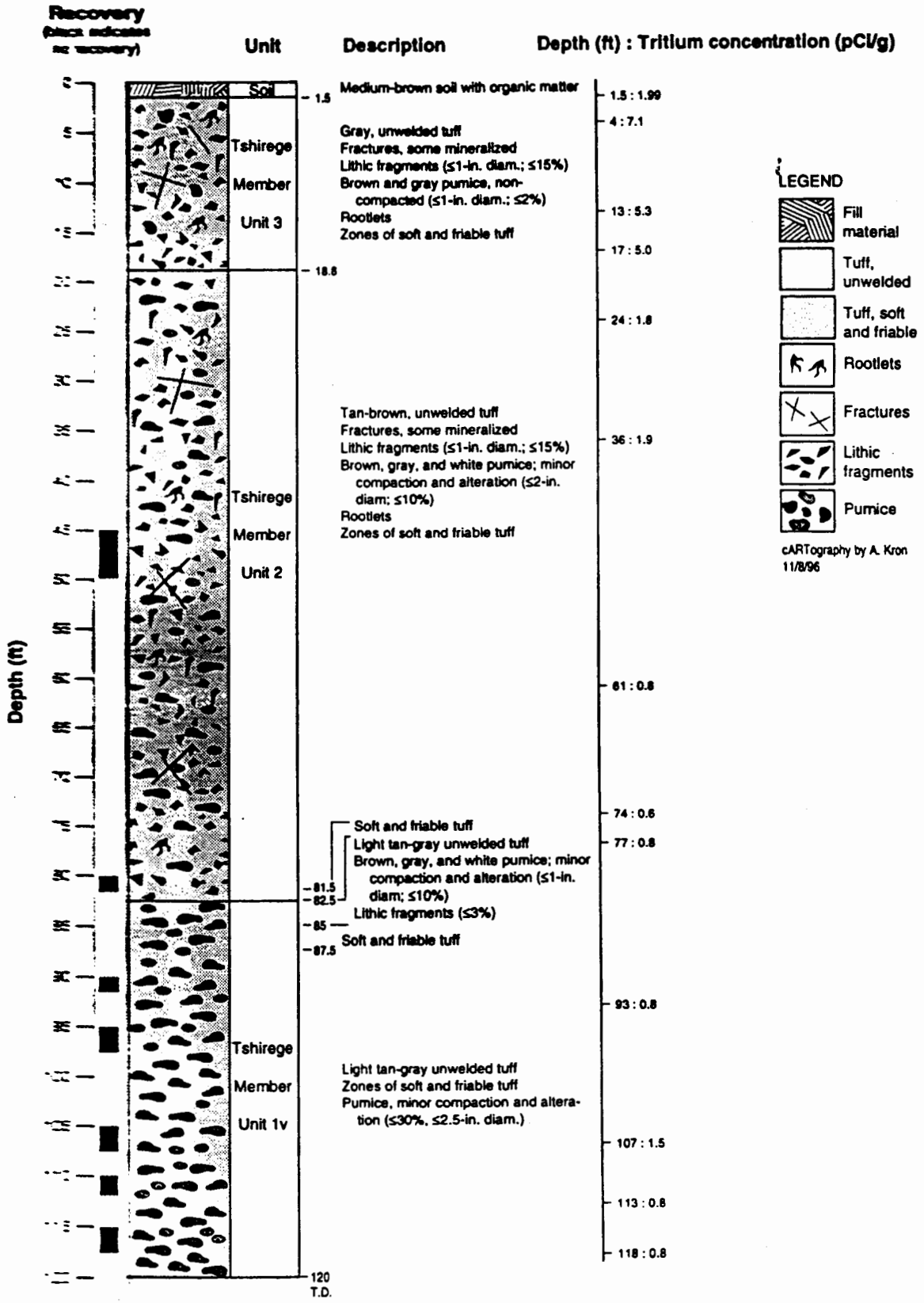
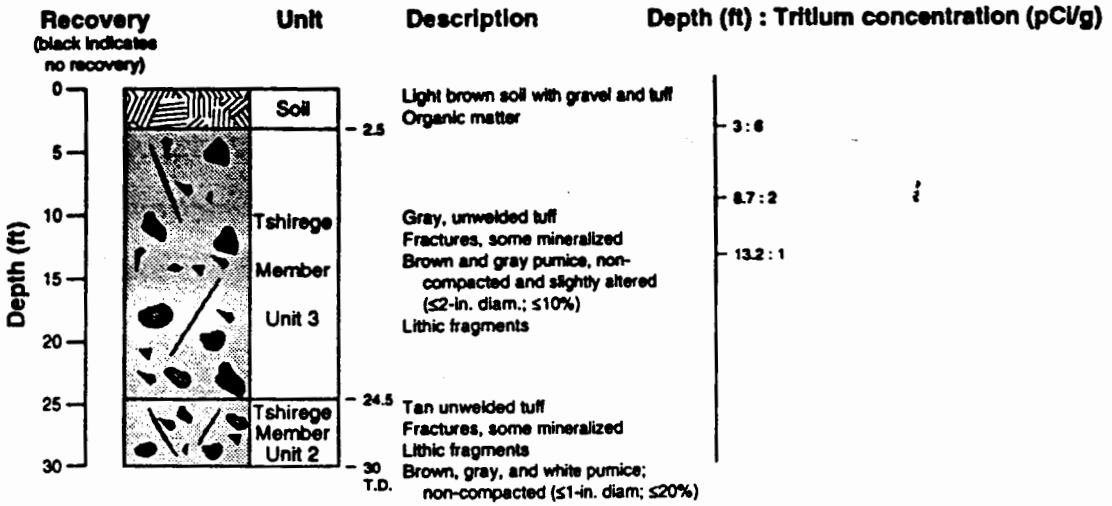


Figure 7. Geologic Log of Borehole 33-1652, MDA-K.

Borehole 33-1541—PRS 33-002(a), Septic Tank



Borehole 33-1542—PRS 33-002(c), Sump

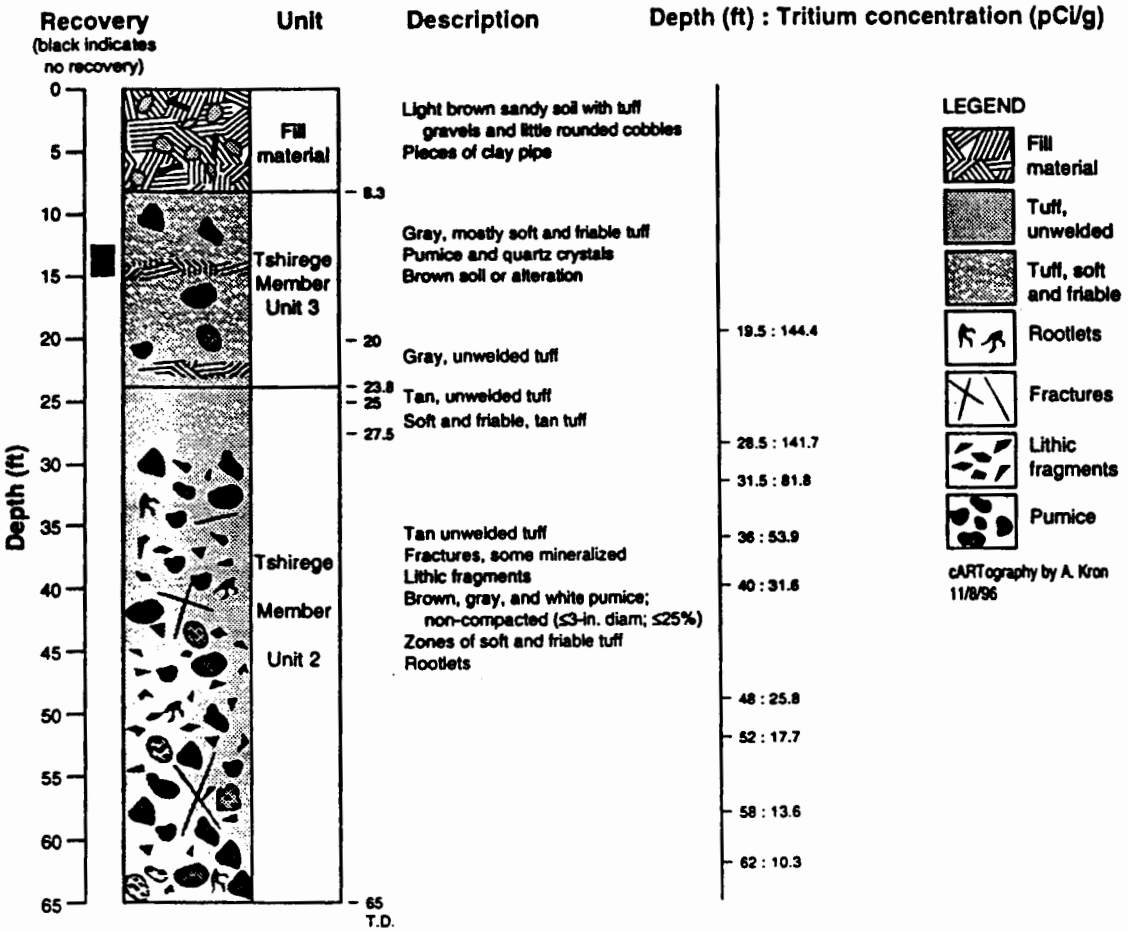


Figure 8. Geologic Log of Boreholes 33-1696 and 33-1697, MDA-K.

Borehole 33-1328—PRS 33-002(b), Sump

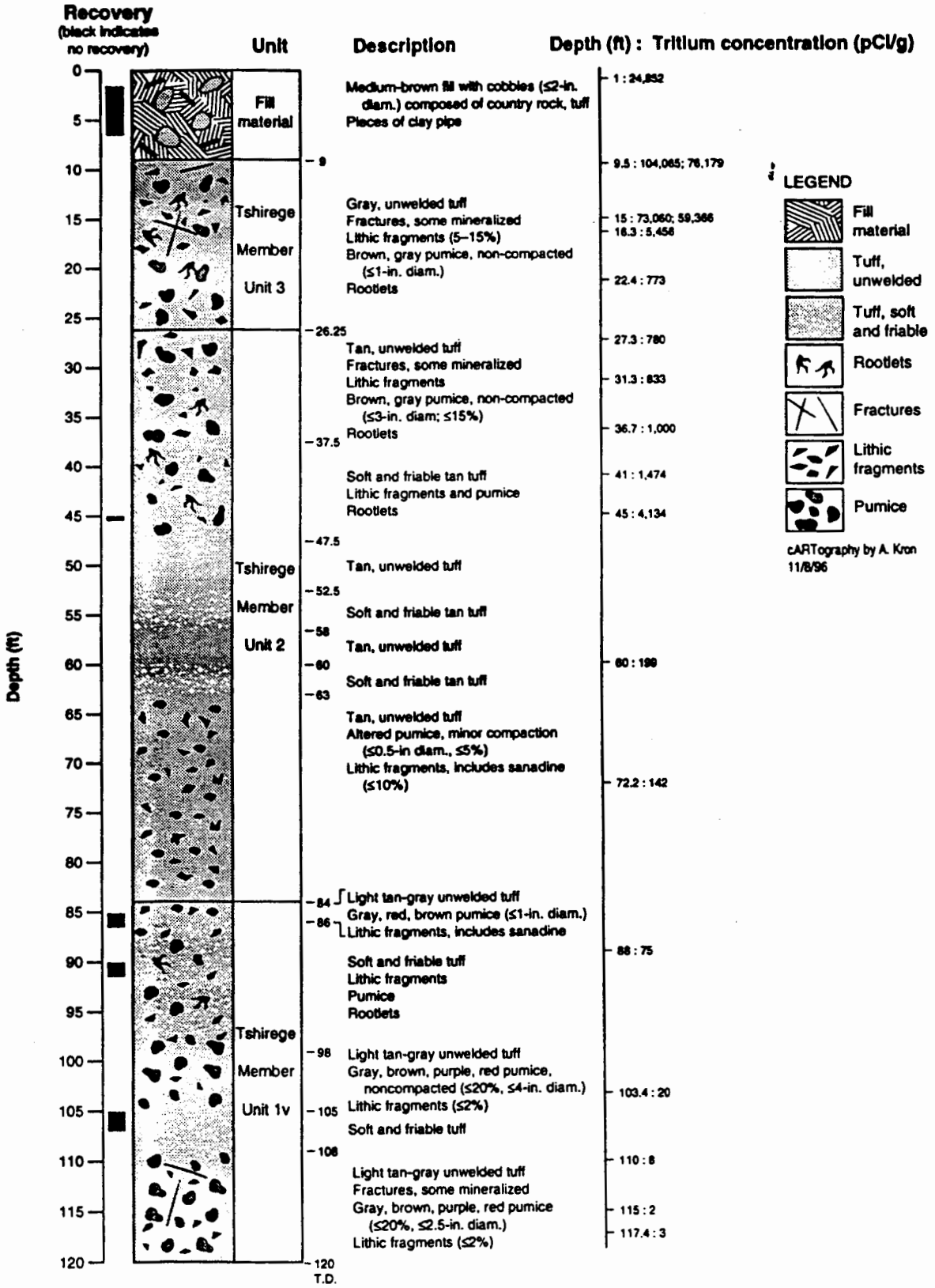


Figure 9. Borehole Schematic of MDA-K Boreholes.

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS #36-001 Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit MDA AA

Date Due to NMED: June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												X		
Well Construction Details												X		
Pilot Testing Reports (not prev. submitted)												X		
													X	Log book containing info on boreholes

Signature: Nancy Riebe

Name (print): Nancy Riebe

Date: 5/17/2001

9.1-4

LOS ALAMOS NATIONAL LABORATORY

OU 1130 FIELD LOG NOTEBOOK#2

NO.284

MDA AA

- No funding or need for borehole logs, info in log book

Borehole 2704

1

2/20/96 MDA-AA Trenches
0715 HNU Calibrated
0730 Ryder is loaded
0745 M. Henke and C Stolz head to Metzgers for gas and Skalski's for Bentonite.
0900 Team meets at Access Control
Team: M. Henke FTL LANL
J. Bingham Sampler LANL
B. Cole RCT MK
C. Goetz SSO ICF KE
C. Stolz documenter ICF KE
N. Ness Office doc ICF KE
objective: continue drilling at the trenches; borehole # 2704
weather: cool with mild wind, mostly cloudy
0930 CRZ is set up
0950 Tailgate safety meeting conducted
1000 Team enters the zone
1018 3 ft east of 2704, HNU background, HE spot test negative, Rad 200 cpm
Push large split spoon from surface to about 2 ft.
1025 0-26", Soil is sandy silt, dark brown 7.5YR 3/4, damp no odor, occasional small gravel size tuff, HNU background, 60% recovery, BG 200
1040 At 56", BG 180, HNU background
3" of ash in shoe & was collected

2

2/20/96 MDA-AA cont.

at 60" Silty sand, Strong brown 7.5YR 4/6, damp, Stringers of sand in it, VOA had burned debris, wood only, no glass or other debris noted

1058 At 81", HE negative, Rad 200, HNU background

1101 53-60", Sample collected, Photo 1 by J. Bingham of the sample BS 200, 60-81" BS 200 Sample #19

1105 VOA from 56" homogenized with material from 53-60" & VOA taken from this core. This is Sample # 18. HE spot test neg.

1110 Sample #19 collected from 60-81, BS 200, Photo 2 of homogenized sample by J. Bingham. Note: Photo #1 read #19 when it should have read sample #18. HE spot test negative, HNU background

1116 Top section was composited w/ later 53-60", VOA taken at 58" was very much ash.

1118 #19, sandy silty, silty sand 7.5YR 4/4, damp granule, very fine sands, some different color stringers, thin bedding noted at end of core

2/20/96 MDA-A4 Cont.
VOA collected directly from core, remainder homogenized & bottle sets filled. Upper core had some unburned styrofoam. Base of trench at about 5 feet. Go down 2 feet and see if we're through ash & indeed at 2 feet below trench.

1145 Sample #20 : 84-109" Photo by J. Bingham of core, VOA packed & the remainder homogenized, silty sand, very fine sand w/ minor medium sands, damp, brown 7.5YR, 4/4, Rad 200, HNU background, occasional granule, 75% recovery, slough noted at top of core & was not retained or homogenized

1204 At 134", sand to silty sand, damp, very fine sand, Rad 200, brown 7.5YR, 4/3, HNU background, slough noted in upper portion of core, very fine sand fraction, minor bedding noted

1210 Photo ~~2~~ #4 by B. Cole of the core.
160", silty sand, sand fraction very fine, damp to moist, brown 7.5YR, 4/4, thin beddings noted.

1228 134-160" Photo #6 by J. Bingham

2/20/96 MDA-AA Trenches cont.
worm burrows also noted, core is consistent, no marked stringers. sludge noted in upper portion of core.

1230 Borehole is terminated. Bentonite is put into the hole.

1240 Team cleans up the area

1310 Team is scanned out of the zone

1320 Ryder is loaded and team departs for Kaiser where samples will be processed. Site id: 36-3130, samples: 0236-96-0018, 0019, 0020.

MM-3 CA 8/8

Borehole 2675
5

9/21/96 MDA-AA
720 HNU calibrated at Kaiser
745 Ryder is loaded
800 Depart Kaiser for Access Control
820 Sign in at Access and head to Lower Slobbovia
845 CRZ is set up
900 Tailgate safety meeting conducted
905 Team: M Henke FTL LANL
J Bingham Sampler LANL
B Cole RCT MK
C Goetz SSO ICF
C Stolz dcon ICF
N Ness office dc ICF
objective: continue drilling, location of the day is #2675.
Weather: sunny, slight breeze, warm
906 Team enters the zone
912 20" west of borehole #2675, Rad 200, HNU .1, HE spot test negative, we're using large diameter split spoon attached to the rods
925 0-26" Rad 189 HNU background, silty sand, very fine to med sands, appears to be reworked fill, brown 7.5YR, 3/3, damp, fragments of tuff-fill material, HE negative
937 26-51" ash material found in shoe, black ash in shoe, Rad 200
Cpt SR

2/21/96 MDT-44 cont.
46-51" is ash, VOA collected here, HNU background
0953 Cut "71", BR 300 cpm on shoe, in ash layer still, remainder of core is filled for sample 0036-96-0024. HNU background, Rad dropped off.
0955 Pht. #7 by J. Bingham of the core and core contains wire, ash and sand, BR 300
1038 Cut "74" - scratched to 1/2s diameter split spoon cut into shoe to see what the ~~re~~ resistance is. Appears to be some kind of metal
1050 We get through whatever it was and M. Henke is going to Skalski's to get cutrite for large split spoon
1058 Team screens out of the zone.
1105 M. Henke leaves for Skalski's
1230 M. Henke returns to the site
1243 Cut "74" and will proceed through with new cutrite shoe
1300 "71-75", Photo #8 by J. Bingham of homogenized sample, HNU background Rad 300. Sample 0036-96-0025. HE spot test negative, metal - [illegible] of, [illegible] mixed with ash & [illegible]
[illegible] SA

2/21/96 MDA-AA cont.
soil, fragments of glass
1309 TD was 79", last five inches of core appear to be undisturbed soil with "75" being depth of trench.
1325 Photo #9 by B. Cole of homogenized material is same except has more chunks of glass in it, sample #25 77-87". Retained VOA from 71-75" the remaining material was homogenized w/ 77-87" material.
HNU background, BZ 200
Base of trench was not at 75" because we encountered more ash to 87"
1343 At 97" (approximately) ash is as before, soil is silty sand, very fine to med sand, ~~tag~~ tuff fragments, damp excellent recovery, Rad 280, HNU BG, brown 7.5YR 4/4, Photo #10 by J. Bingham time on photo incorrect, retake the photo #11, 1340 of core by M. Henke.
1345 Team decons equipment before go to 10 feet to collect sample
1410 104-137" upper portion slough, sample 120-137", sample was sandy silt, 7.5YR 3/3, Photo #12 by J. Bingham of core, core carefully seperated from slough, HNU BG, Rad 150

8

2/21/96 MDA-AA cont.
file backfilled & material returned to appropriate depth, some bedding noted, small fragments of subangular tuff (large sand size) damp.
1440 after breaking down drill site, team heads to CRZ
1500 Team loads Ryder & departs
1520 Team arrives at Kaiser & processes samples

Site id location: 36-3132
Sample ids: 0236-96-0024, 0025, 0026

2/22/96 MDA-AA Trenches
740 HNU calibrated at Kaiser
745 Ryan is leaving & team heads to Access Control
830 Team arrives at Lower Slobbovia area sets up CRZ
850 Tailgate safety meeting conducted
910 Team enters the zone and visites drill rig
925 Crew: M. Henke FTL LANL
J Bingham Sampler LANL
B. Cole RCT MK
C. Goetz SSO ICF
C Stirk docu ICF
N Ness off. doc ICF
objective: complete drilling for samples; borehole #2676
weather: cool with strong NE winds, cloud coverage
930 Drill rig is located 18" east of borehole #2676.
934 Using large diameter split spoon, HNU background, HE spot test negative, Rad 200 at the surface.
940 Ct 26", Photo #13 by J. Bingham
Q core, Rad 180, HNU background
Silty sand, sandy silt, brown 7.5YR, 4/4, very fine sand fraction in upper core, some medium sand
Cynthia Stitz

2/22/96 MDA-AA cont.

and tiff in lower core, clamp, lower core has clay (fraction)

951 At 50" material is brown (dark) 7.5YR, 3/3, HNU background, silty sand sandy silt, Rad 180, similar material to that of lower portion

1015 50-78", lower 4" had large metal
BG 180 chunks + large dense ash - this is retained to be composite with next sample interval, HNU BG

1027 At 105" this material will be composited, HNU on lower core is background, Rad 180

1022 78-109", Rad 240, HNU background
1034 4" of previous one composited w/ 7" of this core; 74-85" sample
photo #28 #14 # 28, Photo by J. Bingham of core
Upper portion, fluffy, metal, sand bag residuals
Floor of trench appears to be 85", material is sandy silt
black powdery ash, charred metal, HNU background, HE negative, VOA taken from core

Lower ~~Upper~~ portion on 85"-100" consists of sandy silt, brown 7.5YR, 4/4, HNU BG, small piece of tiff, no evidence of bedding (Cynthia Stra-

2/22/96 MDA-AA cont.
total depth is 105", material is damp, lower portion showed no evidence of debris Rad 240 access core
Notes: have had poor communication via walkie talkie
At 1034, sample #28 was taken, 7' from 2nd drive and 4" from previous, depth was 74-85", photo by J. Bingham of entire core and will be the picture for both sample #28 + 29. (Even though indicates, on back of sample #28) Upper portion; fluffy black powdery ash, charred material, sand bag residuals. VOA taken from core and remainder homogenized. HE spot test negative, HNU bg, Rad 240. Lower portion 85-100" consists of sandy silt brown 7.5YR 4/4, HNU BG, small pieces of tuff, no evidence of bedding, damp, Rad 240, lower portion showed no debris. Floor of trench appears to be 95".
1105 At 130" - 110" - 126" Photo #15 by J. Bingham of core, HNU background, Rad 200 sample collected from 110 - 126", VOA taken from core & remainder homogenized.

2/22/96 MDA-SA cont.

HNU BG, silty sand, very fine sand fraction, brown 7.5YR, 4/4, native collect cm, no bedding noted, uniform silty sand 5% large sands + occasional gravels, rounded to sub-rounded, taking one more drive to ensure, HE spot test negative

1122 At 155", Rad 180, HNU background, material is sandy silt w/ fine sand fraction, 5-10% medium + Lg. sands, damp, brown 7.5YR, 4/3, Photo #16 (1125) of core by J. Bingham, no evidence of marked bedding or lamination. Terminate borehole.

1148 After cleaning up the site, team heads in

1205 Crew leaves Tower Slobbovia

Cist Sfr

08/23/96
Additional Field/Sample notes:

Sample collection - acquisition - was difficult aspect of sampling effort. Initial attempts were conducted using the 1¼" id split spoon. The shoes were interchanged from standard to enlarged. Generally, if ash and debris were present, the free space between the material (plus voids spaces in the trenches) was significant. Thus, the narrow diameter of the spoon (i.e. small sample tube or face) caused the ash/debris material to be pushed out away from the spoon orifice rather than into the orifice such that no sample acquisition could occur. Mike Henke developed a sample shoe which mimics a hand auger bucket:

This shoe could collect material that consisted of light, porous ash/debris. During the attempt to collect material from surface soils, Jeff Bingham suggested pushing the rotosonic shoe/split spoon (attached to additional rotosonic core barrel) with the drive head of the rig. From this suggestion, it was determined that rig rods could be attached to the rotosonic spoon (large diameter spoon, 2¼ id) using various adapters. Thus, a significant improvement on sampling abilities was achieved as this thin wall, large diameter sampler could be used on the

01/23/96

rig ~~to~~ CG and allow sample to not be pushed away from spoon or face but collected within. Also, due to the diameter 2¼" id, the sample interval could be shorter ~~so~~ CG to obtain sufficient material. Before, several feet of good recovery had to be obtained in order to have sufficient material for sample bottle sets. A final modification was made to this set up by Mike Herke to add cutrite to the shoe of a Dorsonic split spoon to allow penetration through metal.

On Jan ~~12~~ CG 25, 1996, sampling at the trenches was initiated. These records are found in logbook #1; No. 215, page 126 ~~to~~ CG. The initial sample location is 2 ft. SE of #2664 (grid location). The 1¼" id split spoon with cutrite shoe was used. Location 2664 had elevated rad levels during ~~grid~~ CG delineation drilling. During sampling of this location, no elevated RAD levels were noted. This indicates variability in trench material over a short distance. Narrow diameter split spoon was used ~~forcing~~ sample acquisition over approx. 2-3' intervals. This, coupled with poor recovery did not allow crew to visual inspect entire drilled column; however, sample of ash was obtained over a 3 ft. composite as well as the immediately underlying soils. The immediately underlying soils do ~~not~~ CG appear ~~native but~~ CG slightly disturbed and would provide appropriate information on potential

02/23/96

~~Col~~ CG ~~e~~ PCOC's leaching from the overlying ash. It is recognized from the extensive delineation activity that there is great variability in the trench material both vertically & horizontally. The ash zone was composited from ~~30~~ 40" CG to 75". The ash layer appears to exist from ~~approx~~ CG approximately 36" to 81." Therefore, vertically, the sample material is representative of the ash in this area. The immediately underlying soils will provide leaching information ~~concise~~ CG on ash material in area. Sample interval from 110" to 140" will provide additional vertical migration of PCOCs information. Sample Bottles were sent on SOMC.

On Jan 26, 1996, the crew attempted to drill adjacent to 2675. Failed attempts due to rig refusal - near refusal due to metal and subsequent material recovery of underlying ash.

On Feb. 6, 1996 attempts failed again at 2675 due to lack of material recovery. Discuss potential hand auging.

On Feb. 7, 1996 attempt to sample near 2696 B. Field notes are summarized on p. 138-143 of Logbook # 1. Upper debris (118"-130") contained significant unburned plywood, plastics and slight charred material. Lower "ash" sample is actually soils immediately underlying debris zone. The ash zone was likely from ~ 118" to approx 134". Two sample attempts in this zone were made to collect sufficient material for bottle sets. Material was homogenized except for VOA.

Lower collection zone (approx. 130-134" to 160") is immediately underlying soils as two ash zones could not be obtained with sampling technique and unburned debris sampling problems. The underlying soils will reflect leached materials. (19) ~~A final~~ This sample was collocated approx. 6" south of ash sample location (due to overdrilling). A final soil sample was from 171-200" of undisturbed alluvium starting at approx. 2 ft. beneath trench floor.

On Feb 8, 1996 the crew initiated sampling near 2697. Several attempts were made therefore logbook notes locations as A, B, C, D and E as the locations shifted. Notes are found on p. 144 to 152 of logbook 1. Map of A, B, C... locations are shown on p. 152. Final sample locations were C, D, E - which are approximately with 1 ft. of each other thus eliminating the need for multiple sample location idn. The survey plate was marked for location "C." High RAD HITS. Two ash/debris zones were collected.

On Feb. 14, 1996 Crew completes 2697 borehole area.

On Feb. 15, 1996 Crew proceeds to near 2698. This is the first utilization of the 2¼ id spoon adapted to couple to drill rods. Very successful, ample recoveries. Only complication was sealing off thick ash zones before obtaining "2 ft. underlying soils"

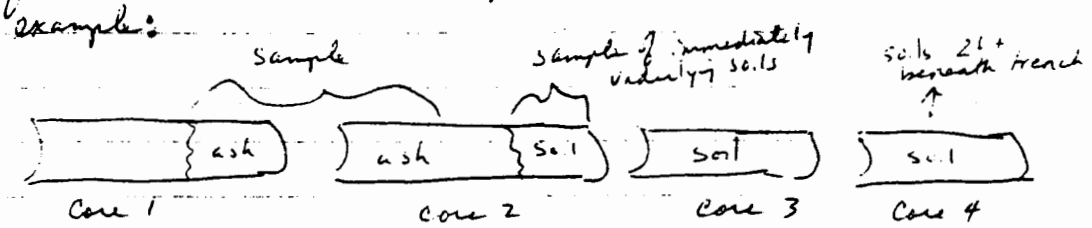
Location near 2698 was drilled with 2¼ id spoon. Two ash zones collected - significant ash zone (approx. 80") On Feb. 20, 1996 Crew drills/samples near 2704. Thin ash zone encountered. Therefore, ash zone collected in one sample and immediately underlying soils on 2nd 3rd Sample is "24 beneath trench" for additional vertical migration info.

On Feb. 21, 1996 Crew drills/samples near 2675. Metal again. Significant ash zone encountered of approx. 60." 2 ash zone samples collected plus underlying (24+) soils.

On Feb. 22, 1996 Crew drills/samples trench near 2676. Success drilling.

The large diameter spoon afforded the ability to collect sufficient sample such that an upper and lower segregation could be accomplished to use as separate samples or add to additional material from previous or subsequent sampling.

example:



Usually ash samples, where sufficient material was present for 2 intervals, were sampled such that the material in the upper ash were different from the lower ash samples as in unburned wood and debris in the upper ash and charred burned material in lower ash sample.

Only the samples sent on Jan 26, 1996 from Borehole near 2664 were sent by way of SMC. The remaining sample sets were sent via direct ship to Gel Lab. Gel was ~~attt~~ attentive to a labeling error on bottles and correctly sampled for SEMI VOCs from a glass jar rather than the plastic 125 poly which was mislabeled. Bottle sets sent to SMC were not mislabeled, thus sampling was not impaired.

10:46 STARTED DRILLING AT BORE HOLE 2683. AT 3 1/2 FEET SOIL IS SILTY SAND & BROWN, HNU IS AT BACKGROUND, RAD IS AT 220 CPM. AT 8 1/2 FEET SOIL IS BROWN SILTY SAND, HNU IS BACKGROUND, RAD IS AT 240 CPM. AT 12 1/2 FEET SOIL SILTY/CLAY/SAND BROWN, HNU BACKGROUND, RAD 220 CPM. BORE HOLE TERMINATED AT 11:22

11:24 SET UP AT BORE HOLE 2702, HE SPOT TEST NEGATIVE, HNU AT BACKGROUND, RAD AT 240 CPM.

11:33 STARTED DRILLING BH 2702. AT 2 1/2 FEET SANDY SILT DARK BROWN, HNU IS AT BACKGROUND, RAD IS AT 200 CPM. AT 5 FEET FINE SILTY SAND AND DAMP, HNU - BACKGROUND, RAD AT 220 CPM, CUTTINGS WERE DARK BROWN.

11:52 AT 12 FEET SILTY/FINE SAND IS DAMP TO MOIST & DARK BROWN, HNU IS AT BACKGROUND, RAD IS AT 220 CPM. AT 11:52 DRILLING OPERATION IS TERMINATED.

Victor Hoch

12:39 SET UP AT BORE HOLE 2716, HE SPOT TEST NEGATIVE, HNU AT BACK GROUND, RAD AT SURFACE IS 220 CPM.

12:40 STARTED DRILLING OPERATIONS AT B.H. 2716. AT 2½ FEET, CUTTINGS SANDY/SILT MED BROWN, HNU AT BACKGROUND, RAD AT 240 CPM. AT 7½ FEET CUTTINGS SANDY/SILT, YELLOW BROWN IN COLOR, HNU IS AT BACK GROUND, RAD IS AT 200 CPM. AT 12 FEET CUTTINGS SANDY/SILT SOME SMALL GRAVEL HNU AT BACK GROUND, RAD AT 240 CPM. CUTTINGS ARE SANDY SILT TO SANDY GRAVEL. TERMINATING BORE HOLE AT 12:56.

1307 SET UP AT BORE HOLE 2667, HNU BACKGROUND HE SPOT TEST NEGATIVE, RAD 200 CPM AT SURFACE

1311 START DRILLING OPERATION AT BH 2667. AT 3 FEET SILTY SAND MEDIUM BROWN CUTTINGS, HNU BACKGROUND AND RAD AT 260 CPM. AT 8 FEET CUTTINGS SILTY SAND BROWN, HNU AT BACKGROUND, RAD AT 260 CPM. AT 10' AN INCREASE IN CLAY AND AN INCREASE IN SOIL RESISTIVITY.

Victor Hasch

CON'T

AT 13 FEET CUTTINGS WERE MED TO DARK BROWN WITH SOME CLAY. TERMINATED BORE HOLE # 2667 AT 1346.

1346

~~1346~~ 1-H SET UP AT BORE HOLE 2678, HE SPOT TEST NEGATIVE (ASSUMED)*, HNU AT BACKGROUND (ASSUMED)*, RAD CPM WILL BE TRANSCRIBED FROM RCT RECORD BOOK.*

* CATHY'S RADIO WENT SOUTH. FAILED CG

1349 STARTED DRILLING AT BH 2678.

1407 TERMINATED DRILLING AT BH 2678. DEPTH ACHIEVED WAS 13 FEET.

Additional notes: During drilling of 2678 radio failed. Activity proceeded as follows:

~~Borehole~~ 2678

1348 hrs.: HE spot test neg; HNU background; RAD 220 cpm for surface readings. Proceed with drilling.

1355 hrs. Cuttings ~~from~~ to 3 feet: ~~Sit~~ CG sandy silt, brown (7.5YR/4/2/4/3); v. fine to med. sand; HNU background; RAD BG 240; no debris, damp.

1400 hrs Cuttings ~~from~~ 3 to 8 feet; silty sand, brown (7.5YR, 4/3); v. fine to CG med. sand ~ 60 to 70%;

1400 CG hrs Cuttings 8 to 13': silty sand to sandy silty, increase clay content brown HNU background RAD BG 220. Terminate drilling.

MDA-AA 36-001 03/26/96

1415hrs. Crew shuts site down for the day.

1510hrs. Site Access. Crew delayed at Lower Stoddard due to firing activity at Fenice.

24

DATE: 3/27/96
LOCATION: TA-36 MDA-AA
LOWER SLOBBOVIA
PERSONNEL: CATHY ROETZ, MIKE HENLE, JEFF BINGHAM, BENNIE COLE, VICTOR HESCH
WEATHER: CLEAR & COOL

TEXT: TAIL GATE MEETING AT 08:53
HAZARDS ARE: ALCOHOL, AND POSSIBLE BURIED EXPLOSIVES. DELINEATION DRILLING WILL BE DONE TODAY.
09:01 ENTERED INTO THE EXCLUSION ZONE TO PREPARE RIG FOR DRILLING OPERATIONS.

BORE HOLE 2690 HE SPOT TEST WAS NEGATIVE, HNU AT BACK GROUND, RAD AT 220 CPM (BETA/GAMMA), ALL READINGS TAKEN AT SURFACE OF B.H. AT 2 FEET THE CUTTINGS SILTY/SAND FINE TO MED ~~BROWN~~ SAND, ~~FINE~~ FINE, BROWN IN COLOR W/ SOME MOISTURE CONTENT, THE RAD COUNT IS 250 CPM.
AT 7 FEET SILTY/SAND, SOME CLAY SOME SMALL GRAVEL, HNU AT BACK GROUND, RAD AT 240 CPM. AT 12 FEET SLIGHT INCREASE IN CLAY, NO ASH OR DEBREE NOTED, HNU AT BACKGROUND, RAD AT 200 CPM, TERMINATE OPERATION AT 11:52.

Victor Hesch

09:55 SET UP DRILL RIG AT BORE HOLE 2700.
SURFACE READINGS ARE: HNU AT BACKGROUND,
HE SPOT TEST IS NEGATIVE, RAD AT 200 CPM.
STARTE DRILLING AT B.H. 2700 AT 10:00.
AT 2 FEET CUTTINGS ARE CRUSHED TUFF &
SANDY SILT, HNU AT BACK GROUND, RAD
AT 200 CPM, SOIL IS DRY & GREY/BROWN
IN COLOR. AT 8 FEET CUTTINGS SHOW
MINOR AMOUNTS OF CHARRED WOOD NOTED
SOIL SILTY/SAND BROWN AND DAMP TO
DRY, ~5% CHARRED MATERIAL, HNU AT
BACK GROUND, RAD AT 200 CPM, CHARRED
WOOD APPEARS AT A DEPTH OF 7 FEET.
AT 12 FEET NO ADDITIONAL MT'L. NOTED,
SAND TO SILTY/SAND, SIGNIFICANT MEDIUM
SAND, DARK BROWN AND DAMP TO MOIST
RAD AT 240 CPM. TERMINATING DRILLING
AT B.H. 2700 AT 10:24.

10:30 SETTING UP AT BORE HOLE 2710. AT
SURFACE HNU BACKGROUND, HE SPOT
TEST IS NEGATIVE, RAD IS 220 CPM.
STARTED DRILLING AT 10:38. AT 2 FEET
SOIL IS CRUSHED TUFF, BROWN SILT, DRY,
HNU BACKGROUND, RAD IS 200 CPM.
AT 8 FEET CUTTINGS ARE SILT/MINOR SAND,
DAMP & DARK BROWN, HNU AT BACKGROUND,
RAD 240 CPM, SOIL CLASSIFICATION 7.5YR 3/3.

Victor Hash

CONT

BORE HOLE 2710. AT 12 FEET SOIL SAME AS ABOVE, SLIGHT INCREASE IN CLAY, SOIL DARK BROWN W/NO ASH OR DEBREE, HNU AT BACKGROUND, RAD AT 200, TERMINATING BORE HOLE AT 10:55.

11:03 SETTING UP AT BORE HOLE 2728 WHICH IS 20 FEET SOUTH ON GRID FROM BORE HOLE 2718. AT SURFACE RAD IS 240 CPM, HE SPOT TEST NEGATIVE, HNU AT BACKGROUND

11:08 CREW TAKES BREAK

STARTED DRILLING AT 11:45. AT 2.5 FEET SILTY SANDY SOIL, DARK BROWN, DRY, HNU BACK GROUND, RAD 240 CPM, SOIL CLASSIFICATION IS 7.5YR 4/6. AT 7 FEET SOIL SAME AS ABOVE SLIGHT INCREASE IN COARSE SAND, HNU AT BACK GROUND, RAD AT 220 CPM. AT 11 FEET SOIL SAME AS ABOVE, HNU BACKGROUND, RAD AT 200 CPM, NO ASH OR DEBREE NOTED. TERMINATING THIS BORE HOLE AT 12:26

Ruth Clark

12:37 SETTING UP AT BORE HOLE 2727.
SURFACE CONDITIONS ARE: HE SPOT
TEST NEG., HNU AT BACKGROUND,
RAD AT 220 CPM. STARTED DRILLING
AT 12:40. AT 2.5 FEET SOIL SILTY
SAND TO SANDY SILT, DARK BROWN,
DRY TO DAMP, RAD AT 220 CPM.
AT 7.5 FEET SOIL IS SILT, STRONG
BROWN, RAD 220, HNU AT BACKGROUND,
DRY TO DAMP. AT 8.5 FEET THE
SOIL RESISTIVITY to drilling CG HAS INCREASED. THE
CLAY CONTENT HAS INCREASED. AT 11 FEET
SIGNIFICANT RESISTANCE TO DRILLING DUE TO
CLAY CONTENT, HNU AT BACKGROUND, RAD
AT 220 CPM. SOIL SEEMS TO BE
NATIVE. TERMINATING BORE HOLE AT
13:25.
(CATHY'S RADIO WENT SOUTH FAILED, CG)

13:35 SET UP AT BORE HOLE 2725 WHICH IS
20' SOUTH OF BORE HOLE _____
STARTED DRILLING AT 13:37.
TERMINATEDED DRILLING AT 14:05

14:21 SET UP AT BORE HOLE _____ (LAST BORE HOLE)
STARTED DRILLING AT 14:27
TERMINATED DRILLING AT 14:50

Vicki Hesch

03/27/96 36-001

Additional notes taken in field as radio in field failed:

at approximately 1335 hrs: Shift to [borehole 2725] which is not on preset grid - location is 20 ft. South of 2715.

1338 hrs Surface readings RAD ~~pt~~ 280 cpm (likely rising due to warm day) HNU background HE - neg.

1340 hrs. Cuttings to 3' high: HNU background; RAD 200 cpm; silty sand, strong brown to dk. brown (7.5YR, 4/6 to 3/4) mostly very fine sand some med. sand approx. 50-60% sand; dry to damp

1350 hrs. Cuttings to 8 ft. increased resistivity to drilling at about 5 ft.; HNU Background; RAD 200, Soils same as above, increase in silt silty sand / Sandy silt; v. powdery silt.

1400 hrs. Significant resistivity to drilling at 9 ft. likely due to increase in clay

1406 hrs. 9'8" to 10" near refusal terminate drilling. Soils same as above with slight increase in Clay, dark brown 7.5YR, 3/2 ~~silty~~ clay sandy silt

1410 hrs. Shift to [2722]. Location is behind berm approximately 20 ft. South on grid of 2712.

1425 hrs. Surface readings; HE Spot test neg., HNU Background; RAD 200 cpm.

1430 hrs. to 2 ft. Sandy silt, dark brown (7.5 YR, 3/2) clayey, very powdery, no plasticity, HNU Background RAD 200 (~~128~~) cpm.

[signature]

03/27/96 36-001

1430hrs. Stop to refuel rig.

1440hrs. to 7ft. > cuttings, powdery silt (powdered tuff?) brown (7.5YR, 5/4) dry Hall Background RAD 220 cpm

1455hrs. at 10ft. soil same - doesn't appear to be alluvium, rather pulverized tuff. No evidence of reworking or debris. Hall Background, RAD 220 (cpm). Terminate drilling.

1500hrs. Crew breaks down drilling operations

1530hrs. Site Access. All personnel screened by G. Cole in CRZ.

Tommorrow activities will consist of marking/measuring, decon, clean up. This concludes all drilling.

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03/28/96 36-001

Voice mail was received by C. Goetz from Mike Alexander (ESH-18) regarding activities. M. Alexander ~~requested~~ is suggesting we stop all field activities until the ESH questionnaire can be reviewed for storm water and spill prevention and control (SPCC) measures. The ESH questionnaire was submitted in 1993 and approved; however, at that time the permits were not reviewed for storm H2O or SPCC. Goetz has attempted to contact Mike Alexander on ~~03/28/96~~ 03/28/96 CG upon returning to the office but was only able to leave message. M. Alexander has not responded.

Logbook was kept on unofficial notepad and maps due to days activities ~~involved~~ CG involving personnel performing different tasks within the PRS. Logs were kept by Victor Hesch (decon area) and Catherine Goetz (mapping).

Personnel: Victor Hesch LANL AFTL
Mike Henke LANL FTL
Jeff Bingham LANL asst. + RSP
Catherine Goetz ICF SSO.

Weather: Clear and cool.

9:25 hrs. Arrived on site. set up for decon. Tailgate meeting.

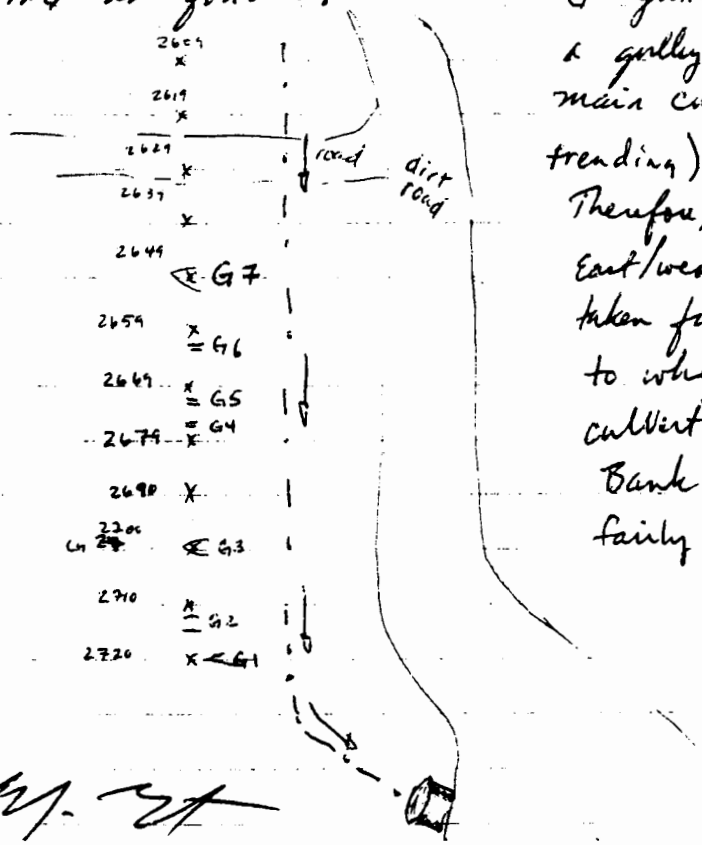
[signature]

03/28/96 36-001

0950 hrs. All enter zone. Radio to Site Access manned by Victor Hesch. Hesch, Henke and Bingham will first decon all non rad/non haz glove, etc. in large rubber tub to assure that all materials have been properly inspected and cleaned for any PCOCs.

1002 Decon begins in zone with gloves, etc.
Bingham prepares rig - removes tools for decon etc.
Goetz close by maps and marks drainage culvert, gulleys, for additional points for Tom Pfeiffer (Surveyor) and crew.

MAPPING as follows:



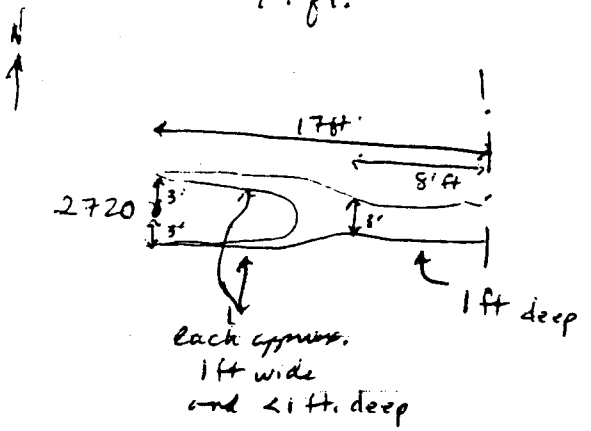
G = gulley:
a gulley extends from the main culvert (north/south trending) into the PRS. Therefore, gulleys trend East/west. Measurements taken from grid line (N/S) to where gulley enters culvert (same elevation). Bank from PRS to culvert fairly significant ~2-3 ft.

(measurements) →

32

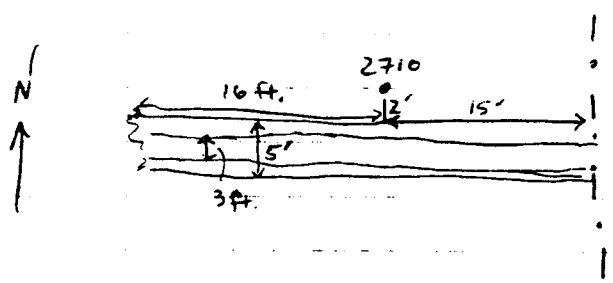
03/28/96 36-001

G.1 = 17 ft.; from flag 2720 to culvert also 17 ft.

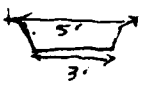


no signs of ash/debris

G2 – MAIN GULLEY

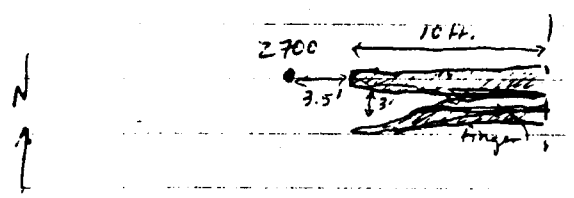


2ft. south of 2710
31ft c/w
5ft. wide at top of gully
3ft wide at floor c)
a channel



no signs of ash/debris

G.3



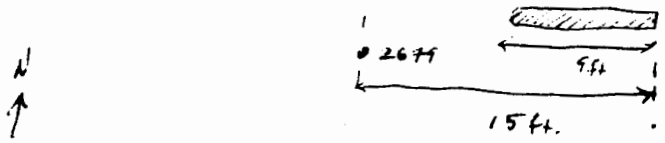
5ft. wide; 1½ ft max depth
hinge 3ft south <1 ft. deep
1.5 ft. wide

This location is 3.5' from borehole with ash; no ash/debris noted in gulley.

Lsm. ef

03/28/96 36-001

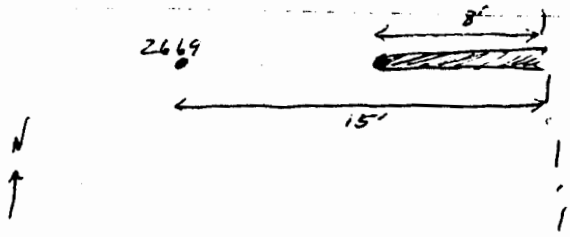
G4 ~~North~~ CG North of 2679 from grid to culvert is 15ft.



9ft E/W from culvert, 2ft. wide; opposite 1ft. deep

No ash/debris noted.

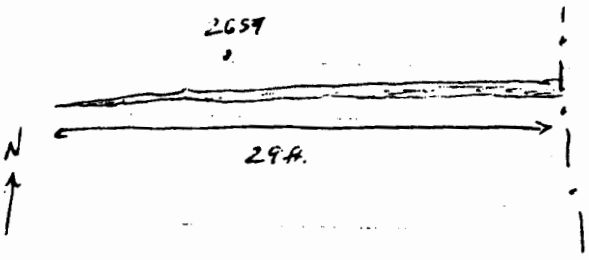
G5 Approximately parallel to 2669



8ft E/W from culvert 1ft. deep; 2ft. wide

No ash/debris noted.

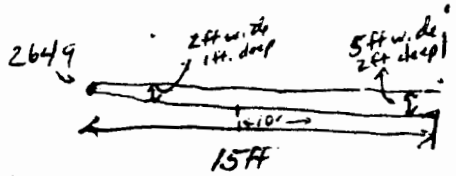
G6 Next to 2659



29ft. E/W long; Culvert to 2659 = 14ft.; Average width 2½ ft. Average depth 1ft. (approx. 1½ ft near culvert to <1ft at far west end)

No ash/debris noted.

G7 at 2649



15ft. E/W; culvert to grid = 15ft.; 5ft wide, 2ft deep at culvert; from approx. 10ft. to 15ft only 2ft wide and 1ft. deep.

No ash/debris noted.

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The seven major gullies are flagged as are 3 locations in the center of the culvert.

10:30hrs. Tom Pfeiffer arrives onsite. Goetz shows the new borehole locations as well as flagged culvert and gulley locations.

Remainder of crew continues decon.

1100hrs. Pfeiffer screened out by RSP Bingham.

1130hrs. Goetz suits up to decon equipment. Decon water collected to hydrate borehole bentonite. Steam/press. wash all equipment

1230hrs. Rig, steamer all equipment deconned.

1300hrs. Decon complete. Prepare to depart site. No equipment will be released today. Release will take place tommorrow using KCT Bonnie Crk.

Leon. Pf

03/29/96 36-001

8:00 As noted on 03/28/96 a call from Mike Alexander has crew stalled. No voice has been received. Goetz has tried again unsuccessfully. Crew cleans out Ryder.

9:15hrs. Crew departs Kaiser. Snow likely, need to release equipment before moisture. At half of decon activities complete will continue with planned activities. Have voice mailed Alexander.

9:36 hrs Site Access. Able to contact Alexander on cell phone. Goetz explains situation - OK to proceed will meet with Alexander on Tuesday to review ESH needs / concerns.

1000hrs. At 36-001. Proceed with equipment release by Cole. Personnel: Bennie Cole MK RCT
Mike Henke ~~TCT~~ CG LANL FTL
Jeff Bingham LANL Assist.
Catherine Goetz ICT SSO.

Tailgate meeting. Only enter zone to drive out equipment. Use proper PPE for last decon items ~~(CG)~~ CG mats, tubs, wheelbarrow, etc. Watch while loading equipment and using hitches for pinches.

1230hrs. All equipment released by Cole. All cleaned and loaded. Site Secure. Depart. Will return to Joe Skalski brown truck, rig, steamer and small trailer.

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 39-008 Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit Firing Site

Date Due to NMED: June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												X		
Well Construction Details												X		
Pilot Testing Reports (not prev. submitted)												X		

Signature: Nancy Riebe

Name (print): Nancy Riebe

Date: 5/17/2001

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 34-004 (a-e) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit Firing Sites

Date Due to NMED: June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												X		
Well Construction Details												X		
Pilot Testing Reports (not prev. submitted)												X		

Signature: Nancy Riebe

Name (print): Nancy Riebe

Date: 5/17/2001

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 33-008(e) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit MDA-E

Date Due to NMED: June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												X		
Well Construction Details												X		
Pilot Testing Reports (not prev. submitted)												X		

Signature: Nancy Riebe

Name (print): Nancy Riebe

Date: 5/17/2001

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 33-003(b) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit MDA - D

Date Due to NMED: June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												X		
Well Construction Details												X		
Pilot Testing Reports (not prev. submitted)												X		

Signature: Nancy Riebe

Name (print): Nancy Riebe

Date: 5/17/2001

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 15-008(a) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit Surface Disposal at EF Site

Date Due to NMED: ~~May~~ June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												✓		
Well Construction Details												✓		
Pilot Testing Reports (not prev. submitted)												✓		

Signature: Tracy L. McFarland

Name (print): Tracy L. McFarland

Date: 4/13/01

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 15-006(d) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit R45

Date Due to NMED: ~~May~~ June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												✓		
Well Construction Details												✓		
Pilot Testing Reports (not prev. submitted)												✓		

Signature: Tracy L. McFarland

Name (print): Tracy L. McFarland

Date: 4/13/01

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 15-006(c) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit R44

Date Due to NMED: ~~May~~ June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												✓		
Well Construction Details												✓		
Pilot Testing Reports (not prev. submitted)												✓		

Signature: Tracy L. McFarland

Name (print): Tracy L. McFarland

Date: 4/13/01

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 15-006(a) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit PHERMEX

Date Due to NMED: ~~May~~ 1, 2001 June

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												✓		
Well Construction Details												✓		
Pilot Testing Reports (not prev. submitted)												✓		
Sample Collection Logs												✓		Active site, no samples collected

Signature: Tracy L McFarland

Name (print): Tracy L McFarland

Date: 4/13/01

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 15-004(f) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit EF Firing Site

Date Due to NMED: ~~May~~ June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												X		
Well Construction Details												X		
Pilot Testing Reports (not prev. submitted)												X		

Signature: Tracy L McFarland

Name (print): Tracy L McFarland

Date: 4/13/01

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 15-007(b) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit MDA Z

Date Due to NMED: June 1, 2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												✓		
Well Construction Details												✓		
Pilot Testing Reports (not prev. submitted)												✓		

Signature: Tracy L. McFarland

Name (print): Tracy L. McFarland

Date: 4/13/01

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS # 15-007(a) Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit MDA N 15-007(a)

Date Due to NMED: [redacted] 1, 2001
June

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)												✓		
Well Construction Details												✓		
Pilot Testing Reports (not prev. submitted)												✓		

Signature: Tracy L. McFarland
Name (print): Tracy L. McFarland
Date: 4/13/01

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS #_21-016(a)-99_Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit_MDA T_

Date Due to NMED:5/1/2001

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)													x	
Well Construction Details														
Pilot Testing Reports (not prev. submitted)														
Geophysical Survey													x	

Signature: [signature]
Name (print): JOHN HOPKINS
Date: 5/7/01

Final Report

on

Geophysical Investigation of Material Disposal Areas A and T (TA-21-016[a-c] and TA-21-011[c]) Los Alamos, New Mexico

submitted to

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

by

Geophex, Ltd.
605 Mercury Street
Raleigh, North Carolina 27603

19588
C6588
10.7
10/11 [illegible]

Geophex Job No. 636

September 1996

Geophex, Ltd.
terram et mare exploramus

Final Report

on

Geophysical Investigation of Material Disposal Areas A and T (TA-21-016[a-c] and TA-21-011[c]) Los Alamos, New Mexico

submitted to

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

by

Geophex, Ltd.
605 Mercury Street
Raleigh, North Carolina 27603

Geophex Job No. 636

September 1996

Executive Summary

This report presents the results of a geophysical investigation of Materials Disposal Area (MDA) 71, (TA-21-016[a-c] and TA-21-011[c]); Operable Unit 1106 at the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico.

This geophysical investigation concentrated on two MDAs located within TA-21; MDA-A and MDA-T. The primary objective was to use electromagnetic (EM) methods to identify and delineate the presence of paleochannels that may, if present, be partly responsible for transporting the contaminants off-site.

We established two grids, one at each site. The total survey area encompasses 60,000 square feet (1.5 acre). Geophex acquired EM data in June 1996, along transect lines spaced five feet apart. The in-line data sampling is approximately two feet. At each sampling location, we acquired in-phase and quadrature component data for two frequencies; 9,210 and 15,210 Hz. The two EM surveys recorded over 27,400 raw data measurements.

The EM data were recorded and logged internally by the GEM-2 instrument. Data processing included assigning spatial registry information, converting the measured signal from part-per-million response to conductivity (in milli-Seimen per meter, mS/m), and contouring (krigging).

A broad EM anomaly is present within the MDA-T site that may represent the anticipated paleochannel. The broad anomaly may, however, identify a recent but currently abandoned, compacted roadway. Aerial photographs taken in 1975 and 1982 show non-paved roads and a trench in the same vicinity as the EM anomaly. We recommend shallow excavation or borings within the anomalous area to confirm the nature of the causative source.

The EM surveys have identified several isolated anomalies within MDA-T and MDA-A that, we believe, represent distinct separate buried objects or debris. Although we do not know the source of the anomalies, or if they contribute contaminants, we do not anticipate that these isolated anomalies are significant to the current project.

We do not observe EM signatures indicative of a meandering paleochannel at the MDA-A site.

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Appendix A. Electromagnetic Method. A-1

1.0 Introduction

This report presents the results of a geophysical investigation of Materials Disposal Area (MDA) 71, (TA-21-016[a-c] and TA-21-011[c]); Operable Unit 1106 at the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico.

TA-21 is centrally located on the Pajarito Plateau and bordered by two canyons; DP Canyon to the north, and Los Alamos Canyon to the south (Figure 1). TA-21 was used primarily for plutonium research and metal production from 1945 to 1978 (Broxton and Eller, 1995). The major waste-disposal activities involve byproducts of the chemical processing. The anticipated disposal mechanisms include (Broxton and Eller, 1995):

- deep liquid releases into absorption beds and seepage pits, .
- near-surface liquid releases (surface discharges),
- subsurface solid-waste disposal areas, and
- surface contamination areas (surface spills).

This geophysical investigation concentrated on two MDAs located within TA-21; MDA-A and MDA-T (Figure 1 and 2). Both MDAs are located on DP Mesa and drain north into DP Canyon. Radioactive contamination has been documented in DP Canyon (Purtymun, 1971; Purtymun et al., 1990). The primary objective of this project was to use electromagnetic (EM) methods to identify and delineate the presence of paleochannels that may, if present, be partly responsible for transporting the contaminants into DP Canyon.

Geophex established two survey areas, one located within the fenced borders of MDA-A and one within the fenced border of MDA-T (Figure 2). The surface vegetation consisted of native grass (Figure 3). The two sites collectively occupy approximately 60,000 square feet (1.5 acres). Although the sites do not currently contain surface features or obstacles, aerial photographs of the site taken in 1975 and 1982 (Broxton and Eller, 1995) reveal substantial landscaping, heavy-equipment traffic, and even a possible trench and associated surface mound.

2.0 Geophysical Instruments and Methods

We acquired EM data using a man-portable EM instrument known as the GEM-2, designed and fabricated by Geophex. The GEM-2 is a unique, hand-held, digital, broad-band EM sensor. The sensor exploits the relationship between electric fields, magnetic fields, and electrical current to detect changes in subsurface conductivity. Electrical conductivity is an inherent property of a material to conduct electrical current and can be used to rapidly and economically characterize near-surface materials.

The GEM-2 simultaneously acquires data from multiple transmitter frequencies. This capability is important because the electromagnetic response of a buried object is frequency dependent (Won, 1980). The EM response is also a function of the coil separation and ground conductivity. For a fixed coil separation (such as the GEM-2) and site-specific background conductivity, low frequencies propagate further into the earth than high frequencies. Consequently, lower frequencies generally respond to deeper targets, and higher frequencies respond to shallower

targets. Acquiring data at multiple frequencies (known as frequency sounding) is, therefore, equivalent to measuring the earth response at multiple depths. Appendix A presents additional background information on the EM method.

3.0 EM Data

We acquired EM data along survey lines spaced five feet apart at each site. Both EM surveys employed a horizontal coil configuration (viz., vertical magnetic dipole [hmd]). The in-line sampling interval was approximately two feet. At each sampling location, we obtained in-phase and quadrature data at two frequencies, 9,210 and 15,210 Hz. The EM surveys generated over 27,400 raw measurements.

The EM data were recorded and logged internally by the GEM-2 instrument. After completing the EM survey, we downloaded the raw data into a laptop computer for processing and display. Data processing included assigning spatial registry information, converting the measured signal from part-per-million response to conductivity (in milli-Seimen per meter, mS/m), and contouring (krigging). We used a commercially available software package called Surfer, manufactured by Golden Software, to contour and display the EM data.

The processed EM data for MDA-T and MDA-A are shown in Figures 4 and 5, and Figures 7 and 8, respectively.

4.0 Interpretation

4.1 MDA-T

In addition to isolated anomalies that probably represent isolated buried objects, a broad positive anomaly is clearly seen in the quadrature component of data (Figures 4 and 5). The quadrature component is believed to respond to poor conductors (viz., namely non-ferrous materials). This broad anomaly, roughly 20 feet wide and 160 feet long, may therefore represent the anticipated paleochannel. It is entirely possible, however, that this anomaly represents an abandoned, compacted road bed. In fact, a trench and associated surface mound can be observed in an aerial photograph taken in 1985 (Figure 1). We recommend a shallow boring be placed along this anomaly (preferably at (60,90)) to confirm the nature of the source.

The in-phase response shows six isolated anomalies. Because the in-phase signal is believed to indicate conductive materials, we anticipate that the source of these isolated anomalies is probably buried ferrous objects or metallic debris.

Figure 6 presents our interpretation of the EM data for MDA-T.

4.2 MDA-A

We do not observe EM anomalies that suggest the presence of paleochannels in the data acquired at the MDA-A site. The north-south trending streaks in Figures 7 and 8 parallel the survey path and are not interpreted to represent real geology. We have observed this streaking before and are working to define its source and, ultimately, to minimize its impact on the recorded data.

The positive isolated anomalies shown in Figures 7 and 8 are interpreted, based on the relative strength of the in-phase and quadrature responses, to represent buried ferrous objects or metallic debris.

Figure 9 presents our interpretation of the EM data for MDA-A.

5.0 Conclusions

A broad EM anomaly is present within the MDA-T site that may represent the anticipated paleochannel. The broad anomaly may, however, identify a recent but currently abandoned, compacted roadway. Aerial photographs taken in 1975 and 1982 show non-paved roads and a trench in the same vicinity as the EM anomaly. We recommend shallow excavation or borings within the anomalous area to confirm the nature of the causative source.

The EM surveys have identified several isolated anomalies within MDA-T and MDA-A that, we believe, represent distinct separate buried objects or debris. Although we do not know the source of the anomalies, or if they contribute contaminants, we do not anticipate that these isolated anomalies are significant to the current project.

We do not observe EM signatures indicative of a meandering paleochannel at the MDA-A site.

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Purtymun, W. D., Peter, R., and Maes, M. N., 1990, Transport of plutonium in snowmelt run-off, *Los Alamos National Laboratory Report LA-11795-MS*.

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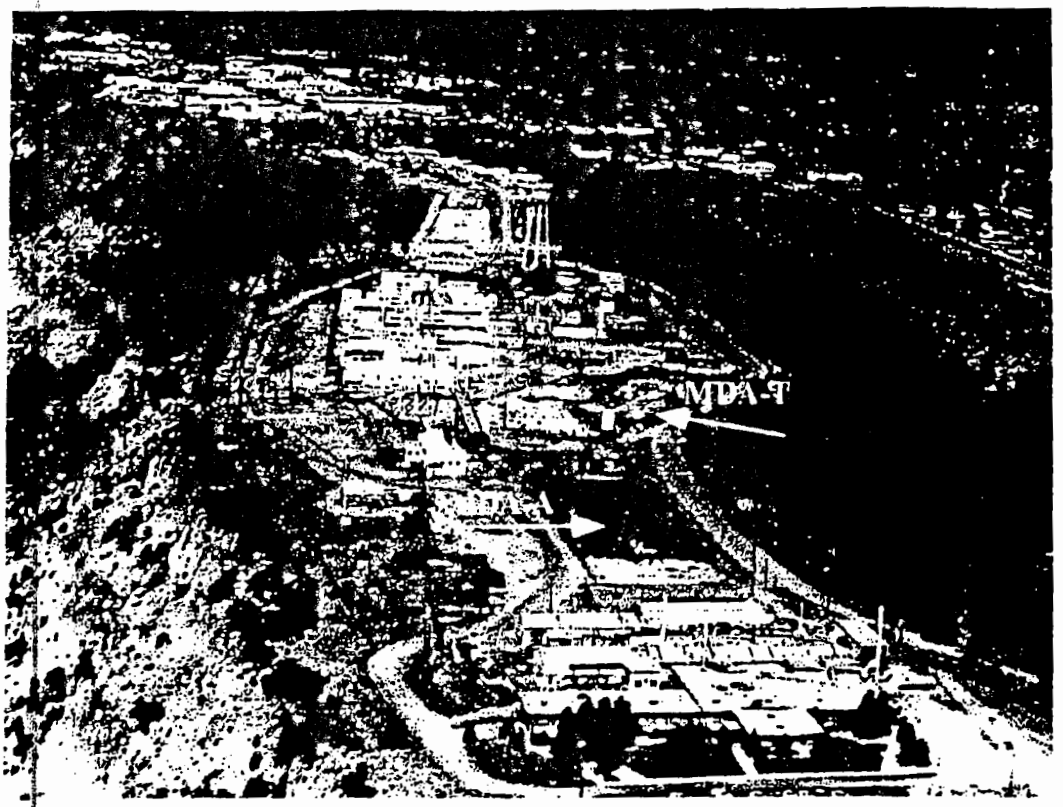
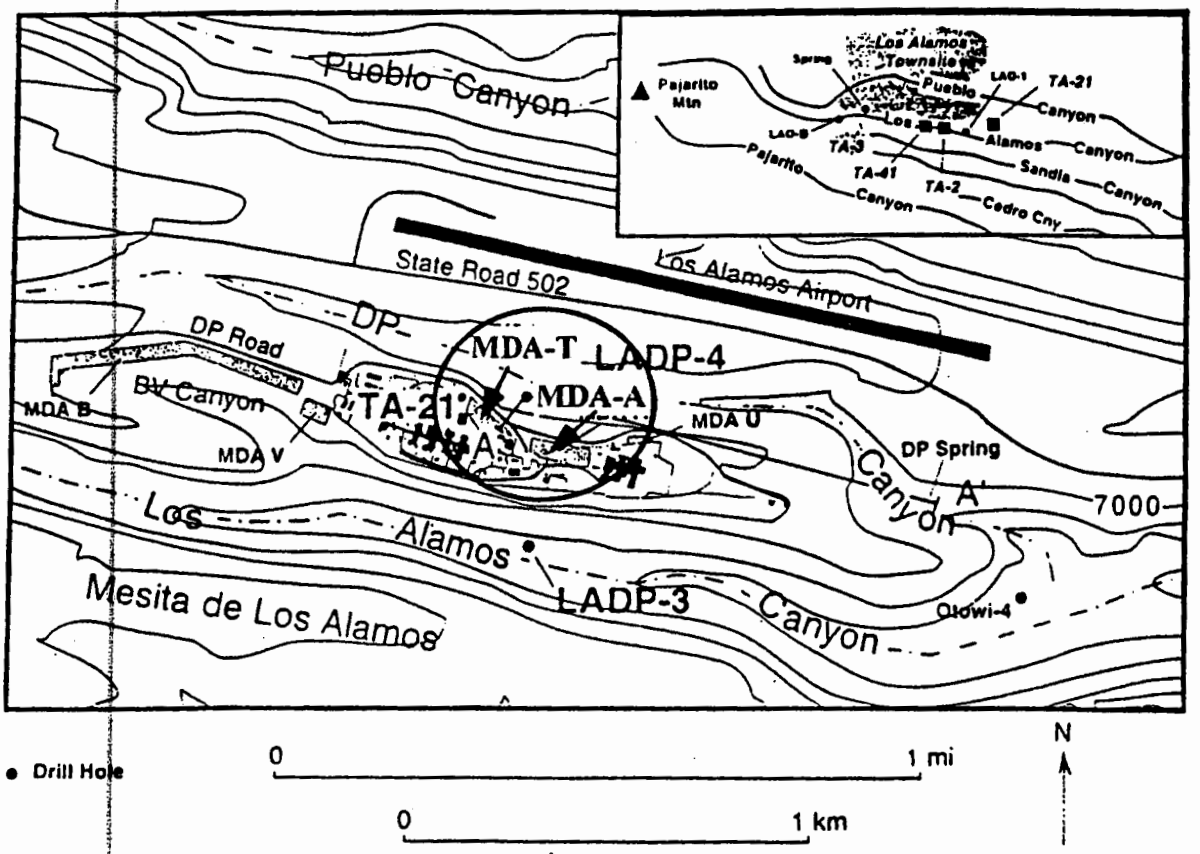
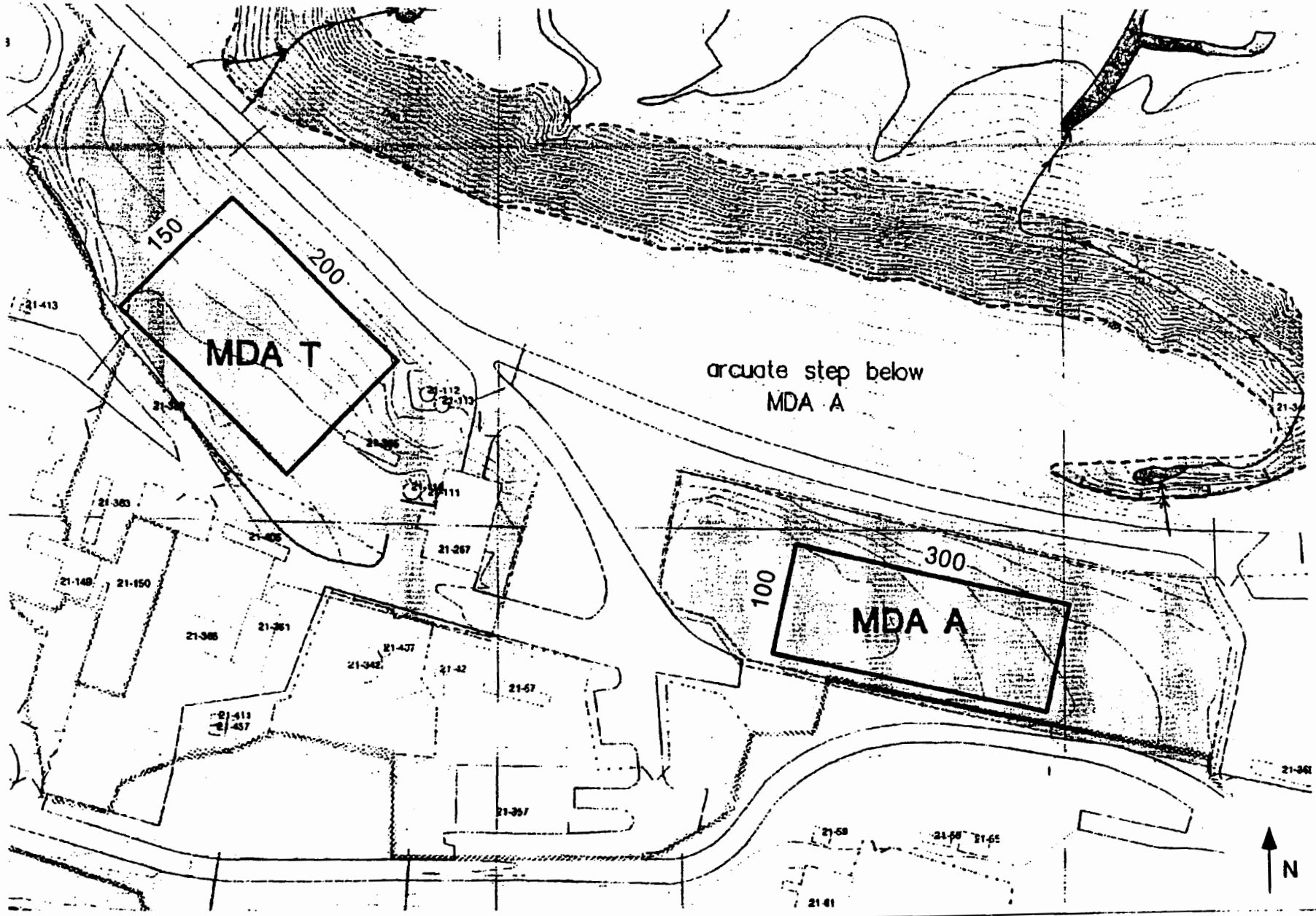
Figures





Geophex

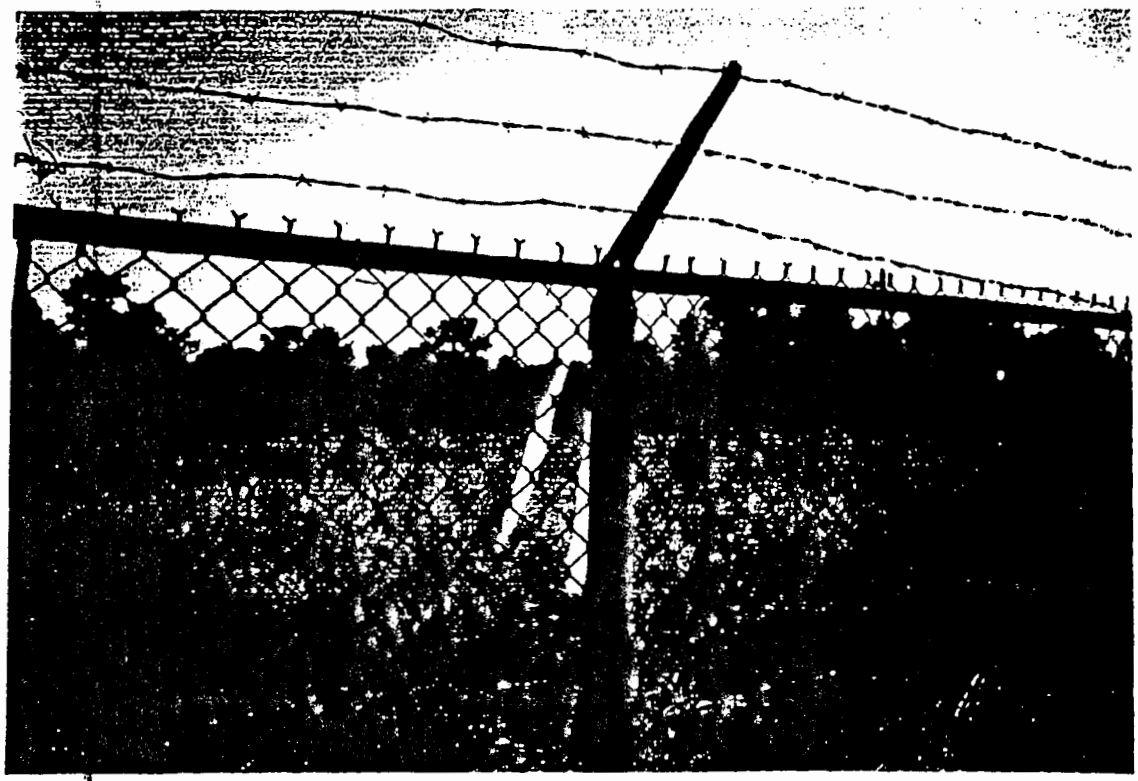
Figure 1. Aerial view of TA-21 in 1982. looking west (top), and general site map (bottom). (Photograph from Broxton and Eller. 1995)



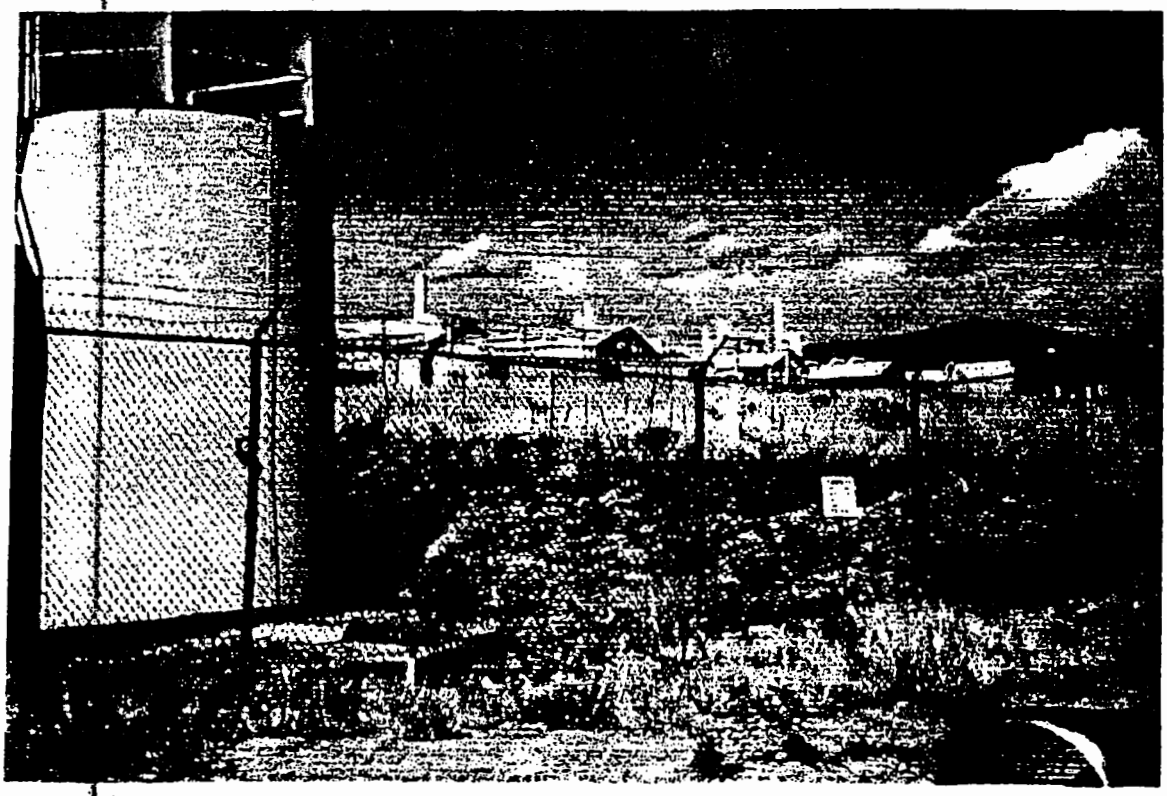
Geophex

Figure 2. Enlarged view of Material Disposal Area (MDA)-T and MDA-A.

MDA-A

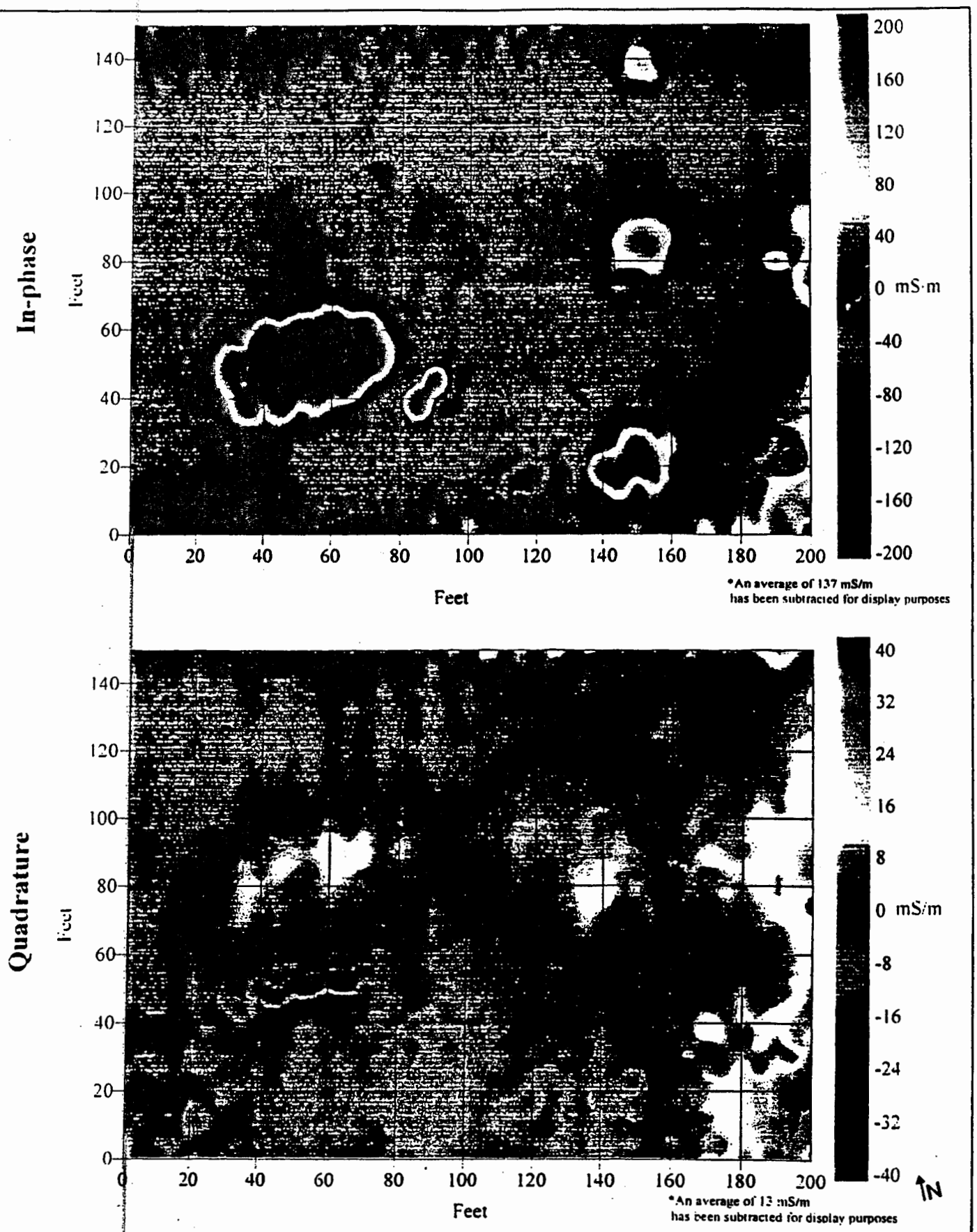


MDA-T



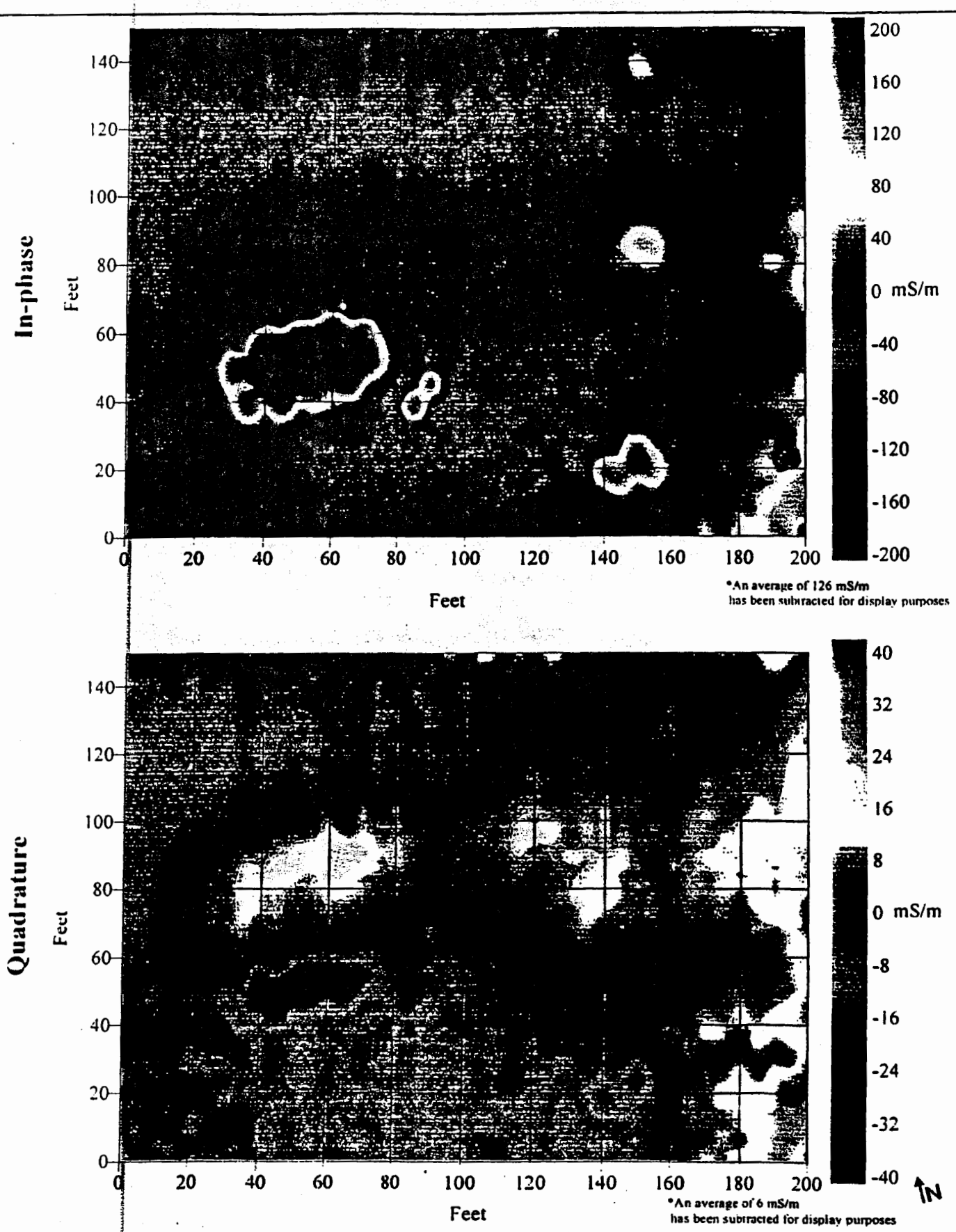
Geophex

Figure 3. Photograph of the MDA-A site (top) and MDA-T site (bottom) in 1996.



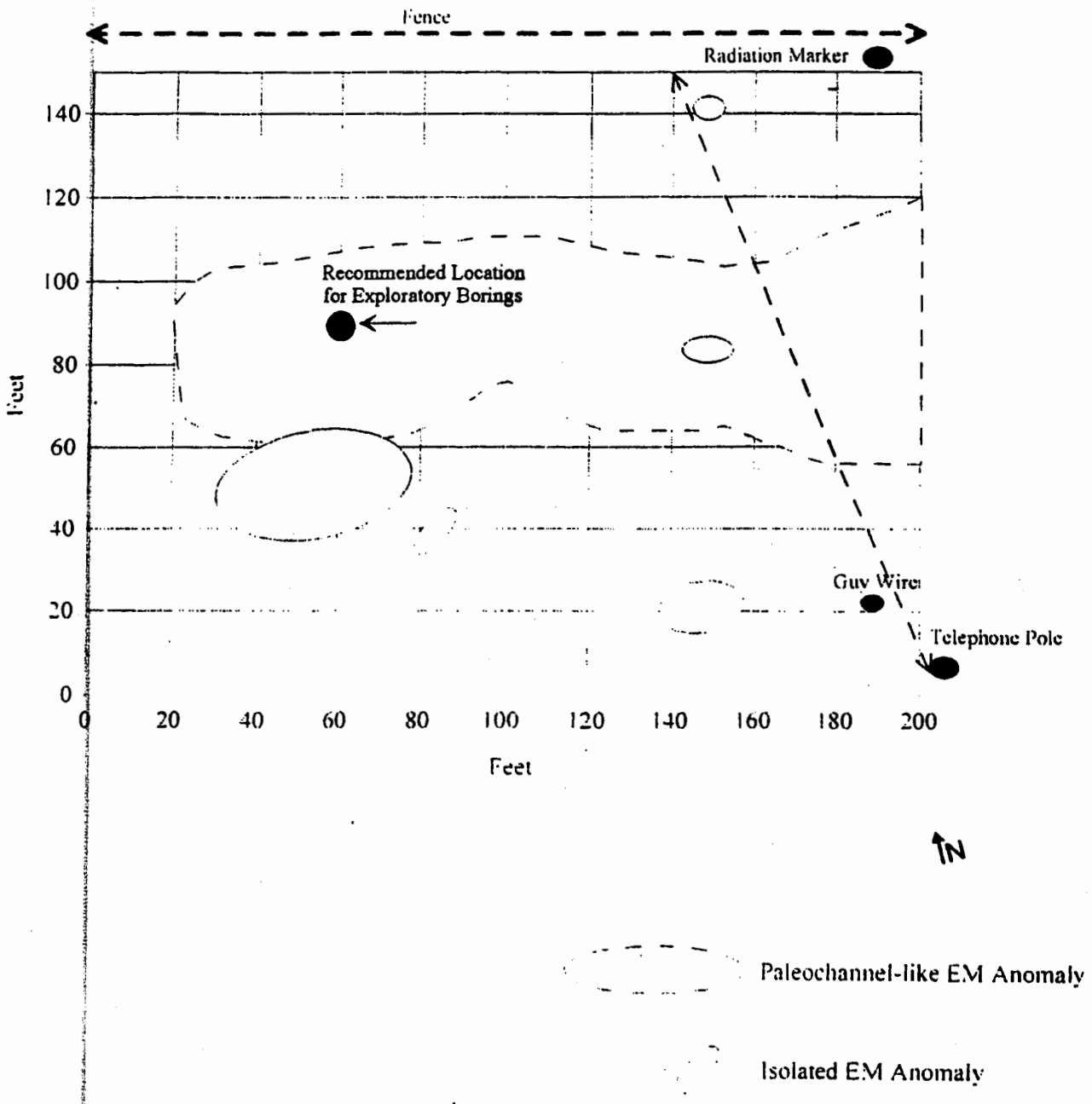
Geophex

Figure 4. Electromagentic (GEM) data for MDA-T: 9.210 Hz.



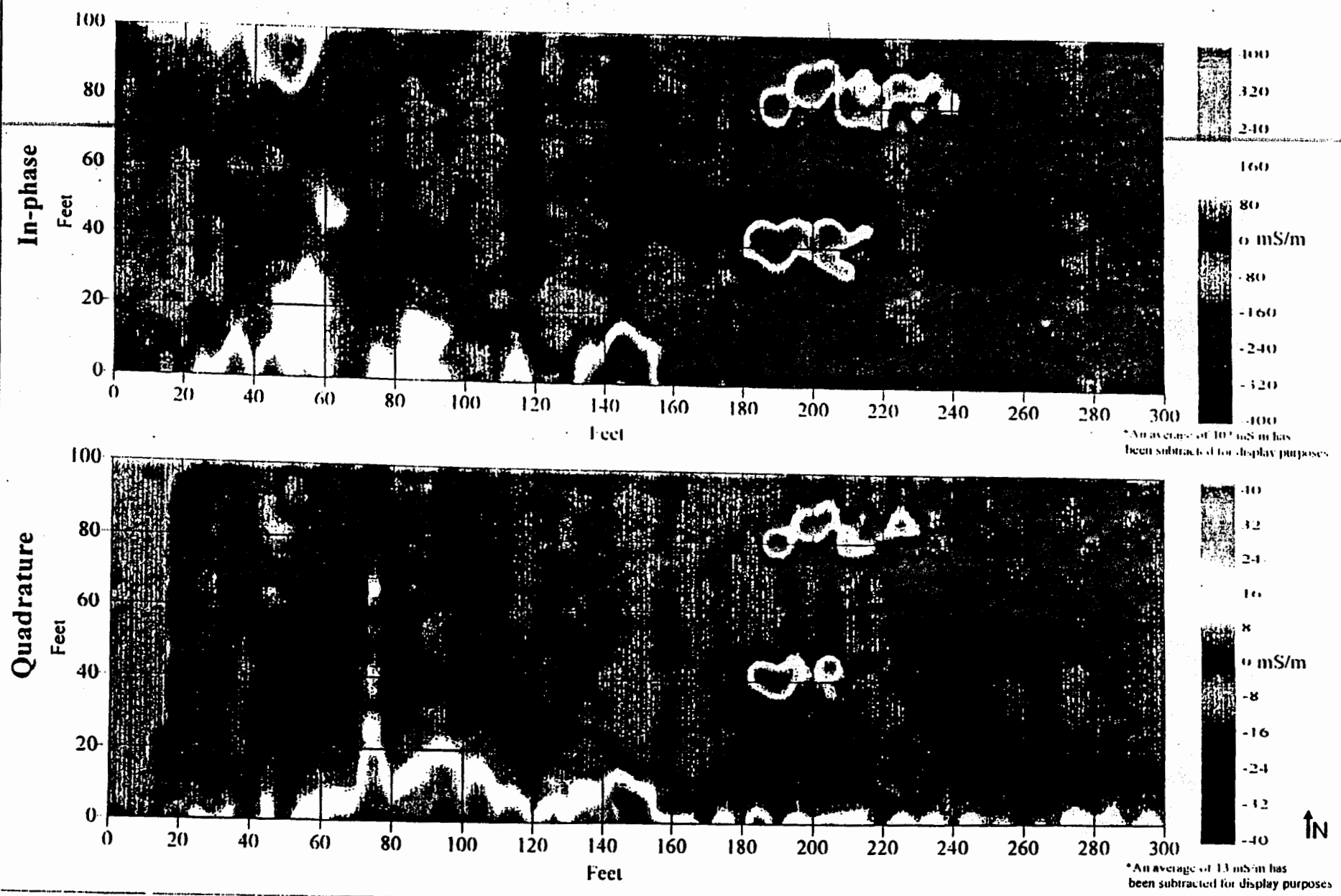
Geophex

Figure 5. Electromagnetic (GEM) data for MDA-T: 15.210 Hz.



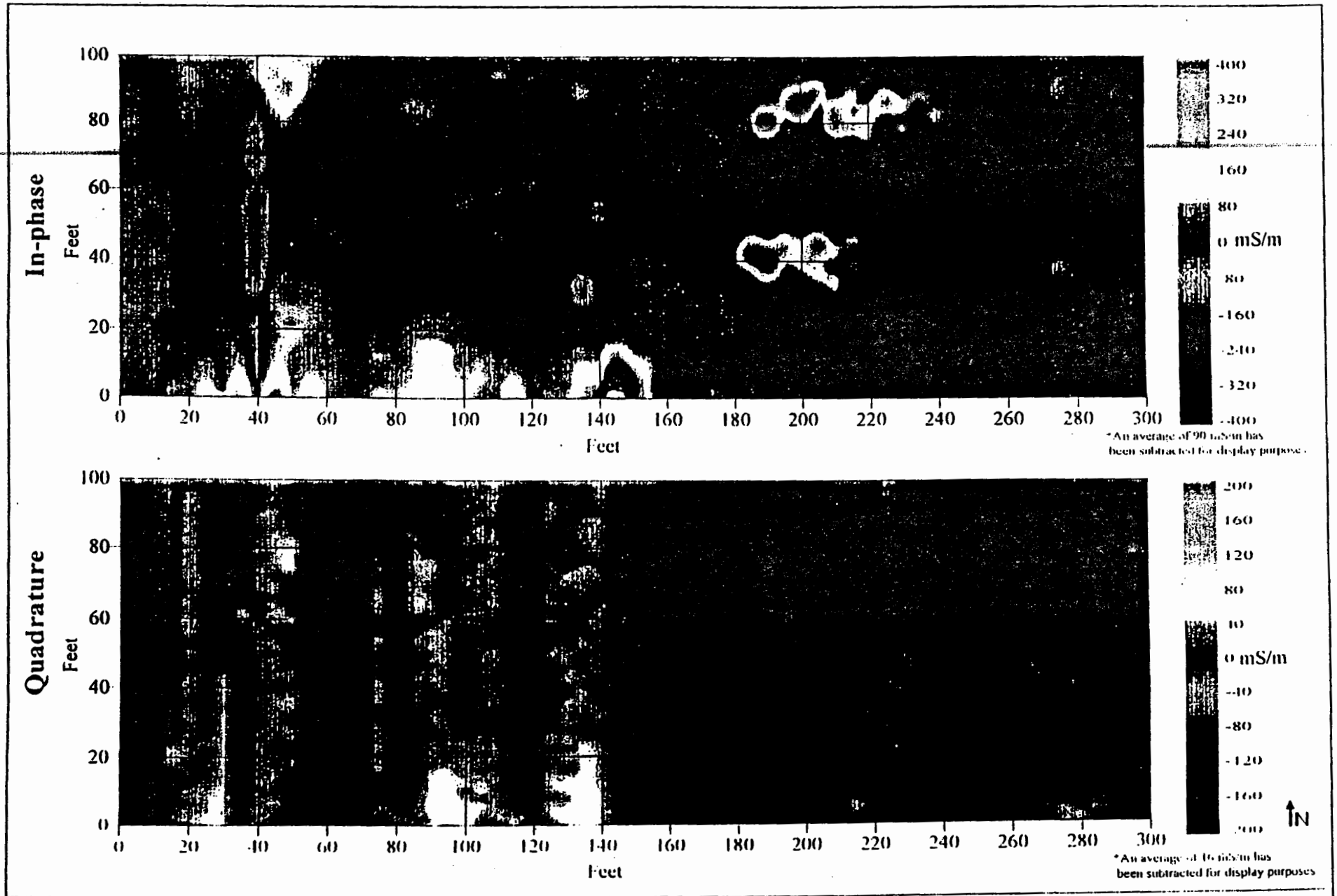
Geophex

Figure 6. Interpretation of EM anomalies for MDA-T.



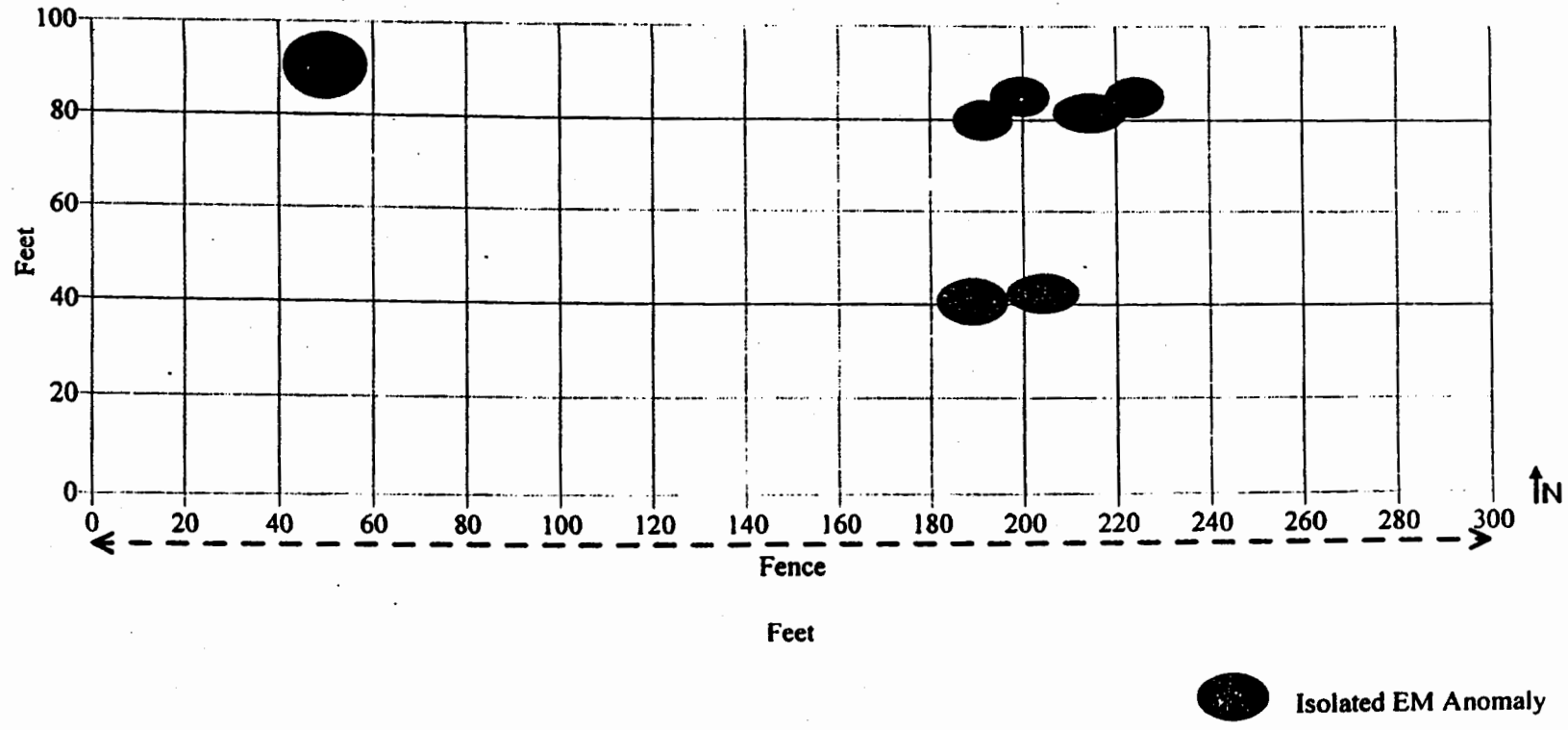
Geophex

Figure 7. Electromagnetic (GEM) data for MDA-A; 9,210 Hz.



Geophex

Figure 8. Electromagnetic (GEM) data for MDA-A; 15,210 Hz.



Geophex

Figure 9. Interpretation of EM anomalies for MDA-A.

Appendix A

Electromagnetic Method

Appendix A
Electromagnetic Method

The electromagnetic (EM) induction method, which is founded upon Maxwell's Equations (the relationship between electric fields, magnetic fields and electric current), characterizes the electrical conductivity of the subsurface and can be used to characterize shallow geological conditions. Electrical conductivity is an inherent property of a material to conduct electrical current. Variations in shallow earth conductivity can result from changes in soil moisture content, groundwater constituents (contamination), and lithological properties, as well as buried man-made materials. The primary application of EM surveys in site assessments are for:

- Searching for waste pits and trenches,
- Determining boundaries of landfills and other burial sites,
- Delineating leachate plumes,
- Locating buried drums, USTs, and other isolated metallic objects, and
- Detecting buried unexploded ordnance (UXO).

The EM method involves exciting the ground material with a primary, time-varying, electromagnetic field of one or more frequencies, and recording perturbations of the normal field that result from secondary eddy currents induced in conducting bodies at or beneath the surface. The primary field is typically established, in practice, by passing an alternating current through a small coil (i.e., the transmitter coils). The intensity of the induced eddy currents in the subsurface is a function of the ground conductivity and is measured by the receiver coil. The receiver generally consists of one or more coils, suitably arranged and connected to a data logger. Field efficient EM instruments, such as the Geophex Electromagnetic (GEM) sensor (Figure A-1), combine the transmitter, receiver, and processing electronics (data logger) into a single, lightweight, man-portable instrument.

Figure A-1. Photograph of the Geophex Electromagnetic (GEM-2) instrument during a site characterization study.

The primary advantage of electromagnetic induction sensors for detection of shallow man-made targets is that these sensors are sensitive to either ferrous or nonferrous (e.g., aluminum, copper, iron, steel) metals. The electromagnetic induction sensor can be used in conjunction with magnetic surveys for enhanced detection.

Figure A-2, adapted from Won (1980), shows ranges of conductivity for typical earth materials and the relationship between transmitter frequency and the skin depth (i.e., the maximum depth of exploration). In general, sediments and sedimentary rocks have higher conductivity than igneous or metamorphic rocks. Clay, owing to its electrolytic interaction with water, exhibits high conductivity, while typical sand shows relatively low conductivity.

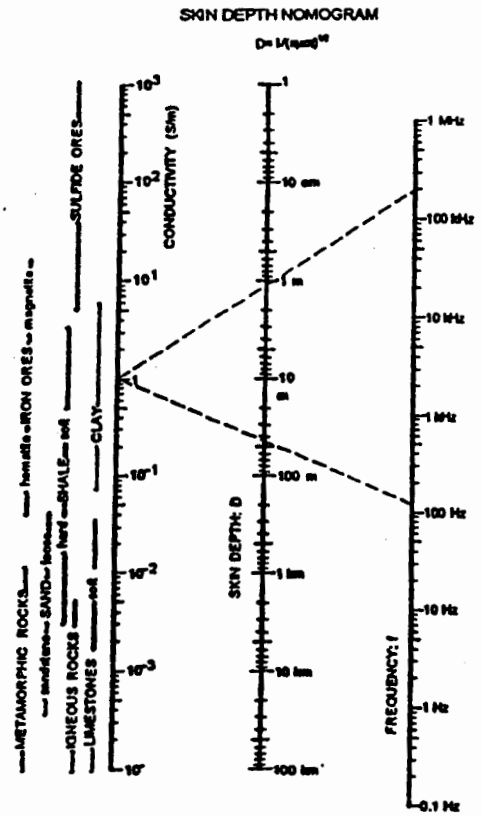


Figure A-2. Nomogram showing the relationship between transmitter frequency, ground conductivity, and depth of penetration. Magnetic permeability, μ, is assumed to be that of the free space. (From Won, 1980. Courtesy: Society of Exploration Geophysicists.)

The electromagnetic induction method can be used to target different depths of interest. The effective depth of exploration can be varied by changing either: 1) the spacing between transmitter and receiver coils, or 2) the frequency of the transmitted field (Patra and Mallick, 1980). The first method is known as *geometrical sounding* and involves recording data using several transmitter-receiver coil spacings at a fixed location; the depth of exploration increases with the coil spacing. The two coils systems (e.g., EM-24 by Geonics), although typically connected by an umbilical cord, are physically separate and thus require two field operators.

The second method is known as *frequency sounding* and involves changing the transmitter frequency, but keeping the transmitter-receiver coil constant (Figure A-3). The depth of exploration is inversely proportional to the square root of the frequency: a low frequency signal travels far through a conductive earth and, thus, sees deep structures, while a high frequency signal can travel only a short distance and, thus, sees only shallow structures. Therefore, broadband parametric sounding is analogous to depth sounding and can be used to create a pseudo 3-D subsurface image (Won, 1983).

Frequency sounding possesses inherent advantages over geometric sounding for depth imaging because: 1) signal attenuation does not allow a signal of fixed frequency to penetrate much deeper than several skin depths, and 2) geometrical sounding averages laterally and thus decreases the resolution. Theoretical and practical discussions on these methods may be found in Grant and West (1965), Keller and Frischkneckt (1966), Kaufman and Keller (1983), and Nabighian (1988).

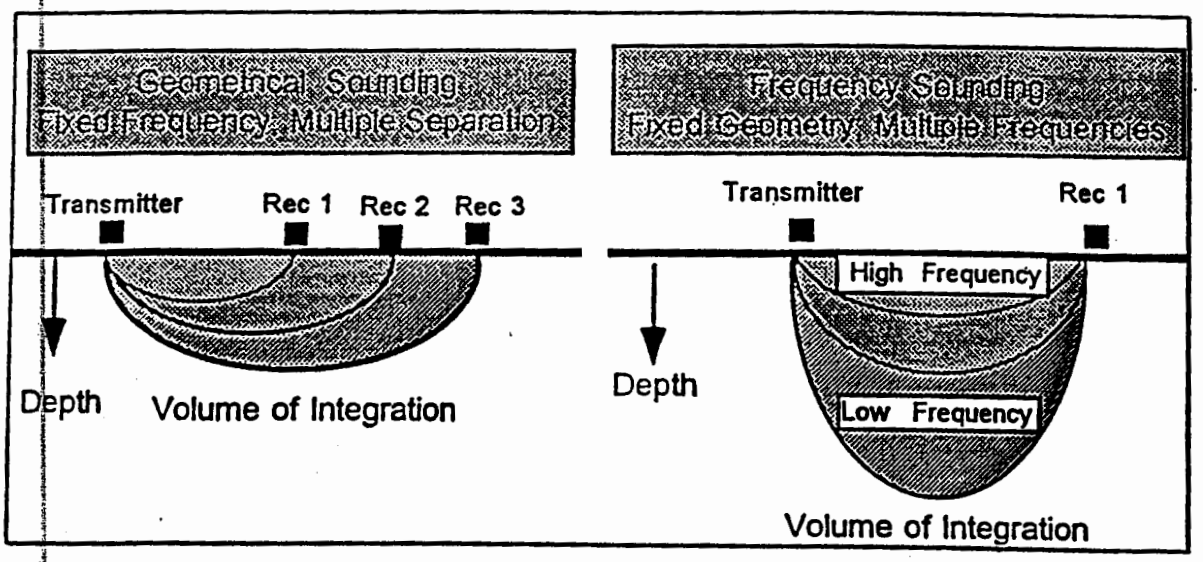


Figure A-3. Electromagnetic methods for depth sounding.

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-001 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 5

Driller Stewart Bro Box #(s) N/A Start Date/Time 1/27/97 1000 End Date/Time 1/30/97 1300

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-055991

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Contamination Criteria 1/27/97	1/27/97	1/29/97	1/30/97	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
					α: 12cpm By: 138cpm	α: 15cpm By: 100cpm	α: 11cpm By: 100cpm	α: 18cpm By: 81cpm				Drilling at east end of absorption bed #1 MDA-T TA-21
0	1.5/2.5	N/A	NDA	N/A	0-1.5' dk-pale brown 5YR 5/2, moist clay/crushed tuff, 6" organics (grasses, roots) 1.5-2.5' No Recovery						Bed F:11	1/27/97 0810 Moving and setting up equipment Run #1 1030
5	1.5/2.5	0127 97 0001 2.5-4'	NDA		2.5-4 lt. brown 5YR/6/4, damp crushed tuff/ s: Hs/sand 4.5' No Recovery							Run #2 1047
	1.5/2.5	0127-97 0002 6-6.5	α: 222cpm By: 160cpm 6-6.5		5-6' H brown 5YR 6/4 damp crushed tuff with lg tuff fragments, trace gravel at 6' 6-6.5' dk brown moist clay 6.5-7.5' No Recovery (clay smeared barrel)							Run #3 1105
	1.5/1.5	0127-97 0003 2.5-7	α: 600cpm By: 220cpm		7.5-9' dk brown, mix of fine med grain sand with s. H and gravel (50%), moist						Absorption Bed	Run #4 1130
10	Center Bit				9-11.5' Center Bit through caddle zone, No Recovery					Center Bit		Run #5 1145 Center Bit
	3.5/3.5	0127-97 0004 8.5-12 0127-97 0005 13.2-14.8	α: 170cpm By: 160cpm 11.5' α: 2600cpm By: 360cpm 13.2-14.5'		11.5-11.8' Pale brown 5YR5/2, moist fine-med grain sand/crushed tuff sharp flat contact 11.8-15' Grayish pink 5YR 7/2, damp mod welded tuff. Fractures at: 13.8-15' H brown 5YR 5/6 clay F:11, 0.2-.3" wide at widest point. Clay up to α 260cpm By: 360cpm @ surrounding tuff slight alteration along fracture surface. Surrounding tuff α: 1000cpm							Run #6 1210
15												Lunch break 1245
	5/5	N/A	α: 260cpm 15-15.3' α: 150cpm 15.3-18' α: 70cpm 18-20' By: NDA		15-20' Gray mod welded damp-moist tuff above fracture continues to 15.3' α: 260cpm Tuff 15.3'-18' is solid (no fractures) with α: 150cpm. 18-20' (no fractures) α: 70cpm Note that tuff is very damp and By is NDA.						Bandelier Tuff Unit #3	Run #7 1410
20	5/5	0127-97 0006 20-21	α: 800 By: 200 20.5' α: 100cpm By: 250cpm 24'		20-25' SAA Fracture at 60° 21-22' clay filled α: 800cpm By 1200cpm, rootlets. non-fractured tuff at 24' α: 100cpm By: 250 cpm							Run #8 1430
25	5/5	0127-97 0007 28 27.5-28	α: 650cpm By: 210cpm 27.5'		25-30' H gray mod-strongly welded tuff darking with depth. No visible fractures 27.5-28' weak-mod welded α: 650cpm By 210 cpm Non fractured tuff at 30' α 300cpm By 200cpm							Run #9 1515
30												

Prepared By J. Waltersdorf Date 1/30/97 Checked By [illegible] Date 2/3/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-001 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 2

Driller Stewart Bros Box #(s) N/A Start Date/Time 1/27/97 1300 End Date/Time 1/30/97 1300

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5/5	N/A	α: 32cpm Bg: 17cpm 33.5'	N/A	30-35 Gray mod welded tuff. Slight increase in moisture. Small hairline fracture with trace alteration (FeOx staining) at 38.5' α 380cpm Bg 190cpm 30-33.5 α: 100cpm 34-35' α: 72cpm		Bandelier Tuff Unit #3	Run #10 Note tuff is moist and damp. End of Day 1610
35	5/5	N/A	α: 140cpm Bg: 140cpm 36' α: 120cpm 35-40'		35-40' Gray mod. welded tuff slight increase in pumice. No visible fractures. avg. α: 120cpm over length of core. Faint FeOx staining at 36' α: 140cpm Bg: 140cpm drying with depth			Run #11 0950 1/28/97
40	5/5	0121-97 0008 40-42.5'	α: 40cpm Bg: NDA 40-45'		40-45' Gray 5YR7/2 mod welded tuff. Dry. No visible fractures. α 40cpm over length of core (40-45')			Run #12 1020
45	5/5	N/A	α: 45cpm Bg: NDA 45-50'		45-50' SAA. dry, no fractures. α 45cpm 45-50'			Run #13 1040
50	5/5	0121 97 0009 50-50.5'	α: 45cpm Bg: NDA 50-55'		50-55' SAA, no fractures, trace moisture (no dust when sampling) α 48 cpm 50-55'.			Run #14 1120
55	5/5	N/A	α: 30cpm Bg: NDA 55-60'		55-58' SAA No fractures, α 30cpm 58-60' Gray. 5YR 7/2 mod welded, FeOx spotting on tuff, dry. α 30cpm No visible fractures.			Run #15 1155
60								

Prepared By J. Waltersdorf Date 1/30/97 Checked By [illegible] Date 2/3/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-001 TA/OU 21 Drill Depth From 60 To 90 Page 3 of 5

Driller Stewart Bros. Box #(s) NA Start Date/Time 1/27/97 1000 End Date/Time 1/30/97 1300

Drilling Equip./Method CME 750/auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	1.5/5	0121 97 0010 61-61.5	α: 30cpm β,γ: NDA 60-61.5	N/A	60-61.5' Gray 10YR 6/2, non to partially welded (soft and crumbly) tuff. Tuff is damp. Thin FeOx layering 60.5-61.5'.	Loss	Bandelier Tuff Unit #3	Run #16 1215 Tuff is almost sandy
65					61.5-65' No Recovery			Sample fell out of barrel during retrieval lunch 1230
	2.5/2.5	N/A	α: 20cpm β,γ: NDA		65-67.5' Gray weakly welded, damp tuff No visiable fractures. Trace FeOx staining.			Run #17 1350
	2/2.5	N/A	α: 20cpm β,γ: NDA		67.5-69.5' Gray non to weakly welded tuff. Drying out. Note softer (loosely packed) with depth. Slight increase in pumice.			Run #18 1410
70					69.5-70' No Recovery	Loss		
	1.5/2.5	0121 97 0011 71-71.5	NDA		70-71.5' Gray non-welded (soft) tuff. St. 11 holding some moisture (no dust).			Run #19 1440 Tuff is to soft to push up into catcher.
					71.5-72.5' No Recovery	Loss		
	1.0/2.5	N/A	NDA		72.5-73.5' Gray non-welded (soft, loose) tuff. damp (increase in moisture)			Run #20 1505
75					73.5-75' No Recovery	Loss		
	1.5/2.5	N/A	NDA		75-76.5' Gray non-welded, soft, tuff. damp.			Run #21 1530
					76.5-77.5' No Recovery	Loss		
	1.5/2.5	N/A	NDA		77.5-79' Gray non-welded, soft, damp, tuff.			Run #22 1550
					79-80' No Recovery	Loss		End of Day 1600
80	2.5/2.5	0121 97 0012 80-80.5	NDA		80-82.5' Gray non to weakly welded, damp. tuff. lg. pumice fragments (white)			1/29/97 0850 Run #23 0940
	2.5/2.5	N/A	NDA		82.5-85' Gray non welded, damp, tuff. Trace FeOx spotting.			Run #24 1005 Sandy Tuff (No picture)
85					85-87.5' lt. gray non-welded, damp (drying out with depth) tuff. FeOx spotting. (Sandy)			Run #25 1020 Sandy Tuff
	2.5/2.5	N/A	NDA		87.5-90' lt. gray non-welded soft, tuff. Trace FeOx spotting			Run #26 1045 Sandy tuff
90	2.5/2.5	0121 97 0013 87.5-90	NDA					

Prepared By J. Wetherbee Date 1/30/97 Checked By [illegible] Date 2/3/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-001 TA/OU 21 Drill Depth From 90 To 120 Page 4 of 5

Driller Stewart Bros. Box #(s) NA Start Date/Time 1/27/97 1000 End Date/Time 1/30/97 1300

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
90	2.5/2.5	N/A	NDA	N/A	90-92.5' lt gray very weakly welded, damp tuff. Trace FeOx spotting.		Bandelier Tuff Unit #3	Run #27 1100 Sandy tuff
	2.5/2.5	N/A	NDA		92.5-95 Gray 10YR 6/2 weakly welded slightly drying out with depth. trace FeOx spotting			Run #28 1115
95	2.5/2.5	N/A	NDA		95-97.5' Gray very weakly welded tuff. Drying with depth (no dust almost friable tuff)			Run #29 1130
	2.5/2.5	0121 97 0014 97.5-100	NDA		97.5-100' Grayish-brown very weakly welded tuff, damp. Trace FeOx.			Run #30 1150
100	2/2.5	N/A	NDA		100-102' Grayish brown (mottled) non to weakly welded, damp. tuff. Slight increase in welding with depth. JW 1/27/97			Lunch 1225 Run #31 1430 Snow delay until 1400
	2/2.5	N/A	NDA		102-102.5' No Recovery	Loss		
105					102.5-104.5' Mix of mod welded gray tuff with soft damp H brown tuff.			Run #32 1450
					104.5-105' No Recovery	Loss		
	2/2.5	N/A	NDA		105-107' mix of mod welded gray tuff with soft nonwelded H brown tuff continues.			Run #33 1500
					107-107.5' No Recovery			
110	2/2.5	0121-97 0015 107-107.5	NDA		107.5-109.5' mix of tuff continues. welded pieces make up 30-40% of volume and avg. 1" in size.			Run #34 1520
					109.5-110' No recovery	Loss		
	2.5/2.5	N/A	NDA		110-110.5' SAA			Run #35 1545
					110.5-112.5' dk gray/brown 5YR 5/2, mod welded tuff drying out with depth small pumice fragments FeOx spotting (Unit #2)		Bandelier Tuff Unit #2	Hard drilling
	2.5/2.5	N/A	NDA		112.5-115' dk gray mod welded tuff, continues to dry with depth small FeOx spots around pumice(?). No visible fractures			Run #36 1605 End of Day 1630
115					115-117.5 SAA			1/30/97 0830 Run # 37 0930
	2.5/2.5	N/A	NDA		117.5-120 dk gray mod to strong welding dry, tuff. FeOx spots continue No visible fractures			Run # 38 0945
120	2.5/2.5	012197 0016 117.5-120	NDA					

Prepared By J.W. Herschel Date 1/30/97 Checked By [signature] Date 2/3/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-001 TA/OU 21 Drill Depth From 120 To 150 Page 5 of 5

Driller Stewart Bros Box #(s) N/A Start Date/Time 1/27/97 1000 End Date/Time 1/27/97 1300

Drilling Equip./Method CME750 / Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
120	2.5/2.5	NA	NDA	N/A	120-121.5' dk gray mod to strong welding dry. No fractures. 121.5-122.5' weak to mod welded, dk gray tuff. softer core. No fractures		Bandelier Tuff Unit #2	Run #39 1010
	2.5/2.5	NA	NDA		122.5-125' SAA			Run #40 1020
125	2.5/2.5	NA	NDA		125-127.5' ~~dk gray~~ brownish gray 5YR 4/1 mod. welded (no fractures) tuff			Run #41 1030 Core is being ground during drilling
	2.5/2.5	0121-97 0017 129.5-130	NDA		127.5-130' Brownish gray mod welded tuff. No visiable fractures. Core is broken up from drilling.			Run #42 1045
130	2.5/5	N/A	NDA		130-132.5' ~~SAA~~ Brownish gray weakly welded tuff mixed with soft gray ash(?)	Loss		Run #43 1105
135					132.5-135' No Recovery (soft material pinched barrel)			
	2/2.5	N/A	NDA		135-137 Mix of mod welded brownish gray tuff fragments (70%) with soft ground up tuff (possibly ash) Slight increase in moisture content.			Run #44 1135
140	2.5/2.5	0121-97 0018 137.5-138	NDA		137-137.5 No Recovery. 137.5-140' mix of mod welded tuff fragments with finer grain ground tuff (soft). Tuff fragments make up 40% core.	Loss		Run #45 1150 soft drilling sample collected in rock
	2.5/2.5	NA	NDA		140-142.5' Mix of mod welded and non-welded tuff. No ash.			Run #46 1210
145	2.5/2.5	NA	NDA		142.5-145' SAA. mod welded fragments make up 70% of core			Run #47 1220
	2.0/2.5	NA	NDA		145-~~147.5~~ 147 SAA. change in color to grayish brown 5YR/3/2. 147-147.5 No Recovery			Run #48 1230
150	2/2.5	0121-97 0018 148.5-150	NDA		147.5-148 No Recovery. 148-150 H brown, mix of tuff (welded) with non-welded tuff. 150 ft Total Depth	Loss		Run #49 1245 lunch 1300

Prepared By J. Waterscheid Date 1/30/97 Checked By [signature] Date 2/3/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-002 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 5

Driller Stewart Bo. Box #(s) NA Start Date/Time 3/24/97 0950 End Date/Time 4/1/97 1205

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05052

Contamination Criteria

3/24/97	3/25/97	3/31/97	4/1/97
α: 11 cpm	α: 7 cpm	α: 5 cpm	α: 5 cpm
Bγ: 121 cpm	Bγ: 122 cpm	Bγ: 133 cpm	Bγ: 118 cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2.5/2.5	NA	NDA	NA	0-0.5' Road: base course, asphalt 0.5-2.5' Moderate yellowish brown 10YR5/4 mix of moist clayey silt with crushed tuff.		Overburden/Backfill	3/24/97 Drilling 0950 Run #1 1000
5	2.5/2.5	0121-97 0026 0050 2.5-3'	NDA		2.5'-5' SAA with 5% 1" river rock 5-7.5' Moderate brown 5YR 4/4 mix of moist clayey silt with crushed tuff, 10% river rock, Note 1 inch layer of decomposed grasses and roots at 6'.			Run #2 1015 Field blank 0121-97-0050 collected
	2.5/2.5	NA	NDA		7.5-9' SAA			Run #3 1040
10	2/2.5	0121-97 0027 9-9.5	NDA		9-9.5' Mix of light brown 5YR6/4 medium to coarse grain sand with small to over 1" gravels. Fe ox staining/alteration along rock edges. Moist.			Run #4 1052
	2.5/2.5	NA	NDA		9.5-10' no Recovery 10-12.5' Light brown 5YR5/6 medium to coarse grained sand with small pebbles trace clay. Sand is weakly cemented. Moist		Paleo Channel	Run #5 1106
15	2.5/2.5	NA	NDA		12.5-15' Light reddish brown 5YR 5/6 medium to coarse grain moist sand with small pebbles. Noncemented.			Run #6 1130
	2.5/2.5	NA	NDA		15-17.5' SAA very weakly cemented.			Run #7 1155
20	2.5/2.5	NA	NDA		17.5-20' SAA Note ~~17.5-19.7~~ 18.4-20' was collected in stainless steel sleeves for hydrogeological characterization.			Lunch 1215 Run #8 1320 ~~18.5-19.7~~ 18.4-20' hydrogeological characterization samples (4) collected.
	2.5/2.5	0121-97 0028 20-22.5	NDA		20-22.5' Light reddish brown 5YR5/6 med. grain moist sand with trace pebbles. Collected in stainless steel sleeves. 21.4-22.8' (3 sleeves) sent for hydro characterization			Run #9 1350 21.4-22.8 hydrogeological characterization samples (3) collected
25	2.5/2.5	NA	NDA		22.5-24' light reddish brown loose non cemented medium grain moist sand 24-24.5' light tan med grain moist sand with small dacite and rhyolite pebbles			Run #10 1430
	2.5/2.5	0121-97 0029 ~~NA~~ 26-27	NDA		24.5-25' light reddish brown med grain moist sand 25-26.5' SAA 26.5-27' Dacite/Rhyolite cobble zone. Rounded 1"+ pebbles in sand, moist			Run #11 1455
30	2.5/2.5	NA	NDA		27-27.5' Pale brown 10YR6/2 weak-mod welded tuff 27.5-30' Pale brown moderately welded trace moisture tuff. 70° clay filled fracture (1-2 cm wide) at 28-28' weak alteration along edge of fracture. Core is solid tuff		Unit #3	Run #12 1525

Prepared By J. Waltersheid Date 4/1/97 Checked By [illegible] Date 4/2/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-002 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 5

Driller Stewart Bro Box #(s) NA Start Date/Time 3/24/97 0950 End Date/Time 4/1/97 1205

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	2.5/2.5	NA	NDA	NA	30-32.5 Pale yellowish brown 10YR 6/2 mod. welded tuff. Trace moisture. 10% pumice 5% qtz. moist. SW 3/24/97 ~~32-32.5~~		Bandelier Tuff Unit #3	Run #13 1539 Solid core
35	2.5/2.5	NA.	NDA		32.5-35 SAA			Run #14 1550
40	5/5	0121 97 0030 38.5-40	NDA		35-40 Pale yellowish brown 10YR 6/2 mod. weakly welded tuff (solid core) Trace moisture drying with depth. 5-10% Flattened pumice, 5% qtz. Solid core.			Run #15 1610 End of day 1630
45	5/5	NA	NDA		40-45' SAA			3/25/97 Drilling 0830 Run #16 0900
50	5/5	0121 97 0031 48.5-50	NDA		45-50' SAA. dry.			Run #17 0930 Will stop at 50' and move to 16-013. Team will decide if we need to continue to 150'. End of Day 1000
55	5/5	NA	NDA		50-55' Pale yellowish brown (10YR 6/2) to light brown (5YR 6/4) mottled color ~~with~~ SW 3/31/97 moderately welded (solid core) tuff. increase in moisture content.			3/31/97 Drilling 0820 Run #18 0845
60	5/5	0121 97 0032 ~~0047~~ 1276 RN 4/1/97 55-60	NDA		55-56.5' SAA 56.5-60' Pale yellowish brown (10YR 6/2) to light brown (5YR 6/4) mottled color weakly welded tuff. Slightly moist. Getting softer with depth.			Run #19 0900 Field Blank 0121-97-~~0047~~ 1276 collected RN 4/2/97

Prepared By J. Walterscheid Date 4/1/97 Checked By [illegible] Date 4/2/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-002 TA/OU 21 Drill Depth From 60 To 90 Page 3 of 5

Driller Stewart Bro Box #(s) NA Start Date/Time 3/24/97 0950 End Date/Time 4/1/97 1205

Drilling Equip./Method CME750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	4/5	NA	NDA	NA	60-61.2 Pale yellowish brown mottled with a light tan color. non-weakly welded tuff slightly moist.		Bandelier Tuff Unit #3	Run # 20 0930
					61.2-64 Medium light gray (N6) non welded, soft (sugary texture) tuff. Slightly moist.			
65					64-65 No Recovery	Loss		
	1.5/5	NA	NDA		65-66.5' SAA			Run # 21 0943
					66.5-70 No Recovery	Loss		Changing swivel to get better recovery
70	3.3/5	0121-97 0033 ~~0042~~ 1271 4/1/97 70-71	NDA		70-73.3' Medium light gray (N6) non welded (soft) tuff. Sugar texture, slightly moist. Brown mottled alteration(?) zone at ~~70-73.3~~ JRW 4/1/97 70-71.5'			Run # 22 1003 Duplicate sample 0121-97-~~0042~~ collected 1271 RPB 4/1/97
					73.3'-75 No Recovery	Loss		
75	2.5/2.5	NA	NDA		75-77.5' Medium light gray (N6) non welded (soft) tuff. Sugar texture, slightly moist.			Run # 23 1050
	2.5/2.5	0121-97 0034 ~~87-90~~ 79.5-80	NDA JRW 4/1/97		77.5-80' SAA			Run # 24 1058
80	2.5/2.5	NA	NDA		80-82.5 SAA with some brown mottle alteration at 81-81.4 and 82-82.5'			Run # 25 1114
					82.5-84.3 SAA			
	2.5/2.5	NA	NDA		84.3-85 Light brownish gray (5YR 4/1) soft non welded tuff (sugary). Moist (increase in H_2O content)			Run # 26 1130
85					85-88 SAA			Run # 27 1150
	4/5	0121-97 0035 87-88	NDA		88-89 medium light gray (N6) non welded (soft) tuff Sugar texture, slightly moist			
90					89-90 No Recovery	Loss		

Prepared By J. Waltersted Date 4/1/97 Checked By [illegible] Date 4/2/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-002 TA/OU 21 Drill Depth From 90 To 120 Page 4 of 5

Driller Stewart Bo. Box #(s) NA Start Date/Time 3/24/97 0950 End Date/Time 4/1/97 1205

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
90	5/5	NA	NDA	NA	90-95' Grayish orange pink (5YR 7/2) with light brown coloring, soft non-welded tuff. FeOx spotting, slightly moist.		Unit #3	Run # 28 1205
95	5/5	0121 97 0036 96-96.5	NDA		95-96.5' SAA 96.5-100' Grayish orange pink (5YR 7/2) weak to moderately welded tuff (increase in welding with depth). FeOx spotting, trace moisture.		?	Run # 29 1215 Lunch 1230
100	5/5	NA	NDA		100-105' SAA			Run # 30 1400
105	2.5/2.5	NA	NDA		105-107.5' Grayish orange pink (5YR 7/2) to Pale red (10YR 6/2) moderately welded tuff. FeOx spotting, slight increase in moisture.		Bandelier Tuff Unit #3	Run # 31 1415 Hard drilling.
110	2.5/2.5	0121-97 0037 109-110	NDA		JW 3/31/97 ~~105-107.5'~~ 107.5-110' Pale reddish gray (10YR 6/2) to grayish red (10YR 4/2) mod. welded tuff. FeOx spotting slightly moist.			Run # 32 1430 Hard drilling have to ream hole to advance
	2.5/2.5	NA	NDA		JW 3/31/97 ~~107.5-110'~~ 110-112.5 SAA			Run # 33 1450 Hard drilling cont.
115	2.5/2.5	NA	NDA		112.5-115' Grayish red (10YR 4/2) moderately welded tuff, slightly moist, increase in qtz.			Run # 34 1525 Hard drilling, reaming c
	2.5/2.5	NA	NDA		115-117.5' SAA			Run # 35 1543 Hard drilling, reaming
120	2.5/2.5	0121-97 0038 119-120	NDA		117.5-120' SAA, drying out with depth			Run # 36 1620 Reaming and grinding core

JW 3/31/97

End of Day 1635

Prepared By J. Waltersdorf Date 4/1/97 Checked By [illegible] Date ~~4/1~~ 4/2/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-002 TA/OU 21 Drill Depth From 120 To 150 Page 5 of 5

Driller Stewart Bros Box #(s) NA Start Date/Time 3/24/97 0950 End Date/Time 4/1/97 1205

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes 4/1/97
120	2.5/2.5	NA	NDA	NA	120-122.5' Pale red (10YR 6/2) moderately welded tuff. FeOx spotting, trace to dry moisture content.		Bandelier Tuff Unit #2	Run #37 0920 hard core, having to ream hole
125	2.5/2.5	NA	NDA		122.5-125' SAA			Run #38 0930 SAA
	0.7/2.5	NA	NDA		125-125.7 SAA 125.7-~~130~~ 127.5 No Recovery	Loss		Run #39 0944
130	0/2.5	NA	NDA		127.5-130 No Recovery.	Loss		Run #40 0955 Ground core and went up auger slight (miss later)
	2.5/2.5	0121-97 0039 130-131 1277	NDA		130-132.5' Pale red (10YR 6/2) moderate to strongly welded tuff. Slight decrease in FeOx spotting, dry.			Run #41 1010 Field Blank 0121-97-1277 collected
135	2.5/2.5	NA	NDA		132.5-135' SAA			Run #42 1031
	2.5/2.5	NA	NDA		135-137.5' SAA			Run #43 1045
140	2.5/2.5	0121-97 0040 137-140	NDA		137.5-140' Pale Red (10YR 6/2) moderately welded Tuff. FeOx spotting, 10% qtz, dry.			Run #44 1056
	2.5/2.5	NA	NDA		140-142.5' SAA			Run #45 1119
145	2.5/2.5	NA	NDA		142.5-145' SAA			Run #46 1130
	2.5/2.5	NA	NDA		145-147.5' Pale Red (10YR 6/2) weak to moderately welded tuff. FeOx spotting, 5-10% qtz, dry			Run #47 1145
150	2.5/2.5	0121-97 0041 1272 149-150	NDA		147.5-150' SAA			Run #48 1155 Duplicate Sample 0121-97-1272 collected

150' Total Depth

T.D. 1205'

Prepared By J. Walterskirchen Date 4/1/97 Checked By [illegible] Date 4/2/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-003 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 3

Driller Stewart Bar Box #(s) N/A Start Date/Time 1/21/97 0900 End Date/Time 1/23/97 1040

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05053

Background Contamination Criteria

1/21/97	1/22/97	1/23/97
α: 10cpm	α: 14cpm	α: 8cpm
βγ: 121cpm	βγ: 100cpm	βγ: 98cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results Counts Per Minute cpm	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	1.5/2.5	N/A	No Detectable activity NDA	N/A	0-1' dk brown 5YR 4/4, moist, mix of silty clay with crushed tuff. 1-1.5' lt. gray crushed tuff, damp 5YR 7/2 1.5-2.5' No Recovery		Backfill	1/21/97 Drilling 0900 Run #1
	2/2.5	0121-97 0051 4.2-4.6	α: 750cpm βγ: 400cpm 4.5'		2.5-3' No Recovery 3-4.2' lt. gray crushed tuff, damp (No rad) 4.2-5' lt brown 5YR 5/6 silty clay with small pieces of tuff and burnt coal(?)			Run #2 0915 Top of absorption bed 4.2'
5	1.5/2.5	0121-97 0052 0064 6.5-7'	α: 550cpm βγ: 2400cpm 6.7'		5-6' No Recovery 6-7.5' mix of lt brown 5YR 5/6 silty clay (damp) and small (≤1") river gravels (25%) lg. 2" river gravel at 7.5'		Absorption Bed	Run #3 ~~0730~~ 0950 JCW 1/21/97
	1/2.5	0121 97 0053 7.5-10	α: 26,000 βγ: 3800 7.5-10'		7.5-9' No Recovery 9-10' mix of lt brown silty clay / small river gravel and pieces of clay pipe. Note inside of pipe has α: 45,000 cpm			Run #4 1035 Driller is not sure on depth of pipe or core box JCW 1/21/97
	Center Bit				10-12.5' No Recovery. Drilled with center bit through cobbles.	Center Bit		Run #5 exact footage for tuff contact unknown
15	2.5/2.5	0121 97 0054 12.5-13	α: 160 cpm βγ: 140cpm 13'		12.5-15' lt gray 5YR 7/2, dry tuff. weak-moderately welded small pumice crystals Rad is dropping with depth. No fractures.		Bandelier Tuff unit #3	Run #6 1200 Break for lunch: 1220
	2.5/2.5	0121 97 0055 17-17.3	α: 40cpm βγ: 120cpm 17'		15-17.5 SAA with a horizontal clay filled fracture at 17'. Fracture is 0.6" wide and filled with an dk orange silty clay (damp) rootscure visiable in fracture			Run #7 1335
20	2.5/2.5	N/A	α: 150cpm βγ: 120cpm 18'		17.5-20' lt gray-tan, moderately welded, dry Tuff. Increase in pumice amount and size (10-15%) (No fractures.)			Run #8 1425 α possibly carried down from last run.
	5/5	0121-97 0056 20.5-21.5'	α: 100cpm βγ: 140cpm 20.5-21.5'		20-25 SAA Set of thin fractures at 20.5-21.5'. lt brown alteration rind in tuff No clay in fractures			Run #9 1450
25	4/5	0121 97 0057 25-29'	α: 220cpm βγ: 200cpm 27-29' in fracture		25-29' lt gray 5YR 7/2, moderately welded dry tuff 27-29' vertical fracture 0.5" wide, clay filled (dk brown to burnt orange) pumices along edge are altered. 29-30' No Recovery (pinched off)			Run #10 1520

Prepared By J. Waltersheid Date 1/23/97 Checked By [signature] Date 2/3/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-003 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 3

Driller Stewart Bro. Box #(s) N/A Start Date/Time 1/21/97 0900 End Date/Time 1/23/97 1040

Drilling Equip./Method CME750 / Auger Sampling Equip./Method Split Spoon/core

Location ID: 21-05053

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5/5	N/A	α: 150cpm By: 200cpm 30-32'	N/A	30-35' lt. gray 5YR 7/2, moderately welded, dry, Tuff. Fracture from last run continues to 32.5'. widest point is 1.2" wide and splits into [illegible] 1/24/97		Bandelier Tuff Unit #3	Run #11 1550
35								1610 End of Run
	5/5	0121-97 0058 38.5-40'	NDA		35-40' lt. gray 5YR 7/2 weak-mod. welded, dry, Tuff. Fracture at 35.5'. Fracture is hairline with lt. brown alteration rind. No detectable activity			1/22/97 0845 Run #12 0920
40	5/5	N/A	NDA		40-45' SAA Fracture at 42' is very thin with pumices altering to clay on margins. Fracture at 44.5-45' is along the ~~[illegible]~~ edge of the core and is clay filled clay is a lt brown color 5YR 4/4.			Run #13 1000
45	5/5	0121-97 0059 48-48.5	α: 125cpm By: 140cpm 48' Tuff is NDA		45-50' lt. gray 5YR 7/2 weakly welded, dry tuff. Fracture from 44.5' continues to a depth of 48'. lite orange clay filled upto 1" separation. Almost vertical fracture elevated rad in fracture.			Run #14 1054
50	5/5	N/A	α: 80cpm By: 140cpm 54' in small fracture		50-51' SAA 51-53' lt brown 5YR 5/6 mod. welded clay tuff. Small pumice ~~[illegible]~~ makeup 10% of core. largely fractured clay filled 60° angle No elevated RAD 53-55' lt gray mod. welded, dry, Tuff. clay orange filled fracture on edge of core α: 80cpm By: 140cpm at 54'			Run #15 1140
55								lunch Break 1205
60	5/5	0121 97 0060 59.5-60	α: 175cpm By: 150cpm 59.5-60		55-60' lt. gray 5YR 7/2 weak-mod. welded, trace moisture, tuff. very small ~~pumices~~ pumices ≤ 1-2mm makeup 20% of matrix, lg pumices ≤ 1" < 1%. friable core. No Rad 59.5-59.8 small fracture with brown clay alteration elevated rad			Run #16 1430

Prepared By J. Waterstedt Date 1/23/97 Checked By [illegible] Date 2/3/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-003 TA/OU 21 Drill Depth From 60 To 90 Page 3 of 3

Driller Stewart Bro Box #(s) N/A Start Date/Time 1/21/97 0900 End Date/Time 1/23/97 1040

Drilling Equip./Method CME750/auger Sampling Equip./Method Split Spoon/Core

Location ID: 21-05053

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60–65	5/5	0121 97 0061 60-60.7	α 1200 cpm β 300 cpm 60-60.7'	N/A	60-60.7' lt gray mottled, brown tuff. trace moisture weakly welded. Fracture. yellowish brown clay fill α 1200 cpm β 300 cpm 60.7-62' Mottled brown weakly welded tuff. trace moisture. strong clay alteration in pumice. No visible fracturing α 100 cpm β 140 cpm		Bandelier Tuff Unit #3	Run #17 1505
65–70	5/5	N/A	NDA		62-65' lt grey to mottled brown clay alteration of pumice. α 40 cpm β 140 cpm Increase in moisture. grey tuff is mod. welded. 65-70' SAA no elevated rad. The softer lt brown tuff ~~is~~ JW 1/23/97 contains a higher H_2O concentration than the lt. grey weak-mod. welded tuff. No visible fracturing			Run #18 1550 End of Day
70–75	5/5	0121 97 0062 70-72.5	NDA		70-72.5 SAA 72.5-75 lt brown very soft crumbly moist tuff. non-welded. Clay filled fracture, steeply dipping 0.5" at widest point. dk orange-brown clay			1/23/97 Drilling 0840 Run #19 0905
75–80	5/5	N/A	NDA		75-80' dk yellowish orange to light brown 10YR 6/6-5YR 5/6 non-to-weakly welded, damp to moist tuff. Occasional lt. gray mod. welded pieces. Pumice is gone or altering to clay 75-76' and 77.5-78' are almost sandy.			Run #20 0945
80–85	5/5	0121 97 0063 80-80.5	NDA		80-80.5 SAA. 80.5-~~90~~ 85' JW 1/23/97 change in color to lt. gray non-welded damp tuff. Very soft, crumbles when pinched. Pumice intact, trace clay. No visible fractures.			Run #21 1000
85–90	5/5	0121 97 0445 85-90	NDA		~~90-7~~ JW 1/23/97 85-90' SAA 90' Total Depth			Run #22 1030 T.D. 1040

Prepared By J. Wattersbird Date 1/23/97 Checked By [illegible] Date 2/3/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 10-004 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 2

Driller Stewart Bros Box #(s) NA Start Date/Time 1/17/97 0900 End Date/Time 1/20/97 1130

Drilling Equip./Method CME750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05054

Background

1/17/97 α: 7cpm By: 90cpm

1/20/97 α: 13cpm By: 100cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	2/2.5	N/A	NDA	N/A	0-1ft dk brown 5YR 3/4 crushed tuff/sandy silt. 1.5-2' Tuff black, mod. welded, gray 10YR 4/2		Backfill	1/17/97 Run#1 0923
					2-2.5' No Recovery			
	1.5/2.5	0121-97 0066 3.5-4'	NDA		2.5-4' Lt. brown 5YR 4/4 m.r silt/crushed tuff, dry			Run #2 0935
5					4-5' No Recovery			
	1.5/2.5	0121 97 0067 6.1-6.5	α: 1125 cpm By: 300 cpm 6.1-6.5		5-6.1 Brown 5YR 4/4 silty clay with trace crushed tuff moist sample			Run #3 0954
					6.1-6.5' Med Brown 5YR 3/4 silty sand moist			
					6.5-7.5 No Recovery α 1125 cpm By 300 cpm			
	1/1	0121-97 0068	α 3000 By 1200		7.5-8.2' small rich gravel (≤ 1") with silty clay moist-wet sand at 8.2'		Absorption Bed	Run #4 1015
	Center Bit				8.5-10' Center Bit though cobbles no recovery			Run #5
10					10.-10.5' No Recovery			Run #6 1050
	2/2.5	0121-97 0069 11'	α: 2000 cpm By: 1600 cpm 11'		10.5-11' med-coarse sand with trace gravel, moist med brown 5YR 4/4, orange alteration at contact α 2000 cpm By: 1600 cpm			Tuff contact is flat and has been scaped.
	2.5/2.5	0121-97 0070 15'	α: 320 cpm By: 260 cpm		11-12.5' Tuff lt gray 5Y 7/2, mod welded damp. α 1000 cpm at 12' By 300 cpm			Run #7 1130
15					12.5-15' lt gray tuff small fracture at 13' α 3000 cpm By 140 cpm. large 1" wide clay filled fracture 13.2-13.2' α drops off to 240 cpm By increases to 260 cpm. Sample collected in fracture at 15'		Bandelier Tuff	lunch 1220 Drilling 1320 Run #8 1335
	2.5/2.5	N/A	α: 120 By: 220 16'		15-17.5 Tuff lt gray 5YR 7/2 damp mod. welded. α By drop off quickly with depth and out of the fracture.			
	2.5/2.5	N/A	α: 40 cpm By: 120 cpm		17.5-20 Tuff. lt gray mod welded, drying with depth No fractures.			Run #9 1350
20					20-25 Tuff lt gray mod. welded, dry vertical 21.9' horizontal fracture with dk orange (burnt orange) clay(?) alteration. Does not go into the tuff 2mm-4mm wide α 2600 cpm By 500 cpm			Run #10 1410
	5/5	0121 97 0071 21.9'	α 2600 By 500 cpm 21.9' Rest of core is NDA		Increase in pumice			
25					25-30' Tuff very hard, lt gray 10YR 6/2, mod. welded, dry. No fractures			Run #11 1450
	5/5	N/A	NDA					
0								

Prepared By J. Whitehead Date 1/20/97 Checked By [illegible] Date 1/21/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-004 TA/OU 21 Drill Depth From 30 To 60 TD Page 2 of 2

Driller Stewart Bro Box #(s) NA Start Date/Time 1/17/97 0800 End Date/Time 1/20/97 1120

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05054

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5/5	0121 97 0072 30-32.5	α: 65 cpm By: 160 cpm 32.3'	N/A	30-35 Tuff lt. tan 5YR 6/4, mod. welded decrease in pumice, increase in qtz Fractures at 32.3' α 65 cpm By 160 cpm very thin trace alteration (orange) Hairline fracture at 33' No detected rad.			Run # 12 1515
35								Early Day 1600
	5/5	0121 97 0073 35.5-36	α: 450 cpm By: ~~410~~ 160 cpm 36' JSW 1/20/97 α: 300 cpm By: ~~300~~ 140 cpm JSW 1/20/97 37-38'		35-40 SAA, turning gray with depth Fractures: 35.5-36' (clay filled 0.2" wide), α 450 cpm By ~~410~~ 160 cpm, 60° 36.8'-38': multiple fractures, trace clay, weak tuff alteration, orange-brown alteration along hairline fractures α 300 cpm By: ~~300~~ 140 cpm JSW 1/20/97			1/20/97 Drilling 0830 Run # 13 0850
40	5/5	N/A	α: 45 cpm By: 120 cpm 44.5'		40-45 ~~SAA~~ JSW 1/20/97 Tuff lt. gray, mod welded, dry, 10YR 6/2, No visible fractures. brown/tan discoloration in core at 44.5' α 45 cpm By: 120 cpm, possible fracture nearby		Bandelier Tuff	Run # 14 0935
45	5/5	N/A	NDA		45-~~50~~ JSW 1/20/97 46.5 Tuff lt gray mod. welded, dry 46.5-47' Tuff non-welded, very soft (loose material) dry 47-50' Tuff lt. gray mod. welded, dry splotchy brown/tan zones throughout no elevated rad.			Run # 15 1011
50	5/5	0121-97 0074 50-55	NDA		50-55' Tuff lt gray mod. welded dry, no fractures			Run # 16 1040
55	5/5	0121 97 0075 55-60	NDA		55-60' Tuff lt. gray-tan 5YR 7/2, mod welded increase in pumice content. No fractures			Run # 17 1110
					60' Total Depth			1120 T.D.

Prepared By J. Wattersteid Date 1/20/97 Checked By [illegible] Date 1/21/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-005 TA/OU 21 Drill Depth From 0 To 15 Page 1 of 1

Driller Stewart Bro. Box #(s) N/A Start Date/Time 1/7/97 1330 End Date/Time 1/8/97 1040

Drilling Equip./Method CME 750/Hollow Stem Sampling Equip./Method Split Spoon/Core

Location ID: 21-05055

Background
1/7/97 α: 3 cpm β/γ: 111 cpm
1/8/97 α: 21 cpm β/γ: 111 cpm

Depth (Feet)	Recovery (feet per feet/%)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2/2.5	N/A	NDA	N/A	0-2' dk brown, moist sandy clay, crusted tuff. 2-2.5' No recovery	Fill	Backfill	1/7/97 Drilling 1330 Run #1 1342
	1.5/2.5	0121-97 0081 35-4'	NDA		2.5-4' dk brown moist sandy clay with crusted tuff 4-5' No Recovery 5-5.5 sandy clay with crusted tuff 5.5-6' lt brown med. grain sand, damp, small river gravel (≤ 1") make up 50% of core	Fill Loess		Run #2 1353
5	1.5/2.5	N/A	NDA		6-6.5' dk brown fine grain moist clayey silt 6.5-7.5' No Recovery	Loess Loess		Run #3 145
	1.5/2.5	0121-97 0082 8.5-9'	α 700 cpm β/γ 220 cpm		7.5-7.8' dk brown fine grain moist clayey silt 7.8-8.5' med grain moist sand with 40% gravels 8.5-9' 30% sand 70% gravel	Loess Gravel	Absorption Bed 21	Run #4 1436 1500 Broken bit pulling to replace
10	Center Bit				9-10' No Recovery 10-12.5' No Recovery center bit through cobble zone.	Center Bit		Run #5 1615 Center bit through cobbles
	0.5/2.5	0121-97 0083 145-15'	α 1060 cpm β/γ 460 cpm		12.5-14.5 No Recovery (problem with bit) 14.5-15' Sand and crusted tuff moist.	Tuff		Run #6 1630 Shutdown 1640
					15 ft Total Depth 1/8/97 Auger flight angled off while drilling through the cobble zone with the center bit. Attempts to ream and straighten the hole were unsuccessful. Abandoned hole 16-005 and moved 5 ft west to drill borehole 16-023. JW 1/8/97			1/8/97 0910

Prepared By J. Wattersdorf Date 1/8/97 Checked By [illegible] Date 2/3/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-05056 TA/OU 21 Drill Depth From [illegible] To 30 Page 1 of 2

Driller [illegible] Box #(s) N/A Start Date/Time 1/13/97 [illegible] End Date/Time 1/15/97 1610

Drilling Equip./Method CME750/Auger Sampling Equip./Method Split Spoon/core

Location ID: 21-05056

Background: 1/13/97 α: 6 cpm βγ: 133 cpm; 1/15/97 α: 8 βγ: 122

Depth (Feet)	Recovery (feet per feet/%)	Field Borehole Analytical Sample Number	Field Screening Results α, βγ: counts per minute	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2.5/2.5	N/A	NDA	N/A	0-1' dk b[illegible] brown s. lt clay, roots 1-2.5' crushed tuff with clay		Backfill	Run #1 1500 Cold 5° snowing
	2.5/2.5	0121-97 0096 4.5-5	NDA		2.5-4' SAA 4-5' fine med grain s. tan sand, moist, small pebbles, (top of absorption bed) orange color			Run #2 1530
5	2.0/2.5	N/A	α: 500 cpm βγ: 300 cpm 7'		5-6' med-coarse grain sand with lg pebbles dk brown 6-7' fine grain moist clay, brown 7-7.5 No recovery		Absorption Bed	Run #3 1600 Early Day 1615
	0.5/1	N/A	NDA		7.5-8' No recovery 8-8.5' moist mix of sandy clay with pebbles			1/15/97 0920 Run #4
	Center		Bit		8.5-9.5' Cobble zone drilling with center bit			Run #5 Center bit
10	0.5/0.5	NA	NDA		9.5-10' Ground tuff, damp, tan color			Run #6 1040
	2.5/2.5	0121-97 0097 11.2-12.2	α: 60 cpm βγ: NDA 11.2-12.2		10-12.5 Tuff lite gray, damp weakly welded dk orange clay filled fracture at 11.2-12.2' α 60 cpm βγ NDA in fracture		Bandelier Tuff	Run #7 1050 Clay also has a white c[illegible]te(?) mineral fill associated with it
	2.5/2.5	N/A	NDA		12.5-15 Tuff continues, weak mal. welded, lite gray color, damp, no fractures			Run #8 1135
15	2.5/2.5	N/A	α: 67 cpm βγ: NDA 16'		15-17.5 SAA drying with depth, no fractures			Run #9 1205
	2.5/2.5	N/A	NDA		17.5-20 SAA moderately welded			Run #10 1225 Lunch 1230
20	5/5	0121-97 0098 20-20.5	NDA		20-25 SAA 23.2' ~~22.2~~ thin fracture, trace alteration along surface 90° Jan 1/15/97			Drilling 1340 Run #11 1400
25	5/5	0121-97 0099 ~~N/A~~ 29'-29.5	NDA		25-30 SAA Hairline fractures with a tan alteration rind at 28' and 29' alteration is tan in color and extends for approx 1-2" around fracture No elevated rad encountered			Run #12 1430
30								

Prepared By J. Waltersheid Date 1/15/97 Checked By [illegible] Date 1/17/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-006 TA/OU 21 Drill Depth From 30 To 50 Page 2 of 2

Driller Stewart Bro Box #(s) N/A Start Date/Time 1/13/97 1430 End Date/Time 1/15/97 1610

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon/core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	0/5	~~0121 97 0077~~ JCW 1/15/97	No Recovery	N/A	30-35- No Recovery. Core barrel mislatched	No Recovery	Bandelier Tuff	Run #13 1445
35	5/5	0121 97 0100 35-39.5	NDA		35-40' 2-3" wide orange clay filled fracture running length of core, Tuff is weak-mod welded, and altered along core edge of fracture			Run #14 1505
40	2.5/2.5	N/A	NDA		40-42.5 Tuff with 1/4-3/4" fracture running length of core, Tuff is weakly welded and damp. Fracture is orange clay filled			Run #15 1540
	2.5/2.5	N/A	NDA		42.5-45 Tuff, weak-mod. welded, fracture continues to 43' 44.5' thin 1/4" clay filled fracture			Run #16 1550
45	5/5	0121 97 0101 47.5-50	NDA		45-50' Tuff 1/2-1" wide fracture from ~~48'~~ JCW 1/14/97 48' to TD at 50'. Fracture is clay filled with a alteration rind 1" from the fracture.			Run #17 1600
50					50 ft Total Depth			

Prepared By J. Walterscheid Date 1/15/97 Checked By [illegible] Date 1/17/97

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LOS ALAMOS NATI' 'AL LABORATORY ENVIRONMENTAL ' ESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-007 TA/~~OU~~ 21 Drill Depth From 0 To 30 Page 1 of 2

Driller Stewart Bros. Box #(s) N/A Start Date/Time 1330 12/12/96 End Date/Time 19 Dec 96

Drilling Equip./Method CME 750 Auger Sampling Equip./Method 3" Stainless Steel Core Barrel

Location ID: 21-05057

Background: 12/12/96 β/γ = 132 cpm α: 4.6 cpm | 12/19/96 β/γ: 115 cpm α: 4.2 cpm

Depth (feet)	Recovery (feet per feet / %)	Field Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2.0/2.5	N/A	NDA	N/A	0-1': Dk brown, moist clayey silts with tuff high organics (grasses) 1-2': Dk brown, moist sand with cooked tuff and silts 2-2.5' core loss	Loss	Backfill Cover	In Zone: 1310 Drilling: 1325 Run #1: 1335
5	2.5/2.5	0121-96 0481 4.3-5'			2.5-3.5' SAA 3.5-4.8' moist tan fine grain sand (10YR 7/4) with small pumice clasts (river sand) 4.8-5' Grey weathered tuff boulder			Run #2: 1355
	2/2.5	N/A			5-5.5' core loss 5.5-7.5' damp brown (5YR 5/6), clayey sand/tuff with tuff fragments (Backfill) trace amount silt.	Loss		Run #3: 1420
10	2.5/2.5	0121-96 0482 9.5-10'			7.5-8' Core loss 8-9' fine-med grain lt. brown sand (5YR 6/4) with trace clay and 20% cooked tuff 9-10' damp dk brown, clayey med grain sand with 25% cooked tuff fragments (Backfill) (10YR 4/2)	Loss		Run #4: 1430
	2.5/2.5	N/A			10-12.5' SAA			Run #5: 1503
15	2.5/2.5	N/A			12.5-15' SAA with slight increase in cooked tuff and clay (Backfill)		RWSA	Run #6: 1520
	2.5/2.5	N/A			15-17.5' damp backfill material consisting of a tightly packed clayey sand with pieces of cooked tuff (5YR 5/6) JW 12/12/96		Backfilled	Run #7: 1535
20	2.5/2.5	0121-96-0483 17.5-20'			17.5-20' becoming fining grained almost silty matrix with cooked tuff. 4x4" piece of white synthetic tarp (used to cover spoils pile during placement of waste containers) JW 12/19/96			Run #8: 1555 1610 shut down
	2.5/2.5	N/A	β/γ: 320 cpm α: 20 cpm 22.5'		20-22.5' High clay content, moist, damp, brown (5YR 4/4) Sandy with cooked tuff, grading into a sand			19 Dec 96 Drilling: 0930 Run #9: 0939
25	2.5/2.5	0121-96-0484 22.5-23.9	β/γ 40,000 ~~52,000~~ α: 52,000 H3 90 nCi/m3		22.5-23.9' Paleo Channel, black dacite looking with med. grain sand β/γ: 40,000 cpm α: 52,000 CPM H3: 90 nCi/m3 23.9-25' Tuff, light grey weathered, damp β/γ (25'): 190 CPM, α 180 cpm		Paleo Channel	Run #10: 1015
	2.5/2.5	N/A	NDA		25-27.5 Tuff damp, weakly welded, trace clay at 25.5' grey (5YR 7/2) lg pumice crystals		Bandelier Tuff	Run #11: 1120
30	2.5/2.5	0121-96 0485 28.5-30'	β/γ NDA α 15 CPM 30'		27.5-30' Tuff, mod. welded, drying out α 15 CPM at 30'			Run #12: 1150

Prepared by [signature] Date 12/19/96 Checked By [signature] Date 1/17/97

LOS ALAMOS NATI AL LABORATORY ENVIRONMENTAL :STORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-007 TA/~~OU~~ 21 Drill Depth From 30 To 50' Page 2 of 7

Driller Stewart Bros. Box #(s) N/A Start Date/Time 18 Dec 96 1330 End Date/Time 19 Dec 96

Drilling Equip./Method CME 750 Auger Sampling Equip./Method 3" Stainless Steel Core Barrel

Location ID: 21-05057

Depth (feet)	Recovery (ice: per feet / %)	Field Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Background 12/19/96 β/γ - 115 CPM α - 4.2 CPM Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5.0 / 5.0	N/A	NDA	—	30-35 Tuff, light gray, changing out with depth (5YR 7/2), mod. welded, trace sanidine crystals, pumice altering to clays small almost horizontal fracture at 33' trace clay in f.ll. 20% qtz.			Run #13: 1215
35	5.0 / 5.0	0121-96-0486 39.5-40		—	35-40' SAA			Run #14: 1240
40				—	40-45' SAA 42-42.7 clay alteration zone tuff changing to a brown color with clay alteration along pumice crystals, trace sanidine crystals (Not a fracture)		Bandelier Tuff	Run #15: 1300
45	5.0 / 5.0	N/A		—	45-50' SAA clay alteration zone at 45.5-46			Run #16: 1325
50	5.0 / 5.0	0121-96-0487 49.5-50'		—				
				—	50' Total Depth			
55				—				
				—				
60				—				

Prepared by [signature] Date 12/19/96 Checked By [signature] Date 1/17/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-008 TA/OU 21 Drill Depth From 0 To 50' T.D. Page 1 of 2

Driller Stewart Bro. Box #(s) N/A Start Date/Time 10 Dec 96 1000 End Date/Time 11 Dec 96 1255

Drilling Equip./Method CME / Auger Sampling Equip./Method Continuous Core/Split Spoon

Location ID: 21-05058

Drilling into western end of the RWSA MDA-T TA-21.

Depth (feet)	Recovery (feet per foot / %)	Field Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0.0	2/2.5	N/A	No detectable activity NDA	N/A	0-2' damp brown clay, sand(20%), tuff(5%), organics (roots, grasses) 5YR 3/4		Over Burden	Run #1/ 1050
	2.5/2.5	0121-96-0491 4.5-5'	NDA	N/A	2-2.5' No Recovery 2.5-5' damp brown clay/tuff mix (Backfill material)			#2/1031
5	1.8/2.5	N/A	NDA	N/A	5-5.7' No recovery 5.7-8.2' clay/crushed tuff mix Backfill		Backfill	#3/1112
	0.7/2.5	0121-96 0492 7.7-8.2'	NDA	N/A	8.2-10.5' No Recovery			#4/1135
10	2.0/2.5	N/A	NDA	N/A	10.5-14.2' Sandy clay with crushed tuff damp, light brown 5YR 6/4 14.2-14.7' piece of tuff, weathered			1200 lunch also down due to high winds #5/1444
* see notes 15	2.5/2.5	0121-96 0493 14.5-15'	NDA	N/A	14.7-18.1' Sandy clay with 30% tuff fragments damp light brown 5YR/6/4 (Backfill material)			#6/1521 Sample not submitted for analysis JCW 12/11/96
	2.5/2.5	N/A	NDA	N/A				#7/1550 1604 end of day
20	2.5/2.5	0121-96-0494 17.5-18.2'	NDA	N/A	18.1-50' Tuff damp moderately welded pale brown/grey 10YR 6/2, 20% qtz, 5-10% pumice. Note sharp flat contact at 18.1' 22' small fracture			0830 warming up Rig setting up equipment #8/0900
	2.5/2.5	N/A	NDA	N/A				#9/0934
25	2.5/2.5	N/A	NDA	N/A	SAA (same as above)		Welded Tuff	#10/0952
	5/5	0121-96	NDA	N/A	SAA, no fracturing			#11/1015
30		0495 29.5-30'	NDA	N/A				5 ft runs in tuff

Prepared by Jeff Wa Herscheid Date Dec 10-11, 96 Checked By [illegible] Date 1/8/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-008 TA/OU 21 Drill Depth From 30 To 50' Page 2 of 2

Driller Stewart Bro Box #(s) N/A Start Date/Time 10 Dec 96 End Date/Time 11 Dec 96

Drilling Equip./Method CME 750 Hollowstem Auger Sampling Equip./Method Core / Split Barrel

Depth (feet)	Recovery (feet per feet / %)	Field Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5/5	N/A	NDA	N/A	30-50' Tuff cont., drying with depth. 31.7' small fracture 60° trace clay infill.	" " "	Bandelier Tuff	#12 / 1135
35	5/5		NDA	N/A	SAA no fractures, ssl. core	" " "		#13 / 1215
40	5/5	0121-96 0496 39.5-40'	NDA	N/A		" " "		
45	5/5	N/A	NDA	N/A	SAA no fractures, solid core	" " "		#14 / 1245
50	5/5	0121-96 0497 49.5-50'	NDA	N/A	SAA no fractures, ssl. core, dry	" " "		#15 / 1255
				N/A	50' T.D. (total depth)			
				—				
				—				
				—				
				—				

Prepared by J. Walterscheid Date Dec 11, 96 Checked By [illegible] Date 1/8/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-009 TA/OU 21 Drill Depth From 0 To ~~50.0~~ 30 ft JCW 3/6/97 Page 1 of 2

Driller Stewart Bro Box #(s) NA Start Date/Time 2/3/97 0930 End Date/Time 2/4/97 1430

Drilling Equip./Method CME 750/ auger Sampling Equip./Method Spl. Spoon/core

Location ID: 21-05059

Contamination Criteria: 2/3/97 α: 8cpm βγ: 98cpm; 2/4/97 α: 13cpm βγ: 122 cpm

Drilling approx 15' east of disposal shafts at MDA-T.

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2.5/2.5	NA	NDA	NA	0-1.5' Brown 5YR 4/4 moist, mix of crushed tuff, silty clay 1.5-2.5' Lt. brown, damp 5YR 6/4 crushed tuff/fine grain silt.		Bandelier Tuff/Overburden	2/3/97 Run#1 0945
5	2/2.5	0121-97 0111 4-4.5	NDA		2.5-3' SAA 3-4.5' Brown 5YR 4/4 moist silty clay 4.5-5' No Recovery			Run#2 1005
	2/2.5	NA	NDA		5-7' Brown 5YR 4/4 moist silty clay, occasional pieces of weathered tuff 7-7.5' No Recovery 7.5-8.5' Brown 5YR 4/4 moist silty clay			Run#3 1025
10	2.5/2.5	NA	NDA		8.5-10' Lt. brown 5YR 5/6, fine grain silty sand with white weathered pumice, 5% small gravel (rounded edges) moist.			Run#4 1050 Bank deposit?
	2.5/2.5	0121-97 0112 10.2-12.7	NDA		10-10.3' SAA 10.3-12.5' reddish brown 5YR 5/6 damp weakly cemented medium-coarse grained sand.			Run#5 1105 channel sands
15	2.5/2.5	NA	NDA		12.5'-13.2' SAA less cementing with depth. 13.2-14.5' med grain sand with small gravels 14.5-14.8' brown gravelly clay zone 14.8-15' medium grain sand, moist (no cement)			Run#6 1130
	2.5/2.5	NA	NDA		15-17.1' medium grain reddish brown 5YR 5/6 damp to moist sand. 17.1-17.5' Coarse grain pebbly sand			Run#7 1150
20	2.5/2.5	NA	NDA		17.5-17.9' SAA 17.9-20' Reddish brown 5YR 5/6 damp/moist med. grain sand with 10-20% small ~~pebbles~~ gravels		Paleo Channel	Run#8 1210
	2.5/2.5	0121-97 0113 20-22.5	NDA		20-22.5' SAA 22.5-24.5 SAA			Run#9 1225
25	0.5/2.5	NA	NDA		24.5-25.0 Med grained Grayish-orange 5YR 7/2 sand w/ 10-15% gravels damp 25.0-27.0' light Brownish Gray 5YR 6/1 moderately welded Tuff w/ pumice infill, altered to Pale Brown 5YR 5/2. 10-12% pumice.			Run#10 (J. Crocker) 1404
	2.5/2.5	~~2/4-97~~ 0114 NA	NDA		27.0-27.5' moderate Brown 5YR 4/4 moderately welded Tuff 5% pumice infill (light grey N8) 27.5-30' No Rec.			Run 11 1420 Run 12 1500 No Recovery
30	0/2.5	NA	NA					

Prepared By J. Crocker (J. Watterscheid) Date 2/4/97 Checked By [signature] Date 2/7/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-009 TA/OU 21 Drill Depth From 30 To 50.0 ft Page 2 of 2

Driller Stewart Bros Box #(s) NA Start Date/Time 2/3/97 0930 End Date/Time 2/4/97 1430

Drilling Equip./Method CME/750 w/ auger Sampling Equip./Method split spoon (core)

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	1.0/2.5	6121-97-0114 31.5-32.0	NDA	NA	30-31.5' No Recovery 31.5-32.5 Poorly Sorted fine sand, silt and subangular Pacific gravel. Moderate brown 5YR 4/4		Pajarito Channel	Run #13 10 ft
	1.5/2.5	NA	NDA	NA	32.5'-33.5 No Recovery. 33.5-35.0 Moderate brown 5YR 4/4 Poorly sorted silty sand, gravel and cobbles.			Run 14 16:00
35	1.4/2.5	6121-97-0115 36.4-36.9	NDA	NA	35.0-36.4 SAA 36.4-36.8 Light gray (N7) Poorly welded Ignf. Pumice lapilli are white and ~10%			Run 15 2/4/97 0945
	2.5/2.5	NA	NDA	NA	36.8-37.5 Loss 37.5-40 Light gray (N7) Partly welded Tuff. Pumice lapilli are white To grayish blue and make up ~10% of Tuff.		Bandelier Tuff Unit #3	Run 16 1040
40	2.0/2.5	6121-97-0116 40.0-40.5	NDA	NA	Grayish orange 5YR 7/2 (40'-42') Pumice lapilli locally altered Med Gray N5. No Recov. 42.0'-42.5'			Run 17 ~~1310~~ 1351
	5/5	NA	NDA	NA	Grayish orange 5YR 7/2 (42.5-47.5') Pumice Lapilli med Gray (N6) 12-15%			Run 18 1415
45	—	NA	NDA	NA				~~Run 19~~ 2/4/97
	2.0/2.5	6121-97-0117	NDA	NA	47.5-~~50~~ 49.5 Grayish orange 5YR 7/2 Tuff Non-Welded, Pumice lapilli To 12% (N6) med. gray			~~Run 20~~ 1405 Run 19
50					50ft Total Depth			

Prepared By [signature] Date 2/4/97 Checked By [signature] Date 2/7/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-010 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 6

Driller Stewart Bro Box #(s) NA Start Date/Time 2/18/97 1010 End Date/Time 2/21/97 1545

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05060

Contamination Criteria

2/18/97	2/19/97	2/20/97	2/21/97
α: 5 cpm	α: 14 cpm	α: 3 cpm	α: 3 cpm
Bγ: 98 cpm	Bγ: 110 cpm	Bγ: 93 cpm	Bγ: 93 cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Drilling on angle hole to the NW under the disposal shafts at MDA-T, TA-21. Notes
0	2.5/2.5	NA	NDA	NA	0-1.8' dk brown 5YR 4/4 moist silty clays with trace organics (roots) 10% small pebbles.		Overburden/Bandelier Tuff	Drilling 1010 Run #1 1030
					1.8-2' Concrete			
	2.5/2.5	0121-97 0136 4.5-5'	NDA		2-2.5' Pale brown 10YR 6/2 moist tuff, weakly welded. 2.5-3.7 SAA			Run #2 1047
5					3.7-5' dk brown 5YR 4/4 moist clays with FeOx alteration rings			
	2.5/2.5	NA	NDA		5-6.9' SAA			Run #3 1110
					6.9-7.5' Grayish Pink 5YR 7/2 moist, weakly welded tuff.			
	2.5/2.5	NA	NDA		7.5-10' Grayish Pink 5YR 7/2 tuff. Mix of soft damp tuff with moderately welded dry pieces of tuff. Tuff fragments make up 30% of core.		Bandelier Tuff Unit #3	Run #4 1130
10								
	2.5/2.5	0121-97 0137 10-10.5	NDA		10-12.5 SAA with fragments making up 50% of the core.			Run #5 1142
					12.5-15' Grayish pink 5YR 7/2 dry moderately welded tuff. 10% pumice. Solid			Run #6 1200
15	2.5/2.5	NA	NDA		15-20' SAA solid tuff, no fractures			Lunch 1215 Drilling 1255 Run #7 1315
20	5/5	NA	NDA					
	5/5	0121-97 0138 20-20.5	NDA		20-25' SAA			Run #8 1340
25					25-30' Grayish pink 5YR 7/2 dry weak to moderately welded tuff 10% pumice. Trace FeOx ~~staining~~ alteration at 25'. JRW 2/20/97 No Fractures			Run #9 1400
30	5/5	NA	NDA					

Prepared By J. Walterscheid Date 2/21/97 Checked By [illegible] Date 2/25/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-010 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 6

Driller Stewart Bro Box #(s) NA Start Date/Time 2/12/97 1010 End Date/Time 2/21/97 1545

Drilling Equip./Method CME750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5/5	0121 97 0139 30-30.5	NDA	NA	30-35' Grayish Pink 5YR 7/2 dry, weak to moderately welded tuff. 10% pumice. No Fractures.		Bandelier Tuff Unit #3	Run #10 1425
35	5/5	NA	NDA		35-40' SAA small fracture at ~~38.4~~ 37.4 SW 2/10/97 with trace clay filling. NDA			Run #11 1442
40	25/5	0121 97 0140 42-42.5	NDA		40-41.2' SAA 41.2-42.5' H brown gray weakly welded tuff. trace moisture. clay filled fracture at 60° 42.5-45 No Recovery	Loss		Run #12 1502 42' J.C.
45	25/25	NA	NDA		45-47.5 Gray 10YR 6/2 soft, non to weakly welded, dry. tuff.			Run #13 1520
	2/2.5	NA	NDA		47.5-49.5' SAA			Run #14 1535
50	1.3/2.5	0121 97 0141 50-50.5	NDA		49.5-50' No Recovery 50-51.3' H gray 10YR 6/2 soft non to weakly welded, dry tuff. 51.3-52.5 No Recovery	Loss Loss		Run #15 1550 1600 End of Day
55	2.5/2.5	NA	NDA		52.5-54.3' H pinkish gray 5YR 7/2 non welded dry tuff. 54.3-55' H pinkish gray 5YR 7/2 mod welded dry tuff.			2/19/97 Drilling 0830 Run #16 0908
60	2.5/5	NA	NDA		55-55.5' SAA 55.5-57.5' H pinkish gray 5YR 7/2 non-weakly welded (soft) tuff. Slight increase in moisture. Dry. 57.5-60 No Recovery	Loss		Run #17 0925 57.5-60 No Recovery barrel packed off

Prepared By J. Walterscheid Date 2/21/97 Checked By [illegible] Date 4/5/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-010 TA/OU 21 Drill Depth From 60 To 90 Page 3 of 6

Driller Stewart Bo Box #(s) NA Start Date/Time 2/18/97 1010 End Date/Time 2/21/97 1545

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	2.5/2.5	0121-97 0142 60-60.5	NDA	NA	60-62.5' lt pinkish gray 5YR 7/2 non to weakly welded (soft) tuff. 30% Tuff fragments.		Bandelier Tuff Unit #3	Run # 18 0945
65	2.5/2.5	NA	NDA		62.5-65' SAA			Run #19 1005
	2.5/2.5	NA	NDA		65-67.5' lt pinkish gray 5YR 7/2 non to weakly welded (soft) tuff. Contains 35% welded tuff fragments.			Run #20 1025
70	2.5/2.5	0121-97 0143 0163 69.5-70	NDA		67.5-70 SAA			Run #21 1045 Duplicate Sample 0121-97-0163 Taken
	2.5/2.5	NA	NDA		70-72.5 SAA slight increase in pumice			Run #22 1106
75	2.0/2.5	NA	NDA		72.5-74.5 lt pink gray non to weakly welded soft tuff with mottled brown zones.			Run #23 1125
					74.5-75 No Recovery	Loss		Lunch 1140
	2.5/2.5	NA	NDA		75-77.5 SAA clay filled fracture at 76.2' NDA. fracture is very thin			Drilling 1230 Run #24 1240
80	2.5/2.5	0121-97 0144 79.5-80	NDA		77.5-80 lt pinkish gray 5YR 7/2 non welded with 20% welded tuff fragments. Dry			Run #25 1258
	2.5/2.5	NA	NDA		80-82.5 SAA			Run #26 1324
85	2.5/2.5	NA	NDA		82.5-85 lt gray non to very weakly welded soft dry tuff. 10% welded tuff fragments			Run #27 1340
	2.5/2.5	NA	NDA		85-87.5 lt. gray non welded, soft, dry tuff.			Run #28 1400
90	2/2.5	0121-97 0145 89-89.5	NDA		87.5-89.5' lt gray non welded, soft ~~tuffy~~ (sugary) dry tuff			Run #29 1420 sugar texture
					89.5-90 No Recovery	Loss		

Prepared By J. Waltersheid Date 2/21/97 Checked By [illegible] Date 2/25/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-010 TA/OU 21 Drill Depth From 120 To 150 Page 5 of 6

Driller Stewart Bro. Box #(s) NA Start Date/Time 2/18/97 1010 End Date/Time 2/21/97 1545

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anasytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
120	2.5/2.5	NA	NDA	NA	120-122.5' lt gray 5YR 6/1 soft non welded dry tuff. 20% welded tuff fragments.		Bandelier Tuff Unit #3	Run #42 1136
	2.5/2.5	NA	NDA		122.5-125' SAA			Run #43 1203
125					125-126.3' lt brownish gray 5YR 6/1 dry, mix of soft non welded tuff (40%) with moderately welded fragments.			Lunch 1215 Run #44 1340
	1.3/2.5	NA	NDA		126.3-127.5 No Recovery	Loss		
	2/2.5	0121-97 0149 0164 129-129.5	NDA		127.5-129.5 grayish pink 5YR 7/2, dry, mix of soft non welded tuff with 65% mod. welded tuff. Increase in FeOx to 10% possible FeOx spotting.			Run #45 1413 Duplicate taken
130					129.5-130 No Recovery	Loss		
	3/5	NA	NDA		130-133 Grayish pink 5YR 7/2 dry mix of soft non welded tuff with 30% welded tuff.			Run #46 1450
					133-135 No Recovery	Loss		
135	2/2.5	NA	NDA		135-137' Grayish pink 5YR 7/2 dry, mix of soft non-welded soft tuff with 35% welded tuff			Run #47 1520
					137.5-137.5 No Recovery	Loss		
	2/2.5	0121-97 0150 139-139.5	NDA		137.5-139.5 SAA			Run #48 1550
140					139.5-140 No Recovery	Loss		End of Day
	1.5/2.5	NA	NDA		140-141.5' Grayish pink 5YR 7/2 mix of soft non-welded tuff with 35% welded tuff.			2/21/97 Drilling 0830 Run #49 0900
					141.5-142.5 No Recovery	Loss		
	2/2.5	NA	NDA		142.5-~~144~~ 144.5 SAA ~~147-147.5 No Recovery~~ 144.5-145 No Recovery	Loss	Unit 2(?) ?	Run #50 1000
145					~~147.5-150~~ 145-147.5 lt grayish pink mix of soft non welded tuff with 35% welded tuff. FeOx spotting in welded tuff fragments.			Run #51 1030
	2.5/5	NA	NDA		147.5-150 No Recovery	Loss		
150								

Prepared By J. Wathersbee Date 2/21/97 Checked By [illegible] Date 2/25/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-010 TA/OU 21 Drill Depth From 150 To 175 TD Page 6 of 6

Driller Stewart Bro Box #(s) NA Start Date/Time 2/13/97 1010 End Date/Time 2/21/97 1545

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
150	2.5/2.5	0121-97 0151 0162 150-150.5	NDA	NA	150-152.5 lt gray mix of soft tuff with 35% welded tuff fragments. FeOx spotting on tuff fragments.		Bandelier Tuff Unit 2 (?)	Run #52 1105 0121-97-0162 Field Blank
					152.5-155.5' SAA			Run #53 1145
155	3/5	NA	NDA		155.5-157.5 No Recovery	Loss		Lunch 1215
160	3/5	0121-97 0152 160-160.5	NDA		157.5-160.5 Pale brown 10YR 6/2 mix of soft tuff with 40% welded tuff. Tuff fragments are moderately welded with FeOx(?) spotting.			Run #54 1350
					160.5-162.5 No Recovery	Loss		
					162.5-165' SAA			Run #55 1430
165	3/5	NA	NDA		165-165.5' Grayish Pink 5YR 7/2 moderately welded tuff. Dry. ≈10% qtz. Solid.			
					165.5-167.5 No Recovery	Loss		
170	3.5/5	0121 97 0153 169.5-170	NDA		167.5-171' Pale brown 10YR 6/2 mix of soft non welded tuff with 40% welded tuff pieces. Tuff fragments are moderately welded.			Run #56 1505
					171-172.5' No Recovery	Loss		
175	2.5/2.5	0121-97 0154 174.5-175	NDA		172.5-175' SAA			Run #57 1535 End of Day 1600
					175' Total Depth			

Prepared By J. Walterscheid Date 2/21/97 Checked By [illegible] Date 4/25/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-011 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 7

Driller Stewart Bro. Box #(s) NA Start Date/Time 2/26/97 1000 End Date/Time 3/6/97 1030

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Contamination Criteria (also see pg. #2)

2/26/97	2/27/97	3/3/97	3/4/97	3/5/97
α: 9 cpm	α: 6 cpm	α: 3 cpm	α: 6 cpm	α: 5 cpm
Bγ: 93 cpm	Bγ: 82 cpm	Bγ: 126 cpm	Bγ: 97 cpm	Bγ: 93 cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes: Drilling a 35° angle hole to the SE under absorption bed #3 and the disposal shafts at MDA T, TA-21.
0	2.5/5	NA	NDA	NA	0-2.4' Moderate brown 5YR 4/4 very moist silt and clay with small pebbles and pieces of asphalt. Roots and grasses to 1.5'. 2.4-2.5' Grayish pink 5YR 7/2 weathered tuff. 2.5-5' No Recovery	Loss	Overburden/Backfill	2/26/97 Drilling 1010; Run #1 1025
5	1/2.5	0121-97 0166 5.5-6	NDA		5-6' Light brown 5YR 6/4 s. lt, clay with crushed tuff. 6-7.5' No Recovery	Loss		Run #2 1040 putting cutting in core barrel
10	1.5/2.5	NA	NDA		7.5-8' Light brown s. lt, clay with crushed tuff. 8-9' Light brown 5YR 5/6 s. lt, dry. 9-10' No Recovery	Loss		Run #3 1050
	1.3/2.5	0121-97 0167 10-10.5	NDA		10-11.3' light gray, dry, weak to moderately welded tuff. ~~Clay filled (1" wide) fracture, 75° at 11.2', NDA.~~ JCW 2/26/97 11.3-12.5' No Recovery	Loss		Run #4 1102
15	2.5/2.5	NA	NDA		12.5-15' light gray, dry, weak-mod. welded tuff. Clay filled (1" wide) fracture, 75° at 14.2' NDA			Run #5 1123
20	2.5/5	NA	NDA		15-17.5' light gray/brown mottled zone. Weak-mod. welded tuff fragments make up 25% of zone. Trace clay, possible fracture zone. NDA. 17.5-20 No Recovery	Loss		Run #6 1140
	2.5/2.5	0121-97 0168 1126 22-22.5	NDA		20-22.5 SAA with clay filled fracture at 22'		MDA T Unit	Run #7 1200 Duplicate sample 0121-97-1126 Lunch 1230/Smoke break
25	1.7/2.5	NA	NDA		22.5-24.2 light brownish gray 5YR 6/1 mix of non welded tuff with 25% welded tuff fragments. 24.2-25' No Recovery	Loss		2/27/97 0835 Drilling; Run #8 0855
	2.5/2.5	NA	NDA		25-27.5' SAA			Run #9 0912
30	2/2.5	NA	NDA		27.5-29.5 light brownish gray mottled 5YR 6/1 mix of non welded (sand) tuff with 30% welded tuff fragments. 29.5-30' No Recovery	Loss		Run #10 0925

Prepared By J. Wattersteadt Date 3/6/97 Checked By [illegible] Date 3/26/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-011 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 7

Driller Stewart Bo Box #(s) NA Start Date/Time 2/26/97 1000 End Date/Time 3/6/97 1030

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Contamination Criteria
3/6/97
α: 5cpm
$\beta\gamma$: 80cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	2/2.5	0121-97-0167 30-30.5	NDA	NA	30-32 light brownish gray 5YR 6/1, dry non to weakly welded tuff. Contains 20% welded tuff fragments. Mottled Brown		Bandelier Tuff Unit #3	Run #11 0940
					32-32.5' No Recovery	Loss		
	2.5/2.5	NA	NDA		32.5-35' light brownish gray, dry weakly welded tuff with 40% welded tuff fragments.			Run #12 0955
35	2.5/2.5	NA	NDA		35-37.5 SAA			Run #13 1015
	2.5/2.5	NA	NDA		37.5-40 light brownish gray (mottled) non to weakly welded tuff. 40% weak to mod. welded tuff fragments.			Run #14 1030
40	2.5/2.5	0121-97 0170 40-40.5	NDA		40-42.5' SAA			Run #15 1045
	1.7/2.5	NA	NDA		42.5-44.3' SAA			Run #16 1104
45					44.3-45 No Recovery	Loss		
	1.5/2.5	NA	NDA		45-46.5 light brown gray 5YR 6/1 trace moisture non-weakly welded tuff. 20% welded tuff fragments. Brown mottled weathered look. 46.3' clay filled fracture. NDA	Loss		Run #17 1121
					46.5-47.5 No Recovery			
50	2.5/2.5	0121-97 0171 1129 48-47.5	NDA		47.5-50' Brownish gray 5YR 4/1 moist, soft non welded tuff with 10% fragments. 48-50' fracture zone, clay alteration, mottled brown gray.			Run #18 1145 Field Blank 0121-97-1127 taken.
	2.5/2.5	NA	NDA		50-52.5' Brownish gray (mottled) moist, soft non welded tuff with 30% gray welded tuff fragments. Weathered.			Run #19 1205
	2.5/2.5	NA	NDA		52.5-54.5 Pale brown 5YR 5/2, trace moisture, non welded tuff, weathered, 20% welded tuff fragments.			Run #20 1220
55					54.5-55' Grayish pink 5YR 7/2 dry weakly welded tuff.			lunch 1230
	2.5/2.5	NA	NDA		55-57.5' Grayish pink non to weakly welded dry tuff. 20% moderately welded tuff fragments.			Run #21 1400
60	2.5/2.5	0121-97 0172 57.5-60	NDA		57.5-60' SAA			Run #22 1415

Prepared By J. Waltersheid Date 3/6/97 Checked By [illegible] Date 3/28/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-011 TA/OU 21 Drill Depth From 60 To 90 Page 3 of 7

Driller Stewart Bros Box #(s) NA Start Date/Time 2/26/97 1000 End Date/Time 3/6/97 1030

Drilling Equip./Method CME750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	1.4/2.5	NA	NDA	NA	60-61.4' Grayish pink 5YR 7/2 non to slightly welded Tuff. Dry, 20% welded tuff fragments in soft (sugary) tuff		Bandelier Tuff Unit #3	Run #23 1437
					61.4-62.5 No Recovery	Loss		
	1.7/2.5	NA	NDA		62.5-64.3' Grayish pink non welded (soft) dry tuff with 20% welded tuff fragments.			Run #24 1455
65					64.3-65' No Recovery	Loss		
	2/2.5	NA	NDA		65-67' Brownish gray (mottled) non welded dry tuff with slight increase (30%) in welded tuff fragments. Possible fracture zone			Run #25 1520
					67-67.5 No Recovery.	Loss		
	2.5/2.5	0121-97 0173 67.5-70	NDA		67.5-69 SAA			Run #26 1540
70					69-70 Grayish pink non weld dry tuff. Sugary texture. Very soft. 5YR 7/2			Ends of Day 1605
	2/2.5	NA	NDA		70-72' SAA			3/3/97 Drilling 0900
					72-72.5' No Recovery			Run #27 0940
					72.5-74.5' SAA	Loss		
	2/2.5	NA	NDA		74.5-75' No Recovery			Run #28 1010
75					75-77.5' Grayish pink 5YR 7/2 soft, non-welded (sugary) dry tuff.	Loss		
	2.5/2.5	NA	NDA					Run #29 1035
	1.8/2.5	0121-97 0174 78.5-78.8	NDA		77.5-~~78.8~~ 79.3' SAA JW 3/4/97			Run #30 1054
					79.3-~~78.8~~ 80' No Recovery			
80					80-82.5' Grayish Pink 5YR 7/2 soft, dry non-welded tuff. Sugar like texture	Loss		
	2.5/2.5	NA	NDA					Run #31 1114
					82.5-84.5 SAA			
	2/2.5	NA	NDA		84.5-85' No Recovery			Run #32 1132
85						Loss		
	2.5/2.5	NA	NDA		85-87.5 SAA			Run #33 1155
					JW 3/4/97 ~~79~~ 87.5-90 lt. tan gray soft, dry non-welded tuff. sugar like texture			Lunch 1215
	2.5/2.5	0121-97 0175 87.5-90	NDA					Run #34 1330
90								

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-011 TA/OU 21 Drill Depth From 90 To 120 Page 4 of 7

Driller Stewart Bro Box #(s) NA Start Date/Time 2/26/97 1000 End Date/Time 3/6/97 1030

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
90	1.5/2.5	NA	NDA	NA	90-91.5' Light brownish gray 5YR 6/1, soft, dry, fine grain non-welded tuff.		Bandelier Tuff Unit #3	Run # 35 1400
					91.5-92.5' No Recovery	Loss		
95	2.3/2.5	NA	NDA		92.5-94.7' SAA			Run #36 1425
					94.7-95' No Recovery	Loss		
	1.8/2.5	NA	NDA		95-96.8' SAA			Run # 37 1455
					96.8-97.5' No Recovery	Loss		
100	1.8/2.5	0121-97 0176 98.7-99.2'	NDA		97.5-99.3' Light brownish gray 5YR 6/1, soft dry, fine grain non-welded tuff.			Run # 38 1516
					99.3-100' No Recovery	Loss		
	1.8/2.5	NA	NDA		100-101.8 SAA			Run # 39 1545
					101.8-102.5 No Recovery	Loss		End of day 1610
105	2.5/2.5	NA	NDA		102.5-105' Light brownish gray 5YR6/1, soft, dry, fine grain (sugar like texture) non welded tuff.			3/4/97 Drilling 0835 Run #40 0900
					105-107' SAA			Run # 41 0927
	2/2.5	NA	NDA		107-107.5 No Recovery	Loss		
110	1.5/2.5	0121-97 0177 108.5-109'	NDA		107.5-109 SAA			Run #42 0948
					109-110 No Recovery	Loss		
	2.5/2.5	NA	NDA		110-112.5' Light brownish gray 5YR 6/1 soft, dry fine grain non-welded tuff.			Run #43 1015
					112.5-114.5 SAA			Run # 44 1040
115	2/2.5	NA	NDA		114.5-115 No Recovery	Loss		
	2/2.5	NA	NDA		115-116.7 mix light brownish gray 5YR6/1 with light tan soft, dry non-welded tuff.		?	Run # 45 1105
					116.7-117 Light brownish gray soft dry non-welded tuff. Note 5-10% weakly welded tuff fragments with FeOx spotting		?	possible fracture Unit 2?
					117-117.5 No Recovery	Loss		
120	2/2.5	0121-97 0178 118-118.5'	NDA		117.5-118.5' Pale yellowish brown 10YR 6/2 mix of 80% soft non welded tuff with 20% weak to moderately welded tuff fragments with FeOx spotting		Unit 2	Run # 46 1130 Unit 2?
					118.5-120 No Recovery	Loss		

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-011 TA/OU 21 Drill Depth From 120 To 150 Page 5 of 7

Driller Stewart Bro Box #(s) NA Start Date/Time 2/26/97 1000 End Date/Time 3/6/97 1030

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon/ Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
120	1.7/2.5	NA	NDA	NA	120 - 121.7' Pale yellowish brown 10YR 6/2 mix of 70% soft dry nonwelded tuff with 30% mod. welded tuff fragments		Bandelier Tuff Unit #6	Run #47 1158
					121.7-122.5' No Recovery	Loss		lunch 1215
	2/2.5	NA	NDA		122.5-124.5 SAA			Run #48 1330
125					124.5-125' No Recovery	Loss		
	2/2.5	NA	NDA		125-127' SAA with slight increase in percentage of welded fragments.			Run #49 1355
					127-127.5' No Recovery	Loss		
	1.5/2.5	012197 0179 122.5-129	NDA		127.5-129' Pale yellowish brown 10YR 6/2 mix of 65% soft dry nonwelded tuff with 35% mod. welded tuff pieces. FeOx spotting on welded tuff.			Run #50 1420
130					129-130' No Recovery	Loss		
	3/5	NA	NDA		130 - 133 SAA			Run #51 1455
					133-135 No Recovery	Loss		
135	3/5	NA	NDA		135-138 Pale yellow brown (slightly darker) 10YR 6/2. Mix of 65% soft dry non welded tuff with 35% dry moderately welded tuff fragments.			Run #52 1538
					138-140 No Recovery	Loss		
140								End of day 1600
	3/5	0121 97 0180 140-140.5'	NDA		140-143' Pale yellow brown 10YR 6/2 mix of 40% soft dry non welded tuff with 60% moderately welded tuff fragments FeOx spotting on tuff fragments.			3/5/97 Drilling 0840 Run #53 0905
					143-145' No Recovery	Loss		
145	3/5	NA	NDA		145-148' Pale yellow brown 10YR 6/2 mix of 30% soft non welded tuff (trace insistyle) with 70% moderately welded tuff fragments.			Run #54 0942 Hardening with depth
					148-150 No Recovery	Loss		
150								

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-011 TA/OU 21 Drill Depth From 150 To 180 Page 6 of 7

Driller Stewart Bros. Box #(s) NA Start Date/Time 3/2/97 1000 End Date/Time 3/6/97 1030

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
150	0/2.5	No Recovery	No Recovery	NA	150-152.5 No Recovery	Loss	Bandelier Tuff Unit #2	Run #55 1012 No Recovery
155	2.5/2.5	0121-97 0181 152.5-153	NDA		152.5-155' Pale yellow brown 10YR 6/2 mix of 30% soft non welded tuff with 70% mod. welded tuff. Dry.			Run #56 1050
	2/2.5	NA	NDA		155-157.5' SAA 157-157.5 No Recovery	Loss		Run #57 1138
160	2/2.5	NA	NDA		157.5-159.5' Pale brown mix of 30% soft nonwelded tuff with 70% mod. welded tuff pieces. Dry, FeOx spotting			Run #58 1215
	2.5/2.5	0121-97 0182 160-160.5	NDA		160-162.5 SAA	Loss		Lunch 1230 Run #59 1410
165	3/5	NA	NDA		162.5-165.5 SAA 165.5-167.5 No Recovery	Loss		Run #60 1445
170	3/5	0121-97 0183 0121-97 1128 170-170.5	NDA		JW 3/5/97 ~~177.5~~ 167.5-170.5 Pale brown mix of 45% soft non-welded tuff (trace moisture) with 55% welded tuff fragments. Tuff fragments are dry with FeOx spotting. 170.5-172.5 No Recovery	Loss		Run #61 1525 "damp" JW 3/5/97 ~~Some~~ musty smell.
175	3.5/5	NA	NDA		172.5-176' SAA with a decrease in welded tuff fragments to 30%. 176-177.5 No Recovery	Loss		Run #62 1605 End of day 1625
180	3/5	See next page ~~NA~~ JW 3/6/97	NDA		177.5-180.5 Pale brown mix of 70% soft non-welded, trace moisture, with 30% mod. welded tuff fragments with FeOx staining			3/6/97 0815 Drilling Run #63 0900

Prepared By J. Waltersdeich Date 3/6/97 Checked By [signature] Date 3/25/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-011 TA/OU 21 Drill Depth From 180 To 190 TD Page 7 of 7

Driller Stewart Bro. Box #(s) NA Start Date/Time 2/26/97 1000 End Date/Time 3/6/97 1045

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
180	3/5 Cont.	~~NA~~ 121-97-0124 180-180.5	NDA	NA	180-180.5 SAA 180.5-182.5 No Recovery	Loss	Unit #8	
185	4/5	NA	NDA		182.5-186.5 Pale yellow brown 10YR 6/2 mix of 80% soft non-welded tuff (trace moisture) with 20% mod. welded tuff pieces. Fe Oxe spotting on tuff pieces. 186.5-187.5 No Recovery	Loss		Run # 64 0950
190	2.5/2.5	0121-97 0125 189.5 190	NDA		187.5-190' SAA			Run # 65 1030
					190ft Total Depth			

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-012 TA/OU 21 Drill Depth From 0.0 To 30.0 Page 1 of 3

Driller Stewart Bros. Box #(s) NA Start Date/Time 2/5/97, 1445 End Date/Time 2/10/97 1000

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Splitspoon / Core

Location ID: 21-05062

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Contamination Criteria 2/5/97 α Bry	2/6/97 α Bry	2/7/97 α Bry	2/10/97 α Bry 95cpm	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes: Drilling 30° angle hole towards SE under absorption bed 4 and disposal shafts at MDA-T TA-21.
0	1.5/1.5	NA	NDA	NA					0.0'-0.8' Moderate Brown, 5YR 3/4, Silty Clay. 0.8-1.5' light Brown, 5YR 5/6, Silty Fine to med. grained Sand.			Run #1, 1505 0-1.5'
	1.5/3.5	N.A	NDA						1.5-3.5 No Recovery. 3.5'-5.0 Clayey Silt, moderate Brown, 5YR 3/4. Weathered Tuff fragments to 3cm.		Bandelier Tuff Unit #3	Run #2, 1605 1.5'-5.0'
			(5.0-5.5')						5.0 to 5.5 Same as Above (SAA). 5.5 to 6.0 SAA			
5	0.5/1.5	0151	NDA						6.0 to 7.5 Grayish Orange, 5YR 7/2, moderately welded Tuff. ~5% pumice lapilli. lapilly altered moderate Brown, 5YR 4/4.			Run #3 1630, 5.0'-5.5' Run #4, 1630, 5.5'-7.5'
	2.0/2.5	NA 0192	NDA						7.5 to 10.0 Grayish Orange, 5YR 7/2, Tuff, moderately welded and highly fractured from 9.2 to 10.0'. Fractures are un-filled and closed.			Run #5, 1050, 7.5'-10'
10	2.5/2.5	0122-97-043 10.0'-10.5'	0193 NDA						10.0 to 12.5 Grayish Orange, 5YR 7/2, Tuff. moderately welded. ~8% pumice lapilli. Fracture with orange Clay Fill at 12.2; w/ un-even welding resulting in core breaking into Disks.			Run #6, 10-12.5' 1120
	2.5/2.5	NA	NDA	NA					12.5-15.0 Grayish orange, 5YR 7/2, moderately welded. Highly fractured from 12.5 to 14'. Fractures have 1-4mm orange Clay Fill.			Run #7 12.5-15' 1145
15	5.0/5.0	NA	NDA						15' to 20' SAA. unfractured.			Run #8 15'-20' 1215
												1225 Lunch
20	5.0/5.0	0121-97-049 20-20.5	NDA						20'-25' SAA. Pumice increase to ~10% and are Gray (N7) Fracture at 20.8' with 2-3mm of orange Clay Fill			Run #9 20-25' 1350
25	5.0/5.0	NA	NDA						25' to 29.5 SAA 28.5-30.0 Grayish Orange, 5YR 7/2, Tuff. Non-Welded with ~10% Gray (N7) Pumice lapilli.			Run #10 25'-30' 1420
0												

Prepared By J. Crocker / ERM Date 2/5/97 Checked By [illegible] Date 2/20/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-012 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 3

Driller Stewart Bros Box #(s) NA Start Date/Time 2/5/97, 1445 End Date/Time 2/10/97 1000

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5.0/5.0	0121-97-0195 (30.0'-30.5')	NDA	NA	30.0-35.0 Light Brownish Gray, 5YR 6/1 moderately welded Tuff. Pumice Lapilliare gray N6-N7 and 12-15%. Fracture at 34.5 with orange clay fill (2-3mm).		Bandelier Tuff Unit #3	Run # 11, 1500 30.0'-35.0'
35	2.0/5.0	NA	NDA		35.0-37.0 Light Brownish Gray, 5YR 6/1 Tuff. Non-Welded. Core is disaggregated. Gray, N6-N7 Pumice lapilli to N10%. 37.0-40.0 No Recovery.	LOSS		Run # 12, 1525 35.0'-40.0' (Packed off) Loss 37.0-40.0
40	2.5/2.5	0121-97-0196 40.0-40.5'	NDA		40.0-40.5 non-welded Tuff, SAA. 40.5-42.5 Gray, N7, to Brownish Gray, 5YR 6/1, moderately welded Tuff w/ 12% Gray, N7, Pumice lapilli. A fracture w/ 1cm moderate Brown-Orange clay fill from 40.5'-41.8'.			Run #13, 1540 40.0'-42.5'
	2.5/2.5	NA	NDA		42.5-45.0 light gray non-welded to poorly welded Tuff. 12% gray, N6, Pumice lapilli. Poorly welded 42.5-44.3, Non-welded 44.3-45.			Run # 14, 0915 42.5'-45.0'
45	2.1/2.5	NA	NDA		45.0-47.1 Non-Welded Tuff, SAA. Orange Alteration @ 46.3. 47.1-47.5 No Recovery.	LOSS		Run # 15, 0940 45.0'-47.5' (Loss, 47.1-47.5).
	2.5/2.5	0121-97-0197 44.5'-50.0	NDA		47.5-50.0 Gray, N7, to Pinkish Gray 5YR 8/1 Tuff. Moderately welded. 12% Gray, N6, Pumice lapilli.			Run # 16, 1000 47.5'-50.0'
50	5.0/5.0	NA	NDA		50.0-55.0 Pinkish Gray, 5YR 8/1, moderately welded, Tuff. 8 to 10% Gray, N6, Pumice lapilli. Clean, closed fractures at 54.0' and ~~52~~ 52.5'			Run # 17, 1040 50.0' to 55.0'
55	4.5/5.0	0121-97-0196 58.5'-59.5' 0121-97-0218 (Dupl.) 58.5-59.5'	NDA		55.0-59.5 Pinkish Gray Tuff, SAA. Becomes Non-welded 57.5 to 59.5. 59.5-60.0 No Recovery	LOSS		Run # 18, 1110 55.0'-60.0' (Loss, 59.5-60.0).
0								

Prepared By J. Crocker/ERM Date 2/6/97-2/7/97 Checked By [signature] Date 2/20/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-012 TA/OU 21 Drill Depth From 60 To 82.5 TD Page 3 of 3

Driller Stewart Bros Box #(s) N/A Start Date/Time 2/5/97 1445 End Date/Time 2/10/97 1000

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon/ Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	5/5	NA	NDA	N/A	60-65' Gray to pinkish gray moderately welded tuff. Pumice lapilli to 12% are gray N6. Unfractured.		Bandelier tuff Unit #3	Run # 19 1150
65	2.9/5	NA	NDA		65-65.3 SAA 65.3-67.9 Gray N6 non-welded tuff. Pumice lapilli: 6-7% N6 to N5. 67.9-70' Loss	Loss		1210 Lunch Run #20 1330
70	2.5/2.5	0127-97 0199 0220 70-70.5	NDA		70-71' Pinkish gray 5YR 8/1 moderately welded tuff with 8% pumice lapilli. 71-72.5' Gray N7 mod. welded tuff with 8-10% pumice lapilli.			Run # 21 1410
	2.3/2.5	NA	NDA		72.5-74.8 Gray N7 poorly welded tuff. 8% pumice lapilli: altered light brown 5YR6/4. 74.8-75 loss			Run # 22 1435
75	4.5/4.5	0121 97 0200 72.4-79.5	α: 25,000 cpm By 10,000 cpm		75-78.9 Non to poorly welded tuff. 8% pumice lapilli: altered light brown 5YR6/4. 78.9-79.5' dk grey concrete grout, hard, possible fracture fill. Hot α 25000 cpm By 10000 cpm	Loss		Run # 23 1500
80	2.3/3	NA	α: 43,000 cpm By: 20,000 cpm 81.5'		79.5-80' dk grey hard cement grout dry. Broken. 80-81' lt grey moist cement grout mixed with plastic bag. Broken up. 81-81.5 piece of tuff mixed with cement grout. 81.5-81.8 lt grey moist cement grout. solid. 81.8-82.5 No Recovery	Loss TD	Dry Auger Slough	End of Day 1515 2/10/97 Drilling 0851 J. Waltersheid Logging Run # 24 0920 TD: 1000

Total Depth 82.5 ft

Prepared By J. Crocker / J. Waltersheid Date 2/10/97 Checked By [signature] Date 2/20/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID _____ TA/OU _____ Drill Depth From _____ To _____ Page _____ of _____

Driller _____ Box #(s) _____ Start Date/Time _____ End Date/Time _____

Drilling Equip./Method _____ Sampling Equip./Method _____

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
62	5/5	NA	NDA	NA	Gray N7 to Pinkish Gray moderately welded Tuff. Pumice lapilli to 10% are Gray N6. Unfractured.			1150 Run 19 62 to 65'
								1210 Lunch
65	3.9/5	NA	NDA	NA	65.0-65.3 SAA 65.3-67.9 non-welded Gray(N6) Tuff. Pumice lapilli 6-7% N6 to N5. 67.9-70 Loss			1330 Run 20
	2.5/2.5	0117-0199 0117-0200 70-70.5'	NDA		70.0-71.0 Moderately welded Pinkish Gray 5YR 8/1 Tuff with .5% pumice lapilli 71.0-72.5 mod welded Gray Tuff N7 w/ 5-10% pumice lapilli.			Run 21 1410
	2.3/2.5	NA	NDA 2-10-97		72.5-74.5 Poorly welded Gray(N7) Tuff. 5% pumice lapilli altered Light Brown 5YR6/4. 74.5-75.0 LOSS			R 401 2122 1435
75	4.9/4	0117-0200	PID 10,000 or 20,000		75- ~~74.5-78.9~~ non-welded to Poorly welded Tuff SAA. ~~73.4-74.0 Gray7 "HC7"~~ ~~78.9-79.0 a-10/7/96~~ 78.9-79.5			1500 Run 23

Log Transcribed onto new form MB 2/26/97

Prepared By _____ Date _____ Checked By _____ Date _____

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID _____ TA/OU _____ Drill Depth From _____ To _____ Page _____ of _____

Driller _____ Box #(s) _____ Start Date/Time _____ End Date/Time _____

Drilling Equip./Method _____ Sampling Equip./Method _____

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	5'/5'	NA	NDA	NA	Gray N7 to Pinkish Gray moderately welded Tuff. Pumice lapilli to 10% are Gray N6. Unfractured.			1150 Run 19 60 to 65'
								1210 Lunch
65	2.9/5	NA	NDA	NA	65.0-65.3 SAA 65.3-67.9 Non-welded Gray(N6) Tuff. Pumice lapilli 6-7% N6 to N5. 67.9-70 Loss			1330 Run 20
	2.5/2.5	0121-97-0199 0121-97-0220 70-70.5	NDA		70.0-71.0 Moderatly welded Pinkish gray 5YR 8/1 Tuff with .5% Pumice lapilli			Run 21 1410
	2.3/2.5	NA	NDA		71.0-72.5 Mod welded Gray Tuff N7 w/ 5-10% Pumice lapilli. 72.5-74.5 Poorly welded Gray(N7) Tuff. 5% pumice lapilli altered Light Brown 5YR6/4. 74.5-75.0 LOSS			Run 22 1435
75	4 pc/4	2-10-97/c ~~10-A-97~~ 0121-97-0200	PID 10,000 to 20,000		75- ~~73.4-74.0~~ 2-10-97 ~~76.4~~ Non-welded to Poorly welded Tuff SAA. ~~73.4-74.0~~ Gray7 "HOT" ~~78.4-79.0~~ 2-10-97 pc 78.9-79.5			1500 Run 23

Log transcribed onto new form JB 2/24/97

Prepared By _____ Date _____ Checked By _____ Date _____

R1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-013 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 4

Driller Stewart Bro Box #(s) NA Start Date/Time 3/25/97 1040 End Date/Time 3/27/97 1340

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05063

Contamination Criteria: 3/25/97 α: 7cpm βγ: 122cpm; 3/27/97 α: 14 cpm βγ: 118cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2.5/2.5	NA	NDA	NA	0-0.5" Asphalt and base course. 0.5-2.5' Dark yellowish brown 10YR 4/2 moist silty clay with crushed tuff, <5% pebbles.		Overburden/Backfill	3/25/97 Drilling 1040; Run #1 1045
	2.5/2.5	0121-97 0221 4.5-5'	NDA		2.5-3' SAA; 3-5' Light brown 5YR 5/6 moist silty clay with tuff fragments.			Run #2 1055
5	2.5/2.5	NA	NDA		5'-7.5' Light brown (5YR 5/6) clayey SILT with tuff fragments. Tuff cobble 5.5'-6.0' moist.			Run #3 1109
	2.5/2.5	0121-97 -0222 -0234 7.5-8.3	NDA		7.5-10.0' Pale brown (5YR 5/2) to Medium gray (N5) TUFF. Poorly welded. Slightly moist. Some Fe-Ox staining		Unit #3	Run #4 1118
10	2.5/2.5	0121-97 0223 10.0-11.0 cps	NDA		10.0'-11.6' SAA with clay-filled fracture. Aperture 0.1 ft.			Run #5 1135; 1145 Lunch break
					11.6'-12.5' Dark gray (N4) TUFF. Poorly welded. Slightly moist.			Run #6 1310
15	2.5/2.5	NA	NDA		12.5-15' SAA			
	2.5/2.5	NA	NDA		15-17.5' Light brownish gray (5YR 6/1). Poor to weakly welded tuff. slightly moist, FeOx spotting. ≤5% qtz.			Run #7 1320
	2.5/2.5	NA	NDA		17.5-20' SAA			Run #8 1335
20	5/5	0121 97 0224 20-20.5	NDA		20-25' SAA drying with depth		Bandelier Tuff	Run #9 1355
25	5/5	NA	NDA		25-30' Light brownish gray (5YR 6/1) poorly welded tuff. Trace moisture. Trace FeOx spotting. Brown mottled core 26.4-27.2.			Run #10 1415
30								

Prepared By Jeff Waltersscheid / Ron Blegen Date 3/27/97 Checked By [signature] Date 3/31/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-013 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 4

Driller Stewart Bro Box #(s) NA Start Date/Time 3/25/97 1040 End Date/Time 3/27/97 1340

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	2/5	0121 97 0225 ~~30-31.5~~ 30.5-31.3 SW 3/26/97	NDA	NA	30-30.5' Light brownish gray (5YR 6/1) weakly welded tuff. Dry. 30.5-32' Light brownish gray mix of 70% non-welded soft tuff with 30% weakly welded tuff fragments. Dry. 32-35' No Recovery	Loss	Bandelier Tuff Unit #3	Run #11 1430
35	2.5/2.5	NA	NDA		35-37.5' Light brownish gray (5YR 6/1) weakly welded tuff. Dry			Run #12 1442
40	2.5/2.5	NA	NDA		37.5-40 SAA possible small fracture at 38'			Run #13 1455
45	5/5	0121 97 0226 41-42	NDA		40-45 Light brownish gray weakly-welded tuff. Dry. Brown/gray mottled zones at 41-42', 43' and 44.5'			Run #14 1507
50	5/5	0121 97 0227 47-50	NDA		SW 3/26/97 ~~40-45~~ 45-50' SAA. Brown/gray mottled zones at 45-46.5, 49.2-50'			Run #15 1526
55	4.5/5	NA	NDA		50-52' Light brown gray weak to mod welded tuff. Dry. Mottled zone at 50.5-51.3' 52-54.5' Light brown gray (5YR 6/1) non-weakly welded soft tuff. 54.5-55' No Recovery	Loss		Run #16 1544
60	5/5	0121 97 0228 52.5-60	NDA		55-57.5' Light brown gray non welded soft tuff trace moisture. 57.5-60' Light brown mottled tuff. Non-welded soft, moist. Fe Ox alteration rind around pumice.			Run #17 1556 End of Day 1620

Prepared By J. Wattersheid Date 3/27/97 Checked By [illegible] Date 3/31/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-013 TA/OU 21 Drill Depth From 60 To 90 Page 3 of 4

Driller Stewart Bo. Box #(s) NA Start Date/Time 3/25/97/1340 End Date/Time 3/27/97/1340

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Spl.t Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	5/5	NA	NDA	NA	60-65' Light brownish gray (5YR4/1) (mottled with light brown (5YR6/4)) non-welded tuff. Moist. Some FeOx staining along edges of larger pumice.		Bandelier Tuff Unit #3	3/27/97 Drilling 0845 Run #18 0900
65	3/3	NA	NDA		65-68' Light brownish gray (5YR4/1) soft non welded tuff. Slightly moist. Sugary texture.			Run #19 0918
70	2/2	0121-97 0229 0235 68.5-70'	NDA		68-70' SAA			Run #20 0930 Field Blank 0121-97-0235 used.
	4/5	NA	NDA		70-74 Medium light gray (N6) soft non weld tuff. Sugary texture. Slightly moist.			Run #21
75					74-75 NO Recovery	Loss		
	3.5/6.0	0121-97 0230 76.0-78.5'	NDA		75-78.5 Medium light gray (N6) non-welded Tuff. Sugary Texture. Slightly moist. 78.5-80 No Recovery.			Run #22 0956
80						Loss		
	2.5/2.5	NA	NDA		80.0-82.5 Light gray (N7) non-welded Tuff. Sugary Texture, White Pumice To 2cm.			Run #23 1020
85	2.5/2.5	NA	NDA		82.5-85.0 Light gray (N7) To Med. gray (N6) non-welded Tuff. Pumice are white and as large as 4.0 cm.			Run #24 1030
	2.5/2.5	NA	NDA		85.0-87.5 SAA			Run #25 1045
90	2.5/2.5	0121-97 0231 89.5-90.0	NDA		87.5-90.0 Light gray (N7) To med. gray (N6) non-welded Tuff, white (N9) Pumice To 3.0 cm. Sugary Texture not as prominent as in previous Runs. Slightly moist			Run #26 1100

Prepared By J Walterscheid / gcrocker Date 3/27/97 Checked By [illegible] Date 3/31/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-013 TA/OU 21 Drill Depth From 90' To 110.5' Page 4 of 4

Driller Stewart Bros. Box #(s) NA Start Date/Time 3/25/97/1040 End Date/Time 3/27/97/1340

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
90	3.5/4.0	NA	NDA		90-93.5 Gray (N6-N7) Non-welded Tuff. Poorly welded 92.0-93.5', Pumice To 2.0 cm. 93.5-94.0 No Recovery.		Bandelier Tuff Unit #3	Run #27 1110 4 FT. Run Packed-off
95	3.5/3.5	NA	NDA		94-97.5 Med. Gray (N6) non-welded To Partly Welded Tuff. White Pumice To 3.0 cm.			Run #28 1120 3.5 FT run To even Things out
	2.5/2.5	C121-97-0232-1209 99.5'-100'	NDA		97.5-100 Med. Gray (N6) Partly To Moderately Welded Tuff, White Pumice To 1.5 cm. Fe Oxide Stains/Spots on core.			Run #29 1130
100	5.0/5.0	NA	NDA		100-105 Med. Gray (N6) Partly Welded To Moderately Welded Tuff. White Pumice To 2.0 cm. Minor Fe Stains/Spots.		? Bandelier Tuff, Unit #2	Run #30 1145 Harder Drilling.
105	2.5/2.5	NA	NDA		105-107.5 SAA.			Run #31 1150
	1.7/2.5	NA	NDA		107.5-109.2 SAA 3-27-97 109.2-110 No Recovery.			Run #32 1200 (Lunch)
110	0.3/0.5	C121-97-0233 110-110.5	NDA		110-110.5 Med Gray (N6) Moderately Welded To Strongly Welded Tuff. White Pumice To 2.0 cm.			Run #33 1340 TD = 110.5'

Prepared By [signature] Date 3/27/97 Checked By [signature] Date 3/31/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-014 TA/OU 21 Drill Depth From 0 To 30 ft Page 1 of 2

Driller Stewart Bro. Box #(s) NA Start Date/Time 2/14/97 1120 End Date/Time 2/14/97 1535

Drilling Equip./Method CME750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05064

Contamination Criteria
2/14/97
α : 2 cpm
βγ : 107 cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2/2.5	NA	NDA	NA	0-0.8' dk brown 5YR silty clay with organics 0.8-1.5' Grayish pink weathered tuff, soft, damp. 1.5-2' Pale brown 10YR 6/2, mod. welded damp		Bandelier Tuff Unit #3 Backfilled Trench	Drilling 20 ft south of absorption bed #2 at MDAT TA-21. Drilling 1120 Run #1 1130
	1.5/2.5	0121-97 0236 3.5-4	NDA		2-2.5' tuff. 2.5-4' lt brown mix of crushed tuff with silt, welded tuff fragments. Small amount of asphalt at 3'. Organics (roots at 3.5'.	Loss		Run #2 1142
5	1.5/2.5	NA	NDA		4-5 No Recovery 5-6.5' Broken up tuff (mod welded) with 10% sand/silt, damp.	Loss		Run #3 1200 will put in cutaway for next run.
	1.5/2.5	0121-97 0237 8.5-9	α 25cpm By NDA 8.5-9		6.5-7.5' No Recovery 7.5-8' Mix broken tuff with sand 8-9' lt brown mix of crushed tuff with silt clays. Trace FeOx, high moisture content	Loss		Run #4 1212 high moisture and clay pinched barrel
10	2/2.5	0121-97 0238 11.5-12	α 80cpm By 200cpm 10-12'		9-10' No Recovery 10-12' Brown 5YR 4/4 saturated mix of silty clay with gray tuff fragments	Loss		Run #5 1225 Saturated
	2/2.5	0121-97 0239 13.5-13.7'	α 350cpm By 400cpm 13.7'		12-12.5 No Recovery 12.5-13.7 Brown saturated silty clay with tuff fragments. 1g gray asphalt 13.6' 13.7-14.2 med grain sand, moist	Loss		Run #6 1244 α 350cpm By 400cpm at clay/sand contact
15	2.5/2.5	NA	NDA		14.2-14.5 lt. gray weakly welded moist tuff trace FeOx 14.5-15 No Recovery 15-17.5' lt. gray 5YR 7/2 mod welded, moist tuff No fractures.	Loss		Run #7 1334 Hard solid tuff
20	2.5/2.5	NA	NDA		17.5-20 SAA			Run #8 1346
	2.5/2.5	0121-97 0240 20-20.5	NDA		20-22.5' lt gray 5YR 7/2 mod. welded (hard) tuff. Drying out with depth. No fractures			Run #9 1358
25	2.5/2.5	NA	NDA		22.5-25' SAA			Run #10 1415
30	5/5	0121 97 0241 29.5-30'	NDA		25-30' lt gray 5YR 7/2 mod. welded tuff slight increase in pumice. Dry. No fractures.			Run #11 1430

Prepared By J. Waltersdorf Date 2/14/97 Checked By [illegible] Date 2/20/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-014 TA/OU 21 Drill Depth From 30 To 50ft Page 2 of 2

Driller Stewart Bro Box #(s) NA Start Date/Time 2/14/97 1120 End Date/Time 2/14/97 1535

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon/ Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5/5	NA	NDA	NA	30-35' lt gray 5YR 7/2 mod welded tuff Dry. lt brown mottled color 33-34' small clay filled fracture 30.8-31.2 no detectable activity		Bandelier Tuff Unit #3	Run #12 1445
35	5/5	0121 97 0242 39.5-40	NDA		35-40' lt gray - brown 5YR 7/2 mod welded tuff. Dry. No fractures.			Run #13 1500
40	5/5	NA	NDA		40-45 SAA			Run #14 1512
45	5/5	0121 97 0243 49.5-50	NDA		45-50' lt brown 5YR 7/2 mod. welded tuff. Dry. No fractures.			Run #15 1522
50					50 ft Total Depth			

Prepared By J Walterscheid Date 2/14/97 Checked By [illegible] Date 2/20/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-015 TA/OU 21 Drill Depth From 0' To 30' Page 1 of 2

Driller Stewart Bro. Box #(s) N/A Start Date/Time 13 Dec 96 1300 End Date/Time 16 Dec 96/1325

Drilling Equip./Method CME750 Auger Sampling Equip./Method Continuous/Auger/Split Spoon

Depth (feet)	Recovery (feet per feet / %)	Field Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
					Background: 16 Dec 96 β/γ ~~260~~ 101 cpm (Jan 13 Dec 96); α 9.3 ~~3.2~~ cpm 13 Dec 96; α -			Drilling 20 ft north of middle of bed #3 MDA-T TA-21 12/13/96
	2.5/2.5	N/A	NDA	N/A	0-1.5' dark brown, moist clayey silt with 10% sand. (5YR 3/4)		Bandelier Tuff	1300 Drilling Run #1: 1310
5	2.5/2.5	0121-96 0621 4.5-5'		N/A	1.5-3.0' brownish red (5YR 5/6) iron stained crushed tuff with sand, moist.			Run #2: 1330
	1.5/2.5	N/A		N/A	3.0-5' grey (10YR 6/2) damp weathered tuff, with minor iron staining along clay filled fractures. 5-6' Core loss	Loss	Overburden/Bandelier	Run #3: 1355
10	2.5/2.5	~~0121-96 0622~~ JRJ 12/13/96		N/A	6-9' Reddish brown (5YR 4/4) damp to moist silt with fine grain sand. 9-50' Tuff: damp light grey moderately welded (10YR 6/2) sharp contact 12' dk brown moist clay in a fracture			Run #4: 1420
	2/2.5	0121-96 0622 10-10.5		N/A	12-12.5' core loss at fracture	Loss		Run #5: 1445
15	2.5/2.5	N/A		N/A	SAA 12.5' fracture with clay coating white mineral coating (calcite looking) 45° angle			Run #6: 1504 End of day 1530
				—	15.0' 45° fracture with clay coating			12/16/96 1006 - Resume Drilling
20	5.0/5.0	0121-96 0623 (15.5-20.0)		N/A —	15.0' to 25.0' Light gray TUFF. Moderately to strongly welded. Pumice to 10mm common. Trace sanidine crystals.		Tuff	Run #7: 1018
				—	20.0' to 25.0' SAA 21.7' Low angle, fracture (< 30°) Clay-lined.		Bandelier	1058 Run #8
25	5.0/5.0	N/A		—	25.0' to 30.0' Lt. gray TUFF. Moderately to strongly welded. Weathered pumice to 10mm common throughout. Low angle, clay-lined fractures at 26.1', 26.8' and 27.8'. High angle clay filled fracture at 29.4' (Aperture 0.04')			1120 Run #9
	5.0/5.0	0121-96 0624 25.5-30		—				
30								

Prepared by JEFF WALTERSCHEID 13 DEC 96 / RON BLEGEN Date 16 DEC 96 Checked By [signature] Date 1/8/97

LOS ALAMOS NATI AL LABORATORY ENVIRONMENTAL :STORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-015 TA/OU 21 Drill Depth From 30' To 50' Page 2 of 2

Driller STEWART BROS. Box #(s) N/A Start Date/Time 13DEC96 / 1300 End Date/Time 16 DEC 96 / 1325

Drilling Equip./Method CME 75 AUGER Sampling Equip./Method 3" STAINLESS STEEL CORE BARREL

BACKGROUND: 16 DEC 96 .8/8 α

Depth (feet)	Recovery (feet per feet / %)	Field Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology-Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5.0/5.0	N/A	NDA	—	30.0 to 35.0 Light gray (N7) to medium light gray (N6) TUFF. Moderately welded. Large pumice throughout. Low angle fractures with reddish-brown weathered zones at 32.2' and 33.7'. Dry.		Bandelier Tuff	1200 - Run #10 GENERATOR OUT OF FUEL 1218 - RESUME
35	5.0/5.0	0121-96-0625 (35.5-40.0)		—	35.0 to 40.0 Light gray (N7) to medium light gray (N6) TUFF. Moderately welded. Dry. Reddish-brown weathered zones 35.6' to 36.0 and at 36.9' to 37.0'.			1220 - Run #11
40	5.0/5.0	N/A		—	40.0 to 45.0 Light gray (N7) TUFF. Moderately welded. Dry. High angle (>45°) fracture at 41.7' is filled with Light brown (5YR 5/6) clayey silt. Aperture 0.04'.			1248 Run #12
45	5.0/5.0	C121-96-0626 -42.2' TO 46.7		—	45.0 - 50.0 Lt gray (N7) TUFF Moderately welded. Dry.			1303 Run #13
50				—	TD @ 50.0 ft BGS.			1325 - TD

Prepared by JEFF WALTERSCHEID / RON BLEGEN Date 13 DEC 96 / 16 DEC 96 Checked By [signature] Date 1/8/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-021 TA/OU 21 Drill Depth From 0 To 30 ft Page 1 of 7

Driller Stewart Bro. Box #(s) NA Start Date/Time 3/12/97 1000 End Date/Time 3/17/97 1635

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05071

Contamination Criteria

3/12/97	3/13/97	3/17/97
α: 15cpm	α:	α: 5cpm
Bγ: 91cpm	Bγ:	Bγ: 127cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	1.0/2.5	NA	NDA	NA	0-1' Moderate brown 5YR 4/4 mix of clayey silt with crushed tuff, wet due to snow melt, organics to 0.5'.	Loss	Overburden/Backfill	3/12/97 1000 Drilling Run #1 1015
					1-2.5' No Recovery (pinched barrel)			
	0.5/1.5	NA	NDA		2.5-3' dk brown mix of clayey silt/tuff, wet. 3'-4' No Recovery	Loss		Run #2 1030
5	1/1	NA	NDA		4-5' Light brown 5YR 6/4 silts with crushed tuff			Hitting large rock, will drill with center bit to try and break or move it.
	1/2.5	0121-97 1161 5-5.5'	NDA		5-6' Light brown 5YR 6/4 silty clay, moist. 6-7.5' No recovery (packed off catcher)	Loss		Run #3 1105 Run #4 1110
	2.5/2.5	0121-97 1162 9.5-10	NDA		7.5-8' Light brown silty clay, moist 8-8.5 Light brown silty clay with fine grain sand 8.5-10' Light brown silty, fine-medium grain sand with small pebbles, moist.		Paleo-Channel	Run #5 1130
10	2.5/2.5	NA	NDA		10-12.5' Light brown (burnt orange) 5YR 6/4 fine to medium grain sand with 25% pumice fragments, silty. Moist.			Run #6 1200
	2.5/2.5	NA	NDA		12.5-13.5' SAA 13.5-15' light brown (burnt orange) fine to medium grain sand with minor silt trace pebbles.			Run #7 1210
15	2.5/2.5	NA	NDA		15-17.5' SAA			Run #8 1222
	18/2.5	NA	NDA		17.5-18' SAA 18-19' Light tan/brown fine grain sand traces silt 19-19.3' Light brown (burnt orange) med grain sand			Run #9 1236
20					19.3-20' No Recovery	Loss		Lunch 1240
	2.5/2.5	0121-97 1163 20-20.5	NDA		20-21.5' Light tan fine grain sand, moist 21.5-22.5' Light brown (burnt) fine-medium grain sand. horizontal bedding is evident. trace silt			Run #10 1345
	2.5/2.5	NA	NDA		22.5-25' altering lt gray/lt brown fine-med. grain sand with minor clay. Bedding is visiable.			Run #11 1400
25	1/1.5	NA	NDA		25-25.5 SAA 25.5-26' Mix of tuff and dacite pebbles (up to 2" in size) with med-coarse grain sand and smaller pebbles.			Run #12 1415
	Center	Bit			26-26.5 No Recovery 26.5-27.5 Center Bit no recovery	Loss / Center Bit		Putting on center bit to try and break up the dacite cobbles. Dacite cobbles are rounded.
	2.5/2.5	0121-97 1164 28.5-29	NDA		27.5-28' lt gray med. grain sand moist 28-28.8' med-coarse grain sand with small dacite pebbles 28.8-29.3' light brown fine grain silt, moist			Run #14 1445
30					29.3-30 dk gray mod welded tuff with 30% sand			

Prepared By J. Walterscheid Date 3/17/97 Checked By [illegible] Date 3/28/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-021 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 7

Driller Stewart Bro Box #(s) NA Start Date/Time 3/12/97 1000 End Date/Time 3/17/97 1635

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	2.5/2.5	NA	NDA	NA	30-30.5' dk orange fine grain silt moist 30.5-32.5' mix of gray mod-strongly welded tuff bolders (FeOx stain in ign tuff) with silt and med grain sand with lg dacite (welded) boulders. Strong FeOx alteration throughout interval (dry)		Paleo Channel	Run #15 1500 Very hard drilling (dry) Rolling on center bit
	Center	Bit			32.5-33.5 Center Bit No Recovery			Run #16
35	1.5/1.5	0121-97 1165 34-34.5	NDA		33.5-34.3' brown (burnt orange) fine grain silty sand with large dacite rhyolite cobbles dry 34.3-35 grayish orange med welded tuff, dry sharp flat contact			Run #17 1550
	2.5/2.5	NA	NDA		35-37.5' grayish orange 5YR 7/2 weakly welded tuff. Trace moisture, 5-10% pumice.		Bandelier Tuff Unit #3	Run #18 1605 1630 End of day
	2.5/2.5	NA	NDA		37.5-40' grayish orange 5YR 7/2 weak to moderately welded tuff. (solid core) trace moisture, 5% large elongated pumice. 5% qtz			3/13/97 Drilling 0840 Run # 19 0850
40	5/5	0121 97 1166 42-42.5	NDA		40-42' SAA 42-45' Mottled grayish orange / lt brown non to weakly welded tuff. Dry, 5% pumice, 5% qtz.			Run #20 0904
45	42/5	NA	NDA		45-49.2' ~~45-44.2'~~ SAA JCW 3/13/97 49.2-50' ~~44.2-45'~~ No Recovery JCW 3/13/97			Run #21 0925
50	5/5	0121 97 1167 50.5-51'	NDA		50-51' Med. yellow brown 10YR5/4, soft non welded tuff with trace moisture. Possible fracture. 51-55' Mottled gray / brown weak to med. welded tuff. Dry, Slight increase in pumice, 5% qtz. Solid core. JCW 3/13/97			Run # 22 0945
55	5/5	NA	NDA		55-~~60~~ 57' SAA 57-60' light to med gray non welded dry tuff. Decrease in lg pumice lapilli.			Run# 23 1000
60								

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-021 TA/OU 21 Drill Depth From 60 To 90 Page 3 of 7

Driller Stewart Bro Box #(s) NA Start Date/Time 3/12/97 1000 End Date/Time 3/17/97 1635

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60–65	5/5	0121 97 1168 61-61.5	NDA	NA	60-61' light gray non welded, dry tuff 61-62.5' light brown/gray mottled non to weakly welded dry tuff, 62.5-65' light gray non-weakly welded dry tuff. 5% small pumice, drop in Qtz content.		Bandelier Tuff Unit #3	Run #24 1025
65–70	5/5	NA	NDA		65-70' SAA			Run #25 1040
70–75	3.5/5	0121 97 1169 70-70.5	NDA		70-73.5' light gray non welded (sugary) tuff. trace moisture, increase in pumice content. slight color change to darker gray with depth. 73.5-75' No Recovery	Loss		Run #26 1058
75–80	3/5	NA	H^3 16 µC:/m3		75-78' medium gray non welded (sugary) tuff. Trace moisture. 78-80' No Recovery	Loss		Run #27 1118
80–85	2.5/2.5	0121 97 1170 80-80.5	H^3 14 µC:/m3		80-82.5 medium gray non-welded (sugary) soft tuff. slight increase in moisture			Run # 28 1140
85–87.5	2.5/2.5	NA	H_3 10 µC:/m3		82.5-85' SAA			Run #29 1150
87.5–90	2.5/2.5	NA	H3 10 µC:/m3		85-87.5' SAA			Run #30
90	2.5/2.5	NA	H_3 4 µC:/m3		87.5-90' medium gray non welded (sugary) soft tuff. trace moisture.			Lunch Run #31 1327

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-021 TA/OU 21 Drill Depth From 90 To 120 Page 4 of 7

Driller Stewart Bro. Box #(s) NA Start Date/Time 3/12/97 1030 End Date/Time 3/17/97 1635

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
90	2.5/2.5	0121-97 1171 90-90.5	H3 22 μC:/m3	NA	90-92.5 light to medium gray non welded (sugary) dry. tuff. < 5% small soft pumice.		Bandelier Tuff Unit #3	Run #32 1340 Tuff is slightly more compacted.
	2.5/2.5	NA	H3 10 μC:/m3		92.5-94' SAA, increase in large pumice 94-95' Pinkish gray 5YR 7/2 (salmon color) weakly welded, up to 1" pumice, dry.			Run # 33 1400
95	2.5/2.5	0121-97 1172 97-97.5	H3 26 μC:/m3		95-97.5 med. gray mix of 70% non-welded tuff with 30% weakly welded tuff pieces. Dry, trace moisture. soft			Run #34 1411
	2.5/2.5	NA	H3 20 μC:/m3		97.5-98' SAA 98-100 Grayish pink 5YR 7/2 m weak to mod. welded tuff. Dry, solid core.			Run # 35 1434
100	2.5/2.5	0121-97 1173 100-100.5	H3 10 μC:/m3		100-102.5' SAA			Run # 36 1446
	2.5/2.5	0121-97 1174 104.2-105	H3 120 μC:/m3 104.2-105		102.5-104.2' SAA 104.2-105' H. tan soft (powder) dry non-welded tuff. H3: 120 μC:/m3			Run # 37 1502
105	2/2	NA	H3 40 μC:/m3		105-106' dk pink moderately welded tuff 8% qtz. FeOx spotting 106-106.5 Soft H gray powdery tuff H3 20 μC:/m3 106.5-107' Pinkish gray moderately welded tuff 10% qtz (large crystals) FeOx spotting		?	Run # 38 1520 very hard drilling. high pull down pressure.
	2/2	NA	H3 12 μC:/m3		107-109' SAA			Run #39 1550
110	1/1	0121-97 1175 109-110	H3 10 μC./m3		109-110' SAA			Run #40 1615 Sample Shutdown 1630
	2.5/2.5	NA	H3 10 μC/m3		110-112.5' Grayish pink 5YR 7/2, moderately welded tuff. FeOx spotting, 10% qtz. (dusty). Tuff is a mix of 70% welded fragments with 30% soft (granular) tuff.		Bandelier Tuff Unit #2	3/17/97 Drilling 0845 Run # 40 0900
	2.5/2.5	NA	NDA		112.5-115 SAA			Run #41 0915
115	2.5/2.5	NA	H3 18 μC:/m3		115-117.5' SAA			Run #42 0930
	2/2.5	0121-97 1176 118.5-119.5	H3 30 μC:/mg		117.5-119.5 SAA 118.5-120' No Recovery	Loss		Run #43 0950
120								

SW 3/17/97 ~~covers~~ 5% flattened pumice,

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-021 TA/OU 21 Drill Depth From 120 To _____ Page 5 of 7

Driller Stewart Bo. Box #(s) NA Start Date/Time 3/12/97 1000 End Date/Time 3/17/97 1635

Drilling Equip./Method CME 750/ Auger Sampling Equip./Method Split Spoon/ Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
120	2.5/2.5	NA	H3 14 uC:/m3	NA	120-122.5' Grayish pink 5YR 7/2 dry, mix of 40% soft non-welded (ground?) tuff with 60% mod. welded tuff. FeOx spotting on tuff. 5-10% qtz.		Bandelier Tuff Unit #2	Run # 44 1010
125	2.5/2.5	NA	H3 10 uC:/m3		122.5-125' SAA slight increase in moisture content			Run # 45 1021
	2.5/2.5	NA	H3 8 uC:/m3		125-127.5 Pale yellowish brown 10YR 6/2 mix of 40% soft non-welded tuff with 60% mod. welded tuff. Decrease in FeOx spotting, 5% qtz, trace moisture.			Run # 46 1035
130	2.5/2.5	0121-97 1177 125-130	H3 12 uC:/m3		127.5-130 SAA			Run # 47 1050
135	2.5/5	NA	H3 18 uC:/m3		130-132.5' SAA 132.5-135' No Recovery	Loss		Run # 48 1107
140	3/5	NA	H3 22 uC:/m3		135-138' Light brown 5YR 6/4 mix of 50% soft non weld tuff (trace moisture) with moderately welded tuff fragments. Increase in FeOx spotting on welded fragments. Increase in qtz. Tuff fragments are dry. 138-140' No Recovery	Loss		Run # 49 1126
145	2.5/5	0121-97 1178 140-141	H3 10 uC:/m3		140-142.5' SAA with increase in moisture 142.5-145' No Recovery	Loss		Run # 50 1144
	2.5/2.5	NA	H3 40 uC:/m3		145-147.5' Tan to brown mix of 60% soft non-welded weathered tuff with 40% light pink welded tuff fragments. Tuff fragments are spotted with FeOx "dots" 5-10% qtz, 5% pumice, dry. Non welded matrix is moist			Run # 51 1159
150	2/2.5	0121-97 1179 149-149.5	H3 32 C:/m:		147.5-149.5 SAA 149.5-150 NO Recovery	Loss		Run # 52 1215 Lunch 1230

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-021 TA/OU 21 Drill Depth From 150 To 180 Page 6 of 7

Driller Stewart Bro. Box #(s) NA Start Date/Time 3/12/97 1000 End Date/Time 3/12/97 1635

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
150	2.5/2.5	NA	H3 20 uCi/m3	NA	150-152.5' Tan to brown weathered tuff. Matrix is a soft weathered tuff with welded tuff fragments making up 30% of volume. Moisture in the soft matrix material. Pumice in fragments are light and dk gray		Unit #2 Bandelier Tuff	Run #53 1350 Adding cable to wireline winch
155	2.5/2.5	NA	H3 18 uCi/m3		152.5-155' SAA (note: the fine matrix material resembles a fine grain silt)			Run #54 1450
	2.5/2.5	NA	H3 25 uCi/m3		155-157.5' SAA			Run #55 1530
160	2.5/2.5	0121-97 1180 157.5-160	H3 30 uCi/m3		157.5-160' Tan/brown mix of 60% welded tuff fragments with 40% soft (silty) weathered tuff. FeOx spotting on fragments trace moisture (drying with depth) in soft material.			Run #56 1545
	2.5/2.5	NA	H3 30 uCi/m3		160-162.5' SAA. Tuff fragments are a light purple color, continuing to dry out			Run #57 1600 End of Run
165	2/2.5	NA	H3 40 uCi/m3		162.5-164.5 Mix of moist brown weathered soft tuff (silt?) with 30% weakly welded fragments FeOx spotting on fragments 164.5-165' No Recovery	Loss		3/18/97 Drilling 1345 Run #58 1355 new tritium meter
170	2.5/5	NA	H3 40 uCi/m3		165-167.5' Mix of 80% soft moist brown non-welded tuff with 20% pinkish weakly welded tuff fragments. Moisture is caught up in the fine matrix material. 167.5-170 No Recovery	Loss		Run #59 1414
175	2.5/5	0121-97 1181 170-171	H3 40 uCi/m3		170-172.5 SAA, drying out with depth 172.5-175 No Recovery ~~177.5~~ JSW 3/17/97	Loss		Run #60 1432
180	2.5/5	NA	H3 45 uCi/m3		175-177.5 mix of light brown soft non-welded tuff with 30% weakly welded pinkish gray tuff. Trace moisture. 177.5-180 No Recovery	Loss		Run #61 1503

Prepared By J. Walterscheid Date 3/17/97 Checked By [illegible] Date 3/28/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-021 TA/OU 21 Drill Depth From 180 To 200 Page 7 of 7

Driller Stewart Bros. Box #(s) NA Start Date/Time 3/12/97 1000 End Date/Time 3/17/97 1635

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
180	2.5/5	0121 97 1182 180-181	H3 40uC:/m3	NA	180-182.5' light brown 5YR 6/4 mix of 70% soft dry non welded tuff with 30% weakly welded tuff fragments. FeOx spotting on fragments. Strongly weathered matrix.		Unit #2	Run #62 1520 soft matrix is almost silty
185					182.5-185 No Recovery	Loss		
	2.5/5	NA	H3 40uC:/m3		185-187.5 SAA			Run #63 1535
					187.5-190 No Recovery	Loss		
190	2.5/5	0121 97 1183 190-191	H3 40uC:/m3		190-192.5' light brown 5YR 6/4 soft dry non-welded to very weakly welded tuff. tuff crumbles when pinched.			Run #64 1555
195					192.5-195 No Recovery	Loss		
	3/5	0121 97 1184 197-198	H3 60uC:/m3		195-198 SAA			Run #65 1616
200					198-200 No Recovery	Loss		End of day 1635
					200ft Total Depth (TD based on TA-21 RAD Lab screening results)			

Prepared By J. Watterson Date 3/18/97 Checked By [illegible] Date 3/28/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-023 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 3

Driller Stewart Bro Box #(s) N/A Start Date/Time 1/8/97 1335 End Date/Time 1/8/97 1630

Drilling Equip./Method CME750/ Auger Sampling Equip./Method Splitspoon/core

Location ID: 21-05073

Background
1/8/97 α: 21cpm Bη: 111cpm
1/9/97 α: 16.4 cpm Bη: 111cpm

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	2.0/2.5	N/A	NDA	N/A	0-2' Surface soil of moist clayey silty sand with grasses and roots. Tuff fragments at 2'. Brown 5YR 3/4/4			Start 1335 Run #1 1350
					2-2.5' No Recovery	Loss	Bandelier Tuff	
	1/2.5	0121-97 0326 2.5-3'	NDA		2.5-3.5' moist brown silty clay grading into a fine-med gr. sand at 3.5'			Run #2 1405
5					3.5-5' No recovery	Loss		
	1.5/2.5	N/A	α 40 cpm Bη H3 NDA		5-6.5' light brown (5YR 5/6) silty med gr. sand with river rock pebbles and crushed tuff			Run #3 1430
					6.5-7.5 No recovery	Loss		
1.5/1.5	1.5/1.5	0121-97 0327 9.5-9'	α 2570 cpm Bη 600 cpm H3 NDA		Note: Run #4 is 7.5-9'. Hit cobbles at 9' and put on center bit. 7.5-8.5' SAA iron type staining at 8.5'. 8.5-9' sand with 50% 1" river gravel (this is the hot zone)		Absorption Bed	Run #4 1440 Driller hit cobbles at 9' putting on center bit
10								Run #5 center bit to 11.5'
	Center Bit				9-11.5' Drilling thru cobble zone with center bit			
	3.5/3.5	0121-97 0328 11.7-12.2	α 652 cpm Bη 260 H3 NDA		11.5-12' ground tuff/w.m. silty sand. 12-15' Tuff, moderately welded, gray (N7 R6/2)			Run #6 1545
15								Shutdown 1600
	2.5/2.5	N/A	α 100 cpm Bη 222 cpm at fracture		15-17.5' SAA 60° Fracture at 16.5' weak clay alteration of pumice. α 100 cpm Bη 222 cpm at fracture. Fracture gouge 0.5mm wide. Bη alteration zone around fracture			1/9/97 Start 0815 Reaming hole. Run #7 0920
	2.5/2.5	N/A	NDA		17.5-20' SAA no fracturing, competent core			Run #8 0945
20								
	5/5	0121-97 0329 22-23'	NDA		20-25' SAA 22-23' Fracture, dk orange clay (weathering?) thin fracture No detectable rad activity		Bandelier Tuff	Run #9 1004
25								
	5/5	N/A	NDA		25-30' SAA no fracturing, weak to mod. welded.			Run #10 1045
30								

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-023 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 3

Driller Stewart B. Box #(s) N/A Start Date/Time 1/2/97 1335 End Date/Time 1/2/97 1630

Drilling Equip./Method CME750 / Auger Sampling Equip./Method Split Spoon / core

Location ID: 21-05073

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	5/5	0121-97 0330 32-32.5'	NDA	N/A	30-35' Tuff minor fracture at 32' trace clay alteration competent tuff drying with depth			Run #11 1115
35	5/5	N/A	α 60 By 120		35-40' SAA minor fracture at 37.5-38' tuff altering to a light brown color along fracture Non 140 Slight increase in pumice α60; By 120 at a large 3" white pumice crystal (Non associated fracture)			Run #12 1140
40	5/5	0121 97 0331 42-42.5'	α 35 ppm By 140 ppm 42'		40-45' SAA Fractures at: 40.5' 75° (~~sampled~~) JCW 1/3/97 42' 45° (sampled) 43-44' 1cm fracture at 60° large area weathering to a dk brown color		Bandelier Tuff	Run #13 1205
45	2.5/5	0121 97 0332 46.5-47'	α 100 By 140		45-~~50~~ 46' SAA JCW 1/3/97 46-47.5' Tuff non-welded, lt. gray very soft (powdery) 47.5-50' No Recover			Run #14 1240
50	2.5/2.5	N/A	NDA		50-52.5' Non-welded soft tuff. 51.8-52.4' brown alteration zone slight increase in moisture content			lunch Break 1310 Drilling 1410 Run #15 1450
55	2.5/2.5	N/A	NDA		52.5-53 SAA 53-55 weakly welded tuff gray competent 54.6-55' fracture, dk orangish brown clay F.Il. fracture along ~~right~~ edge of core JCW 1/3/97			Run #16 1506
60	0/5				55-60 No Recovery Mis-latch on core barrel, ground up and went up outside of augers			Run #17 1525

Prepared By J. Wattenscheid Date 1/2/97 Checked By [signature] Date 1/17/96

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-023 TA/OU 21 Drill Depth From 60 To 70 T.D. Page 3 of 3

Driller Stewart Box #(s) N/A Start Date/Time 1/2/97 1335 End Date/Time 1/3/97 1630

Drilling Equip./Method CME750/auger Sampling Equip./Method Split Spoon/core

Location ID: 21-05073

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	2.5/2.5	01-21-97 0333 0401	NDA		60-62 Tuff weakly welded, grey No fracturing		Bandelier Tuff	Run 18 1600
					62-62.5 non-welded tuff lt. brown alteration			
					62.5-63.5 SAA			Run #19 1610
	2.5/2.5	N/A	NDA		63.5-65 non-welded grey tuff, soft No visible fracturing			
65								
	2.5/2.5	N/A	NDA		65-67.5 SAA			Run #20 1620
	2.5/2.5	01-21-97 0334 70'	NDA		67.5-70 SAA			Run #21 1630
70					70 ft T.D.			

Prepared By J. Walterscheid Date 1/2/97 Checked By [illegible] Date 1/17/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-024 TA/OU 21 Drill Depth From 0 To 30 ft Page 1 of 2

Driller Stewart Bro Box #(s) NA Start Date/Time 2/12/97 1000 End Date/Time 2/12/97 1550

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Location ID: 21-05074

Contamination Criteria: 2/12/97 α: 8cpm β-γ: 126cpm

Depth (Feet)	Recovery (feet per feet/%)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	1.9/2.5	0121-97 1001 0.5-1.3'	α: 1000cpm β-γ: 165cpm 0.8-1.3	NA	0-0.8' dk brown 10YR 3/2 clay, organics (grasses, roots) moist. 0.8-1.3' Mottled brown/gray mix crushed tuff/sand moist.		Overburden/Backfill	Drilling ≈ 15' ~~east~~ of north of absorption bed #4, MDA-T TA-21. Drilling 1000 Run #1 1008
					1.3-1.9' lt. gray 10YR 6/2 crushed tuff	Loss		
					1.9-2.5 No Recovery			Run #2 1040
5	1.5/2.5	NA	NDA		2.5-3' lt gray crushed tuff, moist.			
					3-4' lt brown 5YR 5/6 mix of silty clay with crushed tuff, Fe2O3 staining.	Loss		Run #3 1050
	1.3/2.5	NA	NDA		4-5' No Recovery			
					5-6' lt brown 5YR 5/6 silty clay, moist.	Loss		
					6-6.3' lt gray crushed tuff.			Run #4 1105
	2.0/2.5	0121-97 1002 7-7.5	NDA		6.3-7.5' No Recovery 7.5-8.5' lt gray 5YR 7/2 weakly welded tuff, clay.			
10					8.5-10' No Recovery	Loss		
	2.5/2.5	NA	NDA		10-12.5' lt gray 5YR 7/2 non to weakly welded tuff. clay with depth. (Bandelier)		Bandelier Tuff Unit #3	Run #5 1118 mix of soft tuff with welded tuff fragments
					12.5-14' SAA			Run #6 1130
	1.5/2.5	NA	NDA		14-15' No Recovery	Loss		
15					15-17.5' lt. gray 5YR 7/2 non-weakly welded tuff. Dry. 7% pumice. (soft with hard pieces of tuff)			Run #7 1140
	2.5/2.5	NA	NDA					
					17.5-20' SAA			Run #8 1151
	2.5/2.5	0121-97 1003 17.5-20	NDA					
20					20-21.5' lt gray 5YR 7/2 non-weakly welded tuff. (mix of soft tuff with welded tuff fragments)			Run #9 1203 will put in cutter for better Recovery next run Lunch 1215
	1.5/2.5	NA	NDA		21.5-22.5' Dry No Recovery	Loss		
					22.5-23' lt gray non-weakly welded tuff			Run #10 1330 No Recovery due to large piece of tuff caught in cutter
25	0.5/2.5	NA	NDA		23-25' No Recovery	Loss		
					25-27.5' lt gray 5YR 7/2 non-weakly welded tuff. (mix of soft non-welded tuff with welded tuff fragments) small fracture 26.8' lt brown tuff (no clay)			Run #11 1350
	2.5/2.5	0121-97 1004 26.5-26.3	α: 60cpm β-γ: 140cpm 26.8'					
					27.5-30' SAA			Run #12 1415 less welding than previous runs
30	2.5/2.5	NA	NDA					

Prepared By J. W. Hersch Date 2/12/97 Checked By [illegible] Date 2/20/97

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-034 TA/OU 21 Drill Depth From 30 To 50 ft TD Page 2 of 2

Driller Stewart Bros Box #(s) NA Start Date/Time 2/12/97 1000 End Date/Time 2/12/97 1550

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	2.5/2.5	NA	NDA	NA	30 - 32.5' lt gray/brown 5YR 7/2 non to weakly welded tuff. Dry. (Soft tuff 60% welded tuff fragments 40%) 7% pumice, slight color change to lt. brown with depth		Bandelier Tuff Unit #3	Run # 13 1425
	2/2.5	NA	NDA		32.5 - 33.3' SAA 33.3 - 34.5' lt gray 5YR 7/2 non-weakly welded tuff (Soft tuff 65% welded tuff fragments 35%) Dry			Run # 14 1435
35	2/2.5	NA	NDA		34.5-35 No Recovery 35-36' lt gray brown non to weakly welded tuff. 36-36.5 fracture zone FeOx staining. soft tuff is light brown welded tuff is gray.	Loss		Run # 15 1443
	2.5/2.5	0121-97 1005 39.5-40	NDA		36.5-37 lt gray brown tuff. (Soft tuff 60% is brown in color and moderately welded tuff is lt gray 40%) 37-37.5 No Recovery 37.5-40' lt gray brown (mottled) non-weakly welded tuff, dry, Increase in brown color (alteration?) (Soft 70% welded 30%)	Loss		Run # 16 1455
40	1.8/2.5	NA	NDA		40-41.8' SAA 41.8-42.5 No Recovery	Loss		Run # 17 1510
	1.7/2.5	NA	NDA		42.5-44.3' lt gray/brown (mottled) 5YR 6/4 non to weakly welded tuff, trace moisture (soft 80% welded 20% mix)			Run # 18 1520
45	2/2.5	NA	NDA		44.3-45 No Recovery 45-47' lt brown 5YR 6/4 non to weakly welded tuff trace FeOx staining on welded tuff fragments (80% soft tuff 20% welded tuff fragments)	Loss		Run # 19 1530
	1.5/2.5	0121-97 1006 48.5-49	NDA		47-47.5 No Recovery 47.5-49' SAA 49-50' No Recovery	Loss		Run # 20 1540
50						Loss		TD 1550
					50' Total Depth			

Prepared By J. W. Hirschfeld Date 2/12/97 Checked By [illegible] Date 2/20/97

R.1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-025 TA/OU 21 Drill Depth From 0 To 30 Page 1 of 3

Driller Stewart Bros Box #(s) NA Start Date/Time 3/10/97 1020 End Date/Time 3/11/97 1430

Drilling Equip./Method CME 750/Augen Sampling Equip./Method Split Spoon/Core

Location ID: 21-05075

Contamination Criteria: 3/10/97 α: 4 cpm, β/γ: 189 cpm; 3/11/97 α: 20 cpm, β/γ: 110 cpm

Drilling in center of absorption bed #3 TA-21, MDA-T.

Depth (Feet)	Recovery (feet per feet/%)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
0	2.5/2.5	NA	NDA	NA	0-1 Dark moderate brown 5YR 3/4 moist clay, grass, roots. 1-2.5' Moderate brown 5YR 4/4 moist clayey silts with crusted tuff.		? Backfill	3/10/97 Drilling 1020 Run #1 1020
5	2.5/2.5	NA.	NDA		2.5-3.8' Light brown 5YR 5/6 medium grain moist sand with silt and small pebbles. 3.8-5' silty clay with crusted tuff.			Run #2 1035
	2/2.5	0121-97 1139 6.7-7.2	NDA		5-6.5' medium grain moist silty sand with small pebbles. 6.5-7' dk brown moist clay 7-7.5' No Recovery		?	Run #3 1100
10	2/2.5	0121-97 1132 8.8-9.3	α: 80 cpm β/γ: 280 cpm 8-10		7.5-8' dk brown moist clay 8-8.8' Tuff boulder, weathered, soft. 8.8-9.2' dk brown moist silty gravel with sand 9.2-9.5' dk brown silty clay with 2" river gravels 9.5-10' No Recovery	Loss	Absorption Bed #3	Run #4 1115
	0.5/2.5	NA	α: 55 cpm β/γ: 300 cpm 10-10.5		10-10.5' 1-2" rock with med grain silty sand 10.5-13.5' No Recovery 1g rock plugged core barrel.	Loss		Run #5 1145
15	0/2.5	Center Bit			12.5-15' Drilled with center bit through the cobble zone.	Center Bit		Run #6 1200 Drilling with center bit 12.5-13.5' 13.5-15' sample fell out of barrel
	1/1	1133 1141	α: 115 β/γ: 300		15-16' light bowish gray 5YR 6/1 dry (dusty) non-weakly welded tuff.	" "		Run #7 1440 Duplicate sample 0121-97-1141 collected
20	0.5/4	NA	α: 125 cpm β/γ: 300 cpm 16-16.5		16-16.5' dk brown weakly welded tuff, possible fracture. 16.5-20' No Recovery	Loss	Bandelier Tuff Unit #3	Run #8 1500
	1.5/2.5	0121-97 1134 20-21	α: 20 cpm β/γ: 200 cpm		20-21.5' Grayish orange 5YR 7/2 dry (dusty) non-weakly welded tuff with welded disks of tuff. 21.5-22.5' No Recovery	Loss		Run #9 1515
25	1.5/2.5	NA	NDA		22.5-24' Grayish orange non-weakly welded dry tuff. softer with depth 24-25' No Recovery	Loss		Run #10 1535
	1.7/2.5	NA	NDA		25-26.7' SAA 26.7-27.5 No Recovery			Run #11 1552
30	2.5/2.5	0121-97 1135 29.5-30	NDA		27.5-30' Grayish orange non-weakly welded dry tuff.			Run #12 1602 End of day 1625

Prepared By J. Walterscheid Date 3/11/97 Checked By [illegible] Date 3/28/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-025 TA/OU 21 Drill Depth From 30 To 60 Page 2 of 3

Driller Stewart Bro Box #(s) NA Start Date/Time 3/10/97 1020 End Date/Time 3/11/97 1430

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split Spoon/Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaylical Sample Number	Field Screening Results	Top/Bottom of Core In Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
30	2/2	NA	NDA	NA	30-32' Grayish orange, dry (dusty) mix of 70% soft non welded tuff with 30% weakly welded tuff fragments.		Bandelier Tuff Unit #3	3/11/97 Run #13 0845
	3/3	NA	NDA		32-35' SAA			Run #14 0905
35	1.5/25	NA	NDA		35-36.5' SAA with minor clay filled fracture at 36'. Clay is ~~weakly~~ slightly moist.			Run #15 0920
					36.5-37.5 No Recovery	Loss		
	1.7/25	0121-97 1136 38.8-39.3	NDA		37.5-39.3' SAA minor clay filled fracture at 39'. Trace moisture in fracture fill.			Run #16 0941
40					39.3-40' No Recovery	Loss		
	2/25	NA	NDA		40-42' Grayish orange dry mix of 70% soft non-welded tuff with 30% welded tuff. Brown mottled tuff at 41' and 42'.			Run #17 1000
					42-42.5' No Recovery	Loss		
45	2.5/2.5	NA	NDA		42.5-45' Grayish orange dry, mix of mottled brown gray soft non welded tuff with 20% welded tuff fragments. 1" clay zone at 45'.			Run #18 1017
	2/2.5	0121-97 1137 45-46	α: 115cpm β,γ: 120cpm 45-46.5		45-46.5' dk brown moist fracture zone mixed with soft non-welded tuff. 15% clay.			Run #19 1030 high H2O content in fracture as compared to tuff.
					46.5-47' dk gray dry soft non welded tuff.			
					47-47.5 No Recovery	Loss		
	1.5/2.5	NA	α: 55cpm β,γ: 140cpm 47.5-49		47.5-48.5 Fine grain silty sand (?) moist, 1" piece of rounded dacite (?) pebble in sand.			Run #20 1055 small paleo channel?
50					48.5-49 FeOx stained tuff with clay filled fracture.			
					49-50 No Recovery	Loss		
	1.3/2.5	NA	NDA		50-51.3' Brown moist, soft, weathered tuff mixed with 15% white weakly welded pieces of tuff. Fines are silty			Run #21 1125
					51.3-52.5 No Recovery	Loss		
	1.5/2.5	NA	NDA		52.5-54 Mottled brown/lt. gray weakly welded weathered tuff. Trace moisture.			Run #22 1135
55					54-55 No Recovery	Loss		
	1.5/2.5	NA	NDA		55-56.5' lt brownish gray, dry, non welded tuff. Trace pumice.			Run #23 1147
					56.5-57.5 No Recovery	Loss		
	1/2.5	0121-97 1138 58-58.5	NDA		57.5-58.5 SAA			Run #24 1202
60					58.5-60 No Recovery	Loss		Lunch 1220

Prepared By J. Wattersteed Date 3/11/97 Checked By [illegible] Date 3/28/97

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 16-025 TA/OU 21 Drill Depth From 60 To 70 Page 3 of 3

Driller Stewart Rio Box #(s) NA Start Date/Time 3/10/97 1020 End Date/Time 3/11/97 1430

Drilling Equip./Method CME 75/ Hugen Sampling Equip./Method Split Spoon / Core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Anaytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
60	2.5/2.5	NA	NDA		60-62.5' Light brownish gray (5YR 6/1) mix of 60% non-welded tuff w.th 40% welded tuff fragments. Trace moisture.		Unit #3	Run #25 1345
	1.5/2.5	NA	NDA		62.5-64' SAA 64-65' No Recovery	Loss		Run #26 1358
65	2/2.5	NA	NDA		65-67' Mo Hkd brown/gray mix of non welded tuff w.th tuff welded tuff fragments. 67-67.5' No Recovery	Loss		Run #27 1410
70	2.5/2.5	0121-97 1139 69.5-70	NDA		67.5-70' SAA			Run #28 1420
					70ft Total Depth			

Prepared By J. Wattersbach Date 3/11/97 Checked By [illegible] Date 3/28/97

R.1

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

PRS #_21-018___Supplement # (if Applicable)_____ ER ID #_____

Hardcopy Electronic Copy (circle all that apply)

Name of Unit MDA V

Date Due to NMED:_April 1, 2001_

Data Types	Depth & Units	Sample Medium	Analyte Name	Sample Results & Units	Data Validation Qualifiers	Collection Date	Sample Matrix	Request Number	Name of Analytical Lab & Date Submitted	Date of Analysis	Analytical Suite	Information Does Not Exist	Information Included in this Packet	Notes/Comments
Core Logs (not in prev. reports)													x	
Well Construction Details														
Pilot Testing Reports (not prev. submitted)														

Signature: [signature]

Name (print):John Hopkins

Date: 4/23/01

Environmental Restoration Project
Los Alamos National Laboratory
Data Submittal in Response to NMED Question 18

CHECKLIST INSTRUCTIONS

The submittor of each PRS packet is to include this checklist with each packet of information collected in response to Question 18 of the February 12th, 2001 NMED request for information.

If additional information is submitted for a PRS after the original packet has been submitted to RPF, the submittor assigns a (sequential) supplement number in the space provided, so that all documentation relative to that PRS may be tracked. For example, the space provided for a supplement number remains blank for the first submittal packet for a PRS. The second submittal for that PRS would be assigned supplement 1; the third submittal, supplement 2, and so forth.

The submittor assigns a unit name for each PRS. The unit name is a descriptor for the PRS. For example, Septic Tank 12-253, MDA M, Western Steam Plant, 260 Outfall, etc.

RPF personnel assign a reference number to each PRS packet and include it in the space provided.

The submittor checks each cell in the spreadsheet as applicable. It is not necessary to put N/A in cells that are not applicable, just leave the cell blank. Brief notes/comments may be made for each data type as deemed necessary. For example, "XRF data is included in sample collection logs."

If necessary, add any additional data types in the blank cells provided at the end of the checklist.

The submittor of each PRS packet must sign the checklist, print their name, and provide the date the packet is submitted to RPF in the respective spaces provided on page 2 of the checklist.

Any questions about filling in the checklist may be addressed to Holly Wheeler-Benson (7-1312) or Linda Nonno (5-0725), Regulatory Compliance.

MEMORANDUM

WGII/PMC/SEA
Los Alamos Team
2237 Trinity Drive
Bldg. 2, 1st Floor
Los Alamos NM 87544
Tel: (505) 662-3700
Fax: (505) 662-1398

TO: **John Hopkins**

FROM: John Smith

DATE: April 20, 2001

SUBJ: **MDA V RFI Data Provided**

Based on your review of the available data resources for MDA V, the following items you requested are provided as attachments to this memo.

- MDA V Borehole Logs

As I mentioned before, the available borehole logs were not presented in the MDA V RFI Report (LA-UR-96-2735, RPF 54969), and the only version of these that are available are copies of the handwritten field logs. The logs are included under the following tabs, and are also available at the RFP references given.

Tab 1 21-2517 (RPF 53747)

Tab 2 21-2518 (RPF 53747)

Tab 3 21-2519 (RPF 53747)

Tab 4 21-2520 (RPF 53747)

Tab 5 21-2521 (RPF 53747)

Tab 6 21-2522 (RPF 53747)

Tab 7 21-2523 (0-320 ft) (RPF 53754.1 - .12)

Tab 8 21-2523 (320-680 ft) (Not identified in RPF search)

Tab 9 21-2580 (RPF 53747)

Please let me know if there is any other data resource I can provide for MDA V.

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2517 TA/OU 21/1106 Drill Depth From 0 To 25 Page 1 of 4

Driller Layne Box #(s) 1-5 Start Date/Time 9/27/0900 End Date/Time 9/27/1100

Drilling Equip./Method CME 750/AUGER Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	5/5 100%		BACK-GROUND		0-0.3 Silty sandy soil, DRY Mod yel brn 10YR 5/4		F-05	
					0.3-0.8 Clayey zone with Roots Mod brn 5YR 4/4			
					0.8-5.0 Partially welded Tuff, Hard, DRY, crumbly in places. Grey Pumice - 1cm 5-10% ≈ 15% cryst in Grey Ash matrix 11.9y (N7)		Unit 3 Tshirege member Bandelier Tuff.	
	5/5 100%				5-10 As above Partially welded Upper phase altered Tuff, small amount of ~~ch~~ caliche (whitish Residue) @ 5-5.2'			
	5/5 100%				10-15 as above			
	5/5 100%				15-20 as above			
	5/5 100%				20-25 as above			

Prepared By [signature] Date 9/27/94 Checked By [signature] Date 9/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2517 TA/OU 21/1106 Drill Depth From 25 To 60 Page 2 of 4

Driller Layne Box #(s) 6-12 Start Date/Time 9/27/1100 End Date/Time 9/27/1430

Drilling Equip./Method CME 750 / AUGER Sampling Equip./Method Split core barrel / cont. core

Depth (Feet)	Recovery (feet per foot/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	5/5 100%		Brick grant.		25-30 As above Tuff consistant in Texture & hardness		Bandelier Tuff Tshirley member Unit 3 Non-welded member	
	5/5 100%				30-35 As above.			
	5/5 100%				35-40 As above			
	5/5 100%				40-45 As above.			
	5/5 100%				45-50 Tuff becoming softer more crumbly, some Silver-Gray pumice.			
	5/5 100%				50-55 Non-welded Tuff to Partially welded, Crumbly Dry Tuff. @ 51' Non welded unit of Bandelier Tuff			
	5/5 100%				55-60 Non welded Tuff. Silver-Gray Pumice ~5% ~1% Lithics in soft Ash matrix			

Prepared By D. Hooper Date 9/27/94 Checked By Jeff Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2517 TA/OU 21/1106 Drill Depth From 60 To 95 Page 3 of 4

Driller Layne Box #(s) 13 - 19 Start Date/Time 9/27/1430 End Date/Time 9/27/1635

Drilling Equip./Method CME 750/AUGER Sampling Equip./Method Split core barrel/ cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	5/5 100%		Back-ground		60-65 Tuff V SOFT crumbly, DRY		Bandelier Tuff.	
	5/5 100%				65-70 AS above			
	5/5 100%				70-75 AS above			
	5/5 100%				75-80 AS above			
	5/5 100%				80-85 AS above			
	5/5 100%				85-90 ~86 FT Tuff becomes slighty hard but still crumbly slight color change @~89' to Pinkish gy 5YR 8/1		upper welded member	
	5/5 100%				90-95 Tuff non to Partially welded texture as above color Pinkish gy 5YR 8/1		Unit 2 Tshirege member Bandelier Tuff	

Prepared By [signature] Date 9/27/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2517 TA/OU 21/1106 Drill Depth From 95 To 122.5 Page 4 of 4

Driller LAYNE Box #(s) 19-25 Start Date/Time 9/28/0800 End Date/Time 9/28/1000

Drilling Equip./Method CME750/AUGER Sampling Equip./Method Split Core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	5/5 100%		Bar/R-grave		95-100 not welded To Partially welded Tuff, color as above ~5% Grey pumice in ash matrix 10-15% cryst. Tuff alternates from soft To Hard & brittle.		Unit 2 Tshirege member Bandelier Tuff.	Hand Drilling Bit is Grinding Rock so Good Recovery but Tuff is not coming out as "Solid core". no option To Technique.
	5/5 100%				100-105 as above			
	5/5 100%				105-110 as above			
	5/5 100%				110-115 as above			
	5/3.5 70%				115-120 as above. Tuff becoming soft @ ~118'			
	2.5/2.5 100%				120-122.5, as above. zones of Harden, denser Tuff T.D = 122.5' → Refusal			projected T.D. = 125' stopped @ 122.5'

Prepared By [signature] Date 9/28/94 Checked By [signature] Date 1/3/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2518 TA/OU 21/1106 Drill Depth From 0 To 10' Page 1 of 3

Driller Layne Box #(s) _____ Start Date/Time 7/18/94 1700 End Date/Time 7/19/94 0830

Drilling Equip./Method Failing F-10 / AUGER Sampling Equip./Method Split core barrel / cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core / Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Backgrd.		0-2.0 Silt and Sand with Rounded Pebbles to ~½", Pale yellowish brn (10YR 6/2) DRY		Fill material	
					2.0-2.5 Fine Silt with ~20% sand and rare pebbles, DRY Lt brn gy (5YR 6/1)			
					2.5-4.5 Silt and clay with ~20% sand, DRY, cohesive but crumbles in hand. Rare pebbles and stringers of silty Gy material			
					4.5-7.5 coarse pebbles & cobbles			Logged from cuttings no recovery.
					7.5-10 devitrified {partially to non-welded tuff, ~5% pumice most ~1cm, 10-15% cryst, in ash matrix, some brownish staining		Bandelier Tuff Unit 3	

Prepared By D. Stager Date 7/19/94 Checked By [illegible] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2518 TA/OU 21/1106 Drill Depth From 10 To 40' Page 2 of 3

Driller Layne Box #(s) _____ Start Date/Time 7/19/0830 End Date/Time 7/19/1100

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont core

Depth (Feet)	Recovery (feet per foot/%)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Backged.		10-15 AS above, Red-brn Stringers of clayey material Present, DRY some staining of tuff to lt. brn gy (5YR 6/1) 15-20 as above, Stringers absent some discoloration @ ~19 ft to Grey brn. 20-25 AS above (7.5-10') Brn Stringers of material present. 25-30 AS above 30-35 AS above 35-40, 35-37 no recovery non to Partially welded Tuff with Larger size pumice 1-2cm grey green to med gy 10% cryst in ash matrix DRY, med gy (N5) to lt. gy (N7) @ 39.5-40 FT Red brn Stringers in tuff.		Unit 3 Bandelier Tuff	

Prepared By D. Stroper Date 7/19/94 Checked By [illegible] Date 1/3/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2518 TA/OU 21/1106 Drill Depth From 40 To 75' Page 3 of 3

Driller Layne Box #(s) _____ Start Date/Time 7/19/1100 End Date/Time 7/19 1730

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont core.

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Backgrd		40-45 As above (35-40) @ 42.5-45 numerous stringers & mottled staining			
					45-50 As above but Tuff soft're more friable.			
					50-55 As above			
					55-60 As above			
					60-65 Non welded devitrified tuff 5-10% Grey pumice 10% Qtz & Sanidine cryst. Rare lithics in ash matrix lt. gy (N7) Dry. Slight alteration. Tuff is soft're than 10-45 ft above.			
					65-70 As above (60-65 F)			
					70-75 As above			
					T.D = 75 FT.			

Prepared By [signature] Date 7/19/94 Checked By [signature] Date 1/3/95

R1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2519 TA/OU 21/1106 Drill Depth From 0 To 25 Page 1 of 2

Driller Layne Box #(s) _____ Start Date/Time 7/20/1500 End Date/Time 7/28/0900

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Background.		0-2.0 Silty sand with ~10-20% pebbles 2.0-3.0' lt gray tuff, loose dry 3.0-5.0 Coarse pebbles and cobbles to 4-5" dia. Rounded 5.0-10' As above (3-5')		Fill material	3-10 FT no recovery logged from cuttings
					10-15' non to partially welded tuff with ~5% Gray pumice and 10% qtz & sanidine cryst in ash matrix. med lt. gy (N7), dry. Lithics rare to absent. Some stringers of brownish "oxidation" 15-20 As above, Large glassy lithic @ 18' "oxidation" stringers absent. 20-25 As above		Bandelier Tuff Unit 3	

Prepared By D. Stagner Date 7/21/94 Checked By [illegible] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2519 TA/OU 21/1106 Drill Depth From 25 To 75 Page 2 of 2

Driller Layne Box #(s) _____ Start Date/Time 7/21/0900 End Date/Time 7/21/1500

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split ~~spoon~~ barrel/cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Background		25-30 AS above			
					30-35 AS above			
					35-40 AS above			
					40-45 AS above, but mottled colored "oxidation" zone 42.5-43.0' Tuff dry, crumbly		Unit 3 Bandelier Tuff	
					45-50 AS above			
					50-55 AS above			
					55-60 AS above			
					60-65 AS above			
					65-70 AS above			
					70-75 AS above T.D = 75'			

Prepared By D. Thompson Date 7/21/94 Checked By [illegible] Date 1/3/95

R1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2520 TA/OU 21/1106 Drill Depth From 0 To 20 Page 1 of 3

Driller Layne Box #(s) _____ Start Date/Time 7/22/0900 End Date/Time 7/22/1000

Drilling Equip./Method Failing F-10/augen Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Background		0-3.2' Silt and Sand with ~10% rounded pebbles, Roots present. Mod yellowish brn (10YR 5/4), dry to moist.			
					3.2-5.0' Loose volcanic tuff mixed with silt & sand material ~40% Tuff lt olive gy (5Y 6/1) to Lt gy (N7) and ~60% silt & sand material, Mod yel brn (10YR 5/4)		Fill material	
					5-10' Rounded to subrounded Pebbles, cobbles 4-10" dia.			5-10 no Rec. Logged from cuttings
					10-15' non to partially welded devitrified Tuff with ~15% Qtz & Sanidine cryst, Grey Pumice and Rare lithics in Ash matrix, Lithics are Rounded. "Oxidation" Zone @ 14.5'		Bandelier Tuff	
					15-20 as above. "oxidation" Zone @ 17.8'		unit 3	

Prepared By D. Stoper Date 7/22/94 Checked By J. Stoker Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2520 TA/OU 21/1106 Drill Depth From 20 To 65 Page 2 of 3

Driller Layne Box #(s) _____ Start Date/Time 7/22/1000 End Date/Time 7/25/0915

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Ft'ow)	Recovery (feet per foot/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Background.		20-25 as above, "oxidation" ~ 24.8 FT.			
					25-30 as above			
					30-35 as above, "oxidation" zone 32.0-32.5 FT.			
					35-40 as above			
					40-45 Tuff becoming more pomice rich (20-25%) 1-3cm in Dia. Tuff more dense, hardure Fractures @ 41.8 and 42.3 FT.		Unit 3 bandelier Tuff	
					45-50 non to Partially welded Tuff as 10-15' above.			
					50-55 as above (45-50')			
					55-60 as above			
					60-65 as above			

Prepared By D. Stringer Date 7/25/94 Checked By [illegible] Date 1/3/95

R1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2520 TA/OU 21/1106 Drill Depth From 65 To 75 Page 3 of 3

Driller Layne Box #(s) _____ Start Date/Time 7/22/0915 End Date/Time 7/22/1015

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per foot/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Backfilled.		65-70 as above 70-75 as above fracture and 'oxidation' zone 72-73.2 ft. T.D = 75 ft		Bandelier Tuff Unit 3	

Prepared By D. Thompson Date 7/22/94 Checked By [illegible] Date 1/3/95

R1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2521 TA/OU 21/1106 Drill Depth From 0 To 11.5 Page 1 of 4

Driller Layne Box #(s) 1 & 2 Start Date/Time 8/8/0945 End Date/Time 8/8/1030

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per foot/%)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	2.5/5 50%		Background		0 - 0.7 Silty and Sand with some clay and pebbles slighty moist to dry med brn (5YR 4/4)		Fill material	
					0.7 - 5.0 soft, loose, crumbly. Tuff slighty moist to dry Lt. Brn Grey (5YR 6/1). 2.5 - 5.0 no recovery.			
					5.0 - 7.1 as above			
	0/0 0%				7.1 - 7.5 Pebbles & cobbles 2-4" DIA rounded. Basalts Quartzites.			
					7.5 - 11.5 as above no recovery logged from cuttings			Drilled 7.5 - 11.5' Through gravel layer with center bit. No sample.

Prepared By D Stropes Date 8/8/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2521 TA/OU 21/1106 Drill Depth From 11.5 To 35 Page 2 of 4

Driller Layne Box #(s) 2-4 Start Date/Time 8/8 1030 End Date/Time 8/8/1145 1994

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method split core barrel / cont. core.

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	2.5/3.5 71%		Back-ground		11.5 - 15.0 NON to partially welded Tuff with ~10% Qtz & Sanidine cryst. 1-2% Grey pumice in Ash matrix, Absent To Rare Lithics, Dry, crumble to mod. cohesion, Mel lt. gy (N6) to Med. gy (N5) @ ~15.0 Stringers of Slighty Alteration in Tuff.			
	2.5/5.0 50%				15-20 As above Alteration Stops ~ 15.5. Dense lense @ 19.5 - 19.7 FT.		Bandelier Tuff.	
	2.5/5.0 50%				20-25 As above some 1 cm pumice Silver-grey in color.			
	2.5/5.0 50%				25-30 same as above		Unit 3	
	2.5/5.0 50%				30-35 Same as above @ 34.2-35 FT. mottled Alteration from Grey color to Dull brn. Stringers			

Prepared By G. Stoopes Date 8/8/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2521 TA/OU 21/1106 Drill Depth From 60 To 75 Page 4 of 4

Driller Layne Box #(s) 9-11 Start Date/Time 8/8 1530 End Date/Time 8/8 / 1630 1994

Drilling Equip./Method CME 750 / AUGER Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	3.6/5.0 72%		Back-ground.		60 - 65 SAME AS above Rusty colored STAINING of Tuff Through out, To ~63ft. Then more fresh looking non-welded Tuff, U H. gy (N8) to H. gy N7. soft, ~DRY		non-welded member Bandelier Tuff	
					65 - 70 non welded Tuff, same as above except no STAINING or clayey material present.			
					70-75 AS above			
					STOPPED DRILLING @ 75 FT.			START TO pull AUGERS @ 1630

pared By G. STOUPES Date 8/8/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2522 TA/OU 21/1106 Drill Depth From 0 To 10 Page 1 of 4

Driller Layne Box #(s) 182 Start Date/Time 9/28/1600 End Date/Time 9/28/1620

Drilling Equip./Method CME 750/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			BACK-GROUND		0 - 0.6' Silty sandy soil with some pebbles, Roots present ~pale yel. brn 10YR 6/2		Fill Material Tuff adsorption Bed	
					0.6 - 2.5 Grey Tuff fill, crumbly, DRY			
					0.25 - 3.5 Silty Sandy "soil" with some clay, dry to moist Mod yel brn 10YR 5/4			
	5/5 100%				3.5 - 5.0 "Bandelier Tuff" H gray (N7) to Med H. gy (N6) < cm size pumice with 10% cmpits. in ash matrix, Partially to non-welded Upper phase altered Tuff. DRY. Hard to crumbly, Fill			
	3/5 60%				5.0 - 6.2 As above.			
					6.2 - 10.0 pebble & cobbles, Rounded to sub rd. in matrix of coarse sand & silt. DRY to moist. cobble Fill. Various lithologies			

Prepared By G. Stoupes Date 9/28/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2522 TA/OU 21/1106 Drill Depth From 10 To 30 Page 2 of 4

Driller Layne Box #(s) 3-6 Start Date/Time 9/28/1620 End Date/Time 9/28/1720

Drilling Equip./Method CME 750 Auger Sampling Equip./Method Split core barrel / cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	5/5 100%		Back-ground.		10 - 10.2 pebble & cobble fill as above.		Fill	
					10.2 - 15.0 Partially to non-weld Tuff with < cm size Pumice ~5% - 10% cryst in Gray Ashy matrix, lithic Rare to absent. lt gy (N7) Hard to crumbly, DRY.		Bandelier Tuff unit 3	
	15 100%				15-20 as above, Root Fracture zone ~14-15'			
	5/5 100%				20-25 as above Tuff less coherent. more crumbly			
	5/5 100%				25-30 As above Tuff powdery DRY U. crumbly.			

Prepared By D. Stroper Date 9/28/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2522 TA/OU 21/1106 Drill Depth From 30 To 65 Page 23 of 4

Driller Layne Box #(s) 7-13 Start Date/Time 9/29/0800 End Date/Time 9/29/0925

Drilling Equip./Method CME 750/AUGER Sampling Equip./Method SPIT core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/%)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	5/5 100%		Backgrd.		30-35 Partially to non welded Tuff, Dry soft, crumbly. Pinkish Grey 5YR 8/1 to LT gy N7 Small linear brn zones of alteration mm-cm wide		Bandelier Tuff Unit 3	
	5/5 100%				35-40 As above oxidation "spots" Throughout core			
	5/5 100%				40-45 As above			
	5/5 100%				45-50 As above less alteration @ 49 Fracture with alteration -cm wide			
	5/5 100%				50-55 Soft crumbly Tuff, non welded to Partially welded. lt gy (N7)			
	5/5 100%				55-60 mostly non-welded Tuff. Slight alteration @ 56.8'			
	5/5 100%				60-65 Non welded Tuff		Non-welded Tuff	

Prepared By D. Thompson Date 9/29/94 Checked By J. Illestas Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 21-2522 TA/OU 21/1106 Drill Depth From 65 To 75 Page 4 of 4

Driller Layne Box #(s) 14 & 15 Start Date/Time 9/29/0925 End Date/Time 9/29/1005

Drilling Equip./Method CME 750 / AUGER Sampling Equip./Method Split core barrel / cont. core

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	84/5 80%		Backgrd.		65-70 non welded Tuff V: Soft crumbly alteration absent.		non-welded Tuff	
					70-75 As above			
					T.D. = 75'			

Prepared By [signature] Date 9/29/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 0 To 39 Page 1 of ____

Driller Layne Box #(s) 1-8 Start Date/Time 7/26/1700 End Date/Time 7/27/0930

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery Rate per Run %	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			RAD 0-15 FT 100 cpm more than Background.		0-0.5 S.Lt Sand with some coarse sand, Pebbles, slightly moist. Mod yell. brn (10YR 5/4)		L-ON	elevated Beta-Gamma Readings 0-15 FT. ~100 cpm more than back Ground. Background 180-200 cpm
					0.5-5.0 non to partially welded Vapor phase altered Tuff, DRY to Slightly moist with ~15% Qtz & Sanidine crystals, ~5% 1-2 cm Grey pumice, Rare Lithics in Ash matrix Very lt. gy (N8) to Lt. gy (N7) @ ~6.4 FT & 7.0 Fracture filled with Red brn clay/altered Tuff.		Unit 3 Tshirege member Bandelier Tuff	
			15 FT ↓ Back-ground.		5.0-20 FT. same as above no fractures or altered zones @ ~7.6 FT & 8.3 FT.			
					20-39 FT non to partially welded Tuff Soft & Crumbly To Dense and hard ~20% crysts ~5% Grey pumice. DRY, Unit 3 ~75% Ash matrix			

Prepared By G. Stoopes Date 7/26/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 39 To 102 Page 2 of ____

Driller Layne Box #(s) 8-19 Start Date/Time 7/26 0800 End Date/Time 7/28/1400

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per foot %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Back-Ground		39-40 Same as above except softer more crumbly.		Unit 3 Ts member	
					40-~~70~~ 65 (DD 7/26/94) Same as above except more abundant & larger pumice 1-5cm Grey to Greenish Grey & whiteish @ 50 ft Tuff is much softer crumbly to ~ 55.2 FT.			
					65-90 Same as above Except non-welded Tuff, Soft crumbly		Non-welded member	65 ~ 95 FT. Non-welded unit of Tsh. member
					90-95- Tuff becoming more welded, dense, harder.			
					95-102 partially welded Tuff color change to Gray Org. pink (5YR 7/2).		unit 2 Tsh member	@ ~ 95 FT probable start of unit 2 Tsh member.

Prepared By G. Stoopes Date 7/28/94 Checked By J. Shu Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 102 To 135 Page 3 of ____

Driller Layne Box #(s) 19-22 Start Date/Time 7/29/0900 End Date/Time 8/1/ ____

Drilling Equip./Method Failing F-10/AUGER Sampling Equip./Method Split core barrel/cont. core.

Depth (Feet)	Recovery Feet per Foot/ %	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			Back-ground		102 - 110 Mod. to densely welded Tuff ~ 20% qtz & sanidine cryst. ~ 5% Grey pumice 1-2 cm, some are slightly to well compacted (fiamme), rare lithics in ~75% ash matrix, dense, hard dry, grey orange pink (5YR 7/2)		Unit 2 Tshirege member Bandelier Tuff	Hand Drilling broke down 7/29
					110 - 115 Same as above			
					115 - 120 as above but much less welded, softer material			From 115 to 129.8 Alternating layers of partially welded Tuff with more densely welded Tuff.
					120 - 125 As above, Densely welded lense @ 122-122.5 & 124-124.5			
					125 - 130 As above, more dense welding 127.5 - 128.0 & 129.8 - 130			
					130 - 135 No recovery assume as 102 - 110 above			Much Hand Drilling @ 130 ft.

Prepared By G. Stoyes Date 8/1/94 Checked By J. Slotw Date 8/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 135 To _____ Page 4 of _____

Driller Layne Box #(s) 22-28 Start Date/Time 8/2/0800 End Date/Time 8/2/1400

Drilling Equip./Method Failing F-10/AUGER Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/%)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
			BACK-GROUND		135-140 med. to densely welded Tuff as above 100-110 FT.		Tshirege member Bandelier Tuff	
					140-150 as above			
					150-155 as above, @ 155 FT fracture with Red brn clayey material present with Relict texture of Tuff.			
					155-160 Same as above Fracture cont. To 157 FT. Frac. Approx. 2 FT long cut diag. through core few mm wide filled with Red brn clayey material with Relict Tuff Texture			Sample of Fracture 155.2-155.7
					~~160-165 same as above no~~ Fracture(s) dense welded Tuff.		Unit 2	
					165-170 color change to Lt grey (N7) as above mod. welded Tuff			possible start of unit 1V

Prepared By G. Stropes Date 8/2/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2323 TA/OU 21/1106 Drill Depth From 170 To 190 Page 5 of ____

Driller Layne Box #(s) 29-31 Start Date/Time 8/2/1400 End Date/Time 8/3/0930

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (Feet per foot %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	5/5 100%		Back-ground		170-175 · same as above except less welded, softer material - partially welded Tuff, no texture changes		Unit 1V Tshirege member Bandelier Tuff	easier drilling Transition zone to devitrified non-welded Tuff of unit 1V
	5/5 100%				175-180 non-welded Tuff texture - same as above, grey pumice 1-2 cm, ~15% crysts. crumbly core, dry.			
	5/5 100%				180-185 - partially to non welded Tuff, ~10% qtz & sand. crysts, Dark Grey pumice ~2-3% ~1-0.5 cm in ~85 ash matrix, dry crumbly ~182 FT more coherent 183-185 Devitrified Tuff			
	5/5 100%				185-190 SAME as above, more abundant grey pumice 1-2 cm and larger ~3cm 5-10% pumice. Color change to Grayish Org. Pink (10R 8/2) ~189 FT more pumice rich ~15-20%			

Prepared By G. Stoupes Date ____ Checked By J. Statz Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 190 To 220 Page 6 of ____

Driller Layne Box #(s) 32-38 Start Date/Time 8/3/0930 End Date/Time 8/3/1600

Drilling Equip./Method Failing F-10 / Auger Sampling Equip./Method Split core barrel / cut core

Count Feet	Recovery Blot per foot %	Field Screening Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	9/10 90%		Back-ground		190 - 200 Slightly To non welded Revitrified Tuff, pumice ~ 20% 1-3cm on more. lt To DK Grey. - 5-10% crysts, Lithics Rare to absent in ~ 70% ash matrix, DRY, crumbly, color as above. - to			
	5/5 100%				200 - 205 as Above, color change To lt gy (N7) pumice Are Grey to Reddish hue.			
	4.4/5 92%				205 - 210 as above pumices becoming more Red brn to chocl. brn in color			
	4.6/5 93%				210 - 215 Same as above color Pinkish Grey (5YR 8/1)			
	5/5 100%				215 - 220 - pumice Rich some pumice more than 1" dia. pumices matrix color ~~brn~~ GRAY orange (10YR 7/4).			@ 220 PT near vapor phase notch & unit 1G

Prepared By G. Stoopes Date 8/3/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TAOU 21/1106 Drill Depth From 220 To 240 Page 7 of ____

Driller Layne Box #(s) 39-42 Start Date/Time 8/3/1600 End Date/Time 8/4/0900

Drilling Equip./Method Failing F-10/AUGER Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery (feet per feet/%)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	5/5 100%		Back-ground		220-225 as above to ~224 FT @ 224 FT color change to lt. Brn (5YR 6/4) 1-2% Grey lithics (Dacites/andesites) Large pumice ~4cm pumice becoming grey in color instead of chocl. Brn. at vapor phase notch and transition to unit 1G Vitric non-welded Tuff.		Vapor phase notch Unit 1V	Vapor phase Notch 224-225 FT.
	5/5 100%				225-230 Vitric non-welded Tuff, Slightly moist, lt. brn (5YR 6/4) Soft to not Hard crumbly. lt. gray pumice~1cm 1-2% gray lithics, ~10% cryst. may be Rare cpx & Hbl. in ash matrix, "fresh pumice"		Unit 1G Tsh member Bandelier	
	4.5/5 90%				230-235 same as above more coherent 232.5-235			
	36/5 72%				235-240 as above			

Prepared By G. Stoopes Date 8/4/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 240 To 270 Page 8 of ____

Driller Layne Bor 8(1) 43-48 Start Date/Time 8/4/0900 End Date/Time 8/4/1600

Drilling Equip/Method Boiling F-10/Auger Sampling Equip/Method Split core barrel/cont core

Sample Interval	Recovery Per Sample Interval	Field Screening Results	Field Screening Results	Vegetation of Core in Box	Lithology · Petrology · Soil	Graphic Log	Lithologic Unit	Notes
	34/5 68%		Back-Ground		240 - 245 Same as above, soft crumbly		Unit 1G of Tshirege member Bandelier Tuff	unit 1G is generally soft crumbly in core & slightly moist.
	33/5 66%				245 - 250 Same as above some pumice ~3 cm in Dia Silver-Grey color			
	34/5 68%				250 - 255 Same as above Large ~4cm Pumice present			
	4/5 80%				255 - 260 Same as above, some, 0.5 to 1" Lithics dull purple in color may be Altered Rhy.			
	4/5 80%				260 - 265 - As above, color slightly more "Greyish mottled" less pumice.			
	43/5 86%				265 - 270 0 ~ 265 color change to Pinkish grey 5YR 8/1 Tuff here is pumice poor and more lithic rich - lithics ~3% or more consist of altered lavas Grey to Reddish in color, ~10% crystals v soft to mod soft in core			

Prepared By G. Stoopes Date 8/4/94 Checked By [illegible] Date 1/3/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY | CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 270 To 297.7 Page 9 of ____

Driller Layne Box #(s) 49-54 Start Date/Time 8/4/1600 End Date/Time 8/5/0900

Drilling Equip/Method Failing F-10/auger Sampling Equip/Method Split core barrel/cont. core

Core Group	Recovery Box in Inches	Field Screening Results Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology • Petrology • Soil	Graphic Log	Lithologic Unit	Notes
	32/5 64%		Background		270-275' as above (265-270) non-welted vitric Tuff.		Tshirege member Bandelier Tuff	
	9/5 80%		Background		275-280' As above			
					280-285' as above color very pale orange (10YR 8/2)			
	4/5 80%				285-290' same as above			
	4/5 80%				290-295' same as above			
	22/5 44%				297.7 TD. 8/5/94 295-300 no recv. 295-296.8 & 296.8-297.7 same as above "sandy" part of unit 16 90% ash matrix		unit 16	End of unit 16

Prepared By G. Stoopes Date 8/5/94 Checked By [signature] Date 1/12/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 297.7 To 305 Page 10 of ____

Driller Layne Box #(s) 54-55 Start Date/Time 8/5/0900 End Date/Time 8/5/1000

Drilling Equip/Method Failing F-10 / AUGER Sampling Equip/Method Split core barrel / cont. core

Depth (Feet)	Recovery Box or Run No.	Field Borehole Analytical Sample Number	Field Screening Results	Tag Number of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	22/5 64%		Back-ground		297.7 - 300 FT. Tsankawi pumice with inner ash fall unit @ 298.0 - 298.2 · pale yellowish brn (10YR 6/2) moist. Pumice fall has Rare lithics, most pumice 1-2cm or less (breakage occurred during drilling) one large pumice ~4cm in dia @ ~290 Slight pink in color. Pumice v. lt gy (N8)		Tsankawi Pumice	
	23/5				NO REC 300 · 301.7 ; 301.7 - 302.8 epiclastic deposit reworked pumice sub angr to sub rd clasts. (10YR 6/2) @ 302.8 - 304.8 Fresh pumice, pumice fall unit of cerro Toledo Fm lt gy (N7) to Pale yel brn 10YR 6/2 pumice less than 1cm in size. (may be soil) @ 304.8 - 305 Ash unit with 1-2% cpx or Hbl cryst, and Rare grey lithics mm in size Mod. brn 5YR 4/4		Cerro Toledo Fm.	Pale yel brn. clasts - 0.5cm or less in size pumice unit 302.8 · 304.8 has pale yel brn (10YR 6/2) *Tuffaceous sand bed 303.5 - 304.2

Prepared By G. Stoopes Date 8/5/94 Checked By J. Slate Date 1/3/95

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 297.7 To 305 Page 10 of ____

Driller Layne Box #(s) 54-55 Start Date/Time 8/5/0900 End Date/Time 8/5/1000

Drilling Equip./Method Failing F-10 / AUGER Sampling Equip./Method Split core barrel / cont. core

Depth (Feet)	Recovery (Best per foot %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	32/5 64%		Back-ground		297.7 - 300 FT. Tsankawi pumice with inner ash fall unit @ 298.0 - 298.2. pale yellowish brn (10YR 6/2) moist. Pumice fall has rare lithics, most pumice 1-2cm or less (breakage occurred during drilling) one large pumice ~4cm in dia @ ~290 slight pink in color. Pumice v. lt. gy (N8)		Tsankawi Pumice	
	33/5				NO REC 300 - 301.7; 301.7 - 302.8 epiclastic deposit reworked pumice sub ang to sub rd clasts. (10YR 6/2) @ 302.8 - 304.8 Fresh pumice, pumice fall unit of cerro Toledo Fm lt gy (N7) to Pale yel brn 10YR 6/2 pumice less than 1cm in size. (may be soil) @ 304.8 - 305 Ash unit with 1-2% cpx on Hbl cryst, and rare grey lithics mm in size Mod. brn 5YR 4/4		Cerro Toledo Fm.	→ Pale yel brn. clasts - 0.5cm or less in size. pumice unit 302.8 - 304.8 has pale yel brn (10YR 6/2) "Tuffecous sand" bed 303.5 - 304.2

Prepared By G. Stoopes Date 8/5/94 Checked By J. Slate Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY — CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 305 To ~320 Page 11 of ____

Driller Layne Box #(s) 56-58 Start Date/Time 8/5/1000 End Date/Time 8/10/0900

Drilling Equip./Method Failing F-10/Auger Sampling Equip./Method Split core barrel/cont. core

Depth (Feet)	Recovery Per Run or Box per Foot	Field Sample Number/Laboratory Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	35/5 70%		Back-ground		No Recv. 305-306.5 306.5-307.0 epiclastic tuffeous sand similar to 308.7-308.8 307.0-309.9 - mod brn 5YR 4/4 to lt. brn (5YR 5/6) tuffeous sand clasts minor less in size lenses of lithic rich clasts. @ ~ 309.9 - Large 2-3cm pumice clasts in bottom of shoe.			Top part of bed 306.5 → may be soil Took additional sample of soil for moisture cont.
	2.5/5 50%				310-315 epiclastic beds const. of Grey to lt. brn tuffeous sands, with sub ang pumice to 2.4 cm, and a variety of lithics No recv. 310-312.5 or some compaction in sampler			Rod string drop @ 225 FT - drove sampler down into B.H. @ 1130 8/5/94 on 8/9/94 @ 1100, pulled auger string on unsuccessful attempt to fish rod string from B.H.
	38/50 76%				315-320 ~316-319.1 epiclastic unit, Tuffeous sands, pebbles (lithics) to 0.5 cm, sub ang to sub rd clasts mod brn 5YR 3/4 to dk yel brn 10YR 4/2 319.1-320 lt. gy (N7) tuffeous sands			

Prepared By G. Stoopes Date 8/5/94 Checked By [signature] Date 1/3/95

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LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID 2523 TA/OU 21/1106 Drill Depth From 320 To _____ Page 12 of _____

Driller Layne Box #(s) 59- Start Date/Time 8/10/0900 End Date/Time _____

Drilling Equip./Method Failing F-10/ Auger Sampling Equip./Method Split core barrel / cont. core

Depth (Feet)	Recovery (Feet per Feet %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes

Prepared By G. Stoopes Date _____ Checked By [signature] Date 1/3/95

R1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

BIT CUTTINGS LOG

Borehole ID 21-25523 Sample Type — From 320.0 To 660.0 Page 1 of 67.9C

By J. Crocker Date(s) 5/1/95 to 5/5/95 Checked By R. Bigan Date 5/23/95

TA/OU FU/TA-21 Box #(s) — Drilling Equip. J.R. T4W w/ODEX

Depth or Depth Interval	Amount recovered (No. of bags collected)	Sample Splits Amount, requester, organization	Lithology	Comment	
320-323 1615hrs 5-1-95	1	—	Cerro Toledo	5YR 8/1 to 5Y 8/1 No Pumice preserved; ~5%-7% dark grains (mafics?)/crystics(?)).	α=0 βT 118
323-326 1625hrs 5-1-95	1	—	"	Yellow grey cuttings 5Y 7/2. Coarser grain size; Abundant dark grains 30-17% No Pumice fragments observed.	α=0 βT 118
326-329	1	—	"	Same as Above	
329-330	1	—	"	Same As Above	
330-333	1	—	Cerro Toledo/ OTtcwi	330-332→Same as above. 332-333→ Contact w/ OTtcwi. Sharp color change. Reddish Brown 10R5/4. ~7% dark grains. No Pumice Preserved.	α=0 βT=1
333-340	1	—	OTtcwi	333-337' Same as above 337-340 Pale Yellow-Brown Fewer dark grains No Pumice Preserved.	α=0 βT=1
340-~~345~~ DC V 5-5-95 360	1	—	OTtcwi	Brownish grey 5YR6/1 Coarse lithics in cuttings. ~5% dark grains w/ possible Pumice fragments to ~5mm.	α=0 βT=1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

BIT CUTTINGS LOG

Borehole ID 21-2523 Sample Type — From 320.0 To 660.0 Page 2 of 6 7pc

By J. Crocker Date(s) 5/1/95 TO 5/5/95 Checked By R. Dagen Date 5/23/95

TA/OU 21/FU-1 Box #(s) — Drilling Equip. I.R. T4W W/ODEX

Depth or depth interval	Amount recovered (No. of bags collected)	Sample Splits Amount, requester, organization	Lithology	Comment	
350-355 5-2-95	1	—	c HDWi	Pale Yellowish-Brown 10YR 6/2. No Pumice Fragments aparent. Dark grains To ~12%	α=0 βγ=13
356-360 5-2-95	1		"	Few cuttings Recovered. Bleuish gray 5YR 6/1 ~10% Dark grains No aparent Pumice.	α=0 βγ=13
360-363 5-3-95	1	—	"	As above. But cuttings are coarser.	α=0 βγ=1
363-365	1	—	"	As above.	α=0 βγ=1
365-367	1	—	"	cuttings are oxidized. Pale Reddish Brown 10R5/4. Fewer Dark grains ~7% No Aparent Pumice	α=0 βγ=1
367-369	1	—	"	As above	α=0 βγ=1
369-370	1	—	"	As Above	α=0 βγ=1
370-376				As above but some what lighter in color 10R6/2 and perhaps 10% dark grains.	α=0 βγ=1
376-380	1		"	376-377 as above. 377-380 reddish Brown 10R 5/4. Fewer dark grains ~5-7%	α=0 βγ=1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

BIT CUTTINGS LOG

Borehole 52-2523 Sample Type _____ From ~~380.0~~ 320.0 DC To 660.6 Page 3 of ~~6~~ 7DC

By J. Crocker Date(s) ~~5-3-95~~ 5/1/95 DC 5/5/95 Checked By RPBlagg Date 5/23/95

TA/OU FH1/TA-21 Box #(s) — Drilling Equip. IR T4W w/ex

Depth or Depth Interval	Amount recovered (No. of bags collected)	Sample Splits Amount, requester, organization	Lithology	Comment	
380-386	1	—	OTOWi	Reddish Brown 10R 5/4, ~5% dark grains; No apparent pumice clasts preserved.	α=0 βγ=152
386-390 (100 bags)	1	—	OTOWi	Pale Red 10R 6/2 ~3% dark grains very fine grained cuttings. No pumice apparent	α=0 βγ=152
390-403	1	—	OTOWi	Orange-red 10R 7/2 Cuttings still very fine grained. Dark grains/lithic ~2%. No apparent pumice.	α=0 βγ=15
403-410	1	—	"	Orange-red 10R 7/2 as above w/ an increase in dark grains to ~5%	α=0 βγ=14
410-420	1	—	"	Reddish-Brown 10R 6/4 dark grains to ~5%. No pumice fragments observed.	α=0 βγ=1
420-430 (100 bags)	1	—	"	As above, but Light orange-pink 10R 6/4. Cuttings are still very fine grained	α=0 βγ=1
430-440				as Above.	α=0 βγ=1

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

BIT CUTTINGS LOG

Borehole ID 21-2523 Sample Type — From ~~440~~ 320.0 To 660.0 Page 4 of 6 7DC

By J. Crocker. Date(s) ~~5-3-95~~ 5-1-95 ~~00~~ 5-5-95 Checked By R. Bleger Date 5/3/95

TA/OU FU-VTA21 Box #(s) — Drilling Equip. I.R. T4W w/ ODEX

Depth or Depth Interval	Amount recovered (No. of bags collected)	Sample Splits Amount, requester, organization	Lithology	Comment	
440-450	1	—	Ottowi	Same as above. Lithics/dark grains increasing in abundance to ~10%.	α=0 βγ=139
450-455	1	—	Ottowi	10R 6/2 5-7% Lithics/dark grains. A few scattered grey pumice fragments to ~5mm diam. On the whole, cuttings are coarser.	α=0 βγ=180
455-460 1440 hrs 5-3-95	1	—	"	5R 5/2 3-4% Dark grains. No Pumice fragments.	α=0 βγ=180
460-465	1	—	"	5R 5/2 as above	α=0 βγ=144
465-470	1	—		5R 7/2 Very fine cuttings. No pumice clasts observed. 1-2% Dark grains.	α=0 βγ=144
470-473	1	—	"	5R7/2 same as above.	α=0 βγ=12
473-474	1	—	"	Med. greyish orange. 10R 7/2. Very fine grained cuttings. No Pumice. Increased Dark grains to ~5%	α=0 βγ=12
474-480	1	—	"	Greyish orange 5YR 7/1 ~5% Dark grains. No Pumice. observed.	α=0 βγ=129
480-485	1	—	"	Greyish orange 10R7/2. ~3-5% dark grains w/ a few grey pumice fragments to ~3mm.	α=0 βγ=14
485-495	2	—	"	as above.	α=0 βγ=15
—	—	—	—	—	

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

BIT CUTTINGS LOG

Borehole ID 21-2503 Sample Type — From 520 To _____ Page 5 of 7

By J Crocker Date(s) 5-4-95 Checked By R. Blagen Date 5/23/95

TA/OU FU-1 TA 21 Box #(s) — Drilling Equip. _____

Depth or depth interval	Amount recovered (No. of bags collected)	Sample Splits Amount, requester, organization	Lithology	Comment	
520-523	1	—	CTKWi	Same as above	α=0 βγ=32
523-530. 100 cks 5-4-95	4	—	"	10R 6/2 Pale red cuttings; ~3% Dark grains w/ rare fragments of gray pumice to ~3mm.	α=0 βγ=3
530-542	5	—	"	Pale Red (10R6/2) Very fine grained cuttings. ~3%-5% dark grains. Small grey pumice fragments to ~3mm. Cuttings are somewhat moist but not as moist as first two days of drilling.	α=0 βγ=2
542-573	8	—	"	Pale greyish Red 5R7/2. Very fine grained cuttings. Cuttings are fairly dry compared to early on. as above but lighter color (less water). ~3%-5% Dark grains, Rare 2-3mm pumice fragments	α=0 βγ=3
573-580	2	—	"	as Above. This portion of CTKWi has shown almost no variability	α=0 βγ=3

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

BIT CUTTINGS LOG

Borehole ID 25-03305 Sample Type — From 300.0 To 660.0 Page 86 of 167

By J Crocker Date(s) ~~5-4-95~~ 5-1-95 - 5-5-95 Checked By R. Blye Date 5/23/95

TA/OU FU-1/TA-21 Box #(s) — Drilling Equip. IR T4W w/ODEX

Depth or Depth Interval	Amount recovered (No. of bags collected)	Sample Splits Amount, requester, organization	Lithology	Comment	
580-590	3	—	OHCWi	10R 7/2 Fine grained cuttings Pale orangish Pink Rare pumice to 1mm 5% dark grains.	α=0 βγ=30
590-600 5-4-95	3	—	"	Same as above.	α=0 βγ=33
600-603 5-5-95	1	—	"	Greyish Red 10R 6/2 Fine grained cuttings 5% dark grains; No pumice fragments Fairly dry cuttings	α=0 βγ=30
603-606	1	—	"	Greyish-Red 10R6/2, Fine grained cuttings 5%-7% Dark grains No pumice Fragments.	α=0 βγ=30
606-610	1		"	Light Brownish-grey Fine grained cuttings 5YR6/1. 5%-7% dark grains. a few very small 1-2mm Pumice fragment.	α=0 βγ=30
610-612	1	—	"	Greyish-Red 10R6/2. Fine grained cuttings 6-7% Dark grains. No pumice fragments.	α=0 βγ=30
612-615	1	—	"	Greyish-Red 10R6/2 Fine grained cuttings. ~6% dark grains. No pumice	α=0 βγ=30
615-617	1	—	"	10R6/2, 7% dark grains. a few pumice fragments to 3mm.	α=0 βγ=3
617-620	1	—	"	Same as Above.	α=0 βγ=3

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

BIT CUTTINGS LOG

Borehole ID 21-22523 Sample Type — From 620 To 660 Page 6 of 7

By J. Crocker Date(s) 5-1-95 To 5-5-95 Checked By R. Blyn Date 5/23/95

TA/OU 21/FU-1 Box #(s) — Drilling Equip. IR THW drilling odex

Depth or depth interval	Amount recovered (No. of bags collected)	Sample Splits Amount, requester, organization	Lithology	Comment	
620-624 5-5-95	1	—	OTHOWI	10YR 6/2 Grayish-Red Cuttings 5-6% dark grains. No pumice	α=0 βγ=3
624-626	1	—	"	Grayish Red cuttings 10YR 6/2, 6% dark grains, Rare Pumice To ~3mm	α=0 βγ=3
626-630	1	—	"	10YR 6/2, 8% dark grains, Pumice shards 1-2 mm	α=0 βγ=3
630-633	1	—	"	10YR 6/2. 6% dark grains Rare Pumice as large as 2mm.	α=0 βγ=3
633-640	2	—	"	Grayish Red cuttings 10YR 6/2. 6%-7% dark grains. Pumice fragments to 4mm.	α=0 βγ=3
640-646	2	—	"	10R 7/2 Grayish Pink cuttings. 6% dark grains Pumice fragments to 3mm.	α=0 βγ=3
646-650	1	—	"	10R 7/2. 4-5% dark grains Pumice to 2mm	α=0 βγ=3
650-656	1	—	"	10R 6/2 Pale red. 6%-7% dark grains, 1-2mm Pumice fragments	α=0 βγ=3
656-660 5-5-95	2	—	"	10R 6/2 7-4% dark grains as large as 3mm. No Pumice fragments observed	α=0 βγ=

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION PROGRAM

SAMPLE MANAGEMENT FACILITY

CORE SAMPLE LOG

Borehole ID ~~2522~~ 21/2580 TA/OU 21/1106 Drill Depth From 0 To 7.5 Page 1 of 1

Driller Layne Box #(s) ~~1~~ N/A Start Date/Time 8/9/0830 End Date/Time 8/9/1030

Drilling Equip./Method CME 750 / Auger Sampling Equip./Method Split core barrel / cont. core.

Depth (Feet)	Recovery (feet per feet/ %)	Field Borehole Analytical Sample Number	Field Screening Results	Top/Bottom of Core in Box	Lithology - Petrology - Soil	Graphic Log	Lithologic Unit	Notes
	100%		BACK-GROUND		0-0.6 Silty Sand with ~20% clay, soil some pebbles. Slightly moist		Soil	
					0.6-1.6 Non welded Tuff soft crumbly. use all of Tuff for sample.		Fill	
					2.5 - 5 FT cobbles - some large - 5-6".			
					5-7.5 - used Punch sampler to collect samples for Rad, metals, etc. - non welded Tuff.			
					T.D = 7.5'			Stopped drilling Hit cobble layer - still in abs. bed #3. Hole collapsed
					Stopped drilling			

Prepared By G. Stoopes Date 8/8/94 Checked By [signature] Date 2/20/95

R1